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A
DICTIONARY
OF
CHEMICAL SOLUBILITIES
INORGANIC

FIRST EDITION
BY
ARTHUR MESSINGER COMEY, PH D

SECOND EDITION
ENLARGED AND REVISED
BY
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PREFACE TO FIRST EDITION

FOR many years a need has been felt by chemists for a book which shall collect into convenient form for ready reference the various data concerning the solubility of chemical substances that have been published from time to time in chemical periodicals and elsewhere

The first mention that can be found of such a plan was made in 1731, when Peter Shaw delivered Chemical Lectures in London, as may be seen from the following —

EXTRACTS from PETER SHAW's Chemical Lectures, publickly read at London in 1731 and 1732 London Second Edition, London 1755 8vo

Page 97 Experiment I — That Water as a Menstruum dissolves more of one body and less of another

[He shows that two ounces of water dissolve two ounces of Epsom salt, five drachms of common salt, and eight grains of cream of tartar Only in the latter case much remained undissolved until boiled]

"It might be proper for the further Improvement of Chemistry and Natural Philosophy to form a Table of the Time and Quantity wherein all the known Salts are dissolvable in Water Such a Table regularly formed might ease the Trouble of refining Salts, by shewing at once without future Trial or Loss of Time how much Water each Salt required to dissolve it for Clarification, Filtration, or Crystallization It would likewise supply us with a ready and commodious Way of separating any Mixture of Salts, by shewing which would first shoot out of the Mixture upon Crystallization The same Table might also direct us to a ready and commodious Method of separating two Salts without waiting for Crystallization "

It was many years, however, before the scheme suggested by Peter Shaw was put into execution Professor F H Storer published the first work that undertook to carry out the idea in its entirety, in 1864, in a book, which he entitled "First Outlines of a Dictionary of Solubilities of Chemical Substances," and which contained a compilation of nearly all the data on the subject published before 1860 It was at once recognized as a most valuable contribution to chemical literature, but for many years it has been difficult to obtain this work, as the limited edition which was published was soon wholly exhausted Since then nothing has appeared on the subject except the brief tabulations found in various reference books, and no attempt has been made to cover the whole subject

It is needless to state that the growth of chemical science since the publication of Professor Storer's book has been so enormous that that work has lost, at least to a great extent, the practical value it possessed thirty years ago This growth has been indeed so great, and the data which have accumulated since 1860 so far surpass the earlier in volume, that a simple revision of Professor Storer's book was impracticable, and it therefore seemed best to start afresh

With the facilities offered by the various scientific libraries at Harvard University, the Massachusetts Institute of Technology, and other libraries in Boston, it has been possible to collect nearly all the data relating to the subject. For the work before 1860 Professor Storer's work has been found invaluable.

The method pursued has been to form a preliminary list of compounds with more or less data by consulting the two most complete works on inorganic chemistry—Gmelin-Kraut's "*Handbuch der anorganischen Chemie*" and Graham-Otto-Michaelis's "*Lehrbuch*." These statements have been verified and elaborated by consulting the original memoirs in all the periodicals devoted to chemical literature which were obtainable. The "*Jahresbericht der Chemie*" also has been used extensively in tracing references, but the original memoirs have always been consulted and references given to them when possible.

It has been found impracticable to draw any distinction as to reliability between the various data given by different observers. It was manifestly impossible to attempt to verify experimentally the statements of those who have carried on the researches, for the most assiduous labor of many could only cover a small portion of the attested facts. Therefore, even when two statements are directly contradictory, both have been given with the authority for each. The only exception to this has been made when more recent discoveries have shown beyond any reasonable doubt the falsity of previous work. In this way some of the older manifestly inaccurate work has been omitted. In a majority of cases the more recent work may be considered to be the more accurate, but this is not the invariable rule. A Synchronistic Table of the more common periodicals is given in the Appendix, whereby it is easy to determine the date of the publication of a research to which reference is made.

It may be objected by the practical chemist that most of the work previous to 1850 might well have been omitted, but a great deal of this work possesses at least a historical value, and often furnishes facts which have not since been verified. Much of the earlier work, when obviously of less importance, has been printed in smaller type.

The aim has been to include in this volume all analyzed inorganic substances, that is, all substances which do not contain carbon, but exception has been made in the case of CO_2 , CO , CS_2 , the carbonates, cyanides, ferro-cyanides, etc., which are here included.

The work has been brought up to March, 1894, when this volume went to press, and the results of researches published since that time are not included in the present edition.

It is hoped that this book will fill to some extent the want that has been felt by chemists for a compilation of this nature. While it has been attempted to make the book as free from errors as possible, nevertheless it is naturally impossible to avoid many mistakes, and the compiler will be very grateful to those who may call his attention to any errors or omissions.

A M C

PREFACE TO SECOND EDITION

DURING the twenty-five years which have elapsed since the publication of the first edition of this dictionary, a very large amount of work has been published in chemical periodicals, containing data concerning the solubility of inorganic chemical compounds. As it was impossible for the compiler of the first edition to devote the time necessary for the collecting of the published data, it was necessary to employ assistance, and Dr Dorothy A Hahn, Professor of Chemistry, Mt Holyoke College, was engaged for this work. Dr Hahn has collected the larger part of the material in this book, which work in spite of its arduous and tedious nature, she has performed in a most painstaking manner.

The compilation and arrangement of the data collected by Dr Hahn, which devolved upon the original author, took much time. This, together with difficulties in printing, caused by the general conditions after the war, has delayed the publication until the present year, although the work was begun in 1916, and it has only been brought up to January 1st of that year.

Since the publication of the first edition of this work, Dr Atherton Seidell has brought out two editions of his book, entitled "Solubilities of Inorganic and Organic Substances," which covers quite a different field, as he considers only quantitative data and those only for the commoner substances. Dr Seidell has followed the plan in most cases where there are several available solubility determinations of a substance, of selecting and averaging the more reliable results, and embodying them in tables. Although this undoubtedly facilitates ready reference, it has seemed better to adhere to the original plan of the first edition, and to publish all the data in the form of the original authorities with references and dates, so that the user may be at liberty to use his own judgment in selection. Some few of the tables arranged by Dr Seidell, however, have seemed to possess decided advantages over any other published data and they have been incorporated in the present volume. It is desired also to acknowledge indebtedness to Dr Seidell's work for certain other tables where the original sources were not available to the present compilers.

The same plan and arrangement used in the first edition has been followed with certain elaboration, however, of the arrangement of data on the solubility of two or more salts in a solvent, which is explained in the Explanatory Preface.

Data published since the first edition on the cobalt and chromium ammonia compounds and those of the platinum group have been omitted, as it seemed that solubility data on those compounds possessed very little general interest.

As stated in the preface of the first edition, while every possible attempt has been made to avoid errors, it is manifestly impossible to avoid many mistakes in a work of this nature, and the compiler will be glad to have his attention called to any errors or omissions.

WILMINGTON, Del , Jan , 1921

A M C

EXPLANATORY PREFACE

In order to reduce this volume to a convenient size the subject-matter has been abbreviated and condensed as far as seemed compatible with clearness, but it has been the aim not to use any abbreviations which are not at once intelligible without consulting the explanatory table. The more common chemical formulæ have been universally used, thereby saving a large amount of space without detracting from ready intelligibility to chemists.

The solubility of the substance in water is first given, the data being arranged chronologically in the longer articles. Then follow the specific gravities of the aqueous solutions, and also any data obtainable regarding their boiling-points, other physical data concerning solutions are not included. Following this is the solubility of the substance in other solvents—first the inorganic acids, then alkali and salt solutions, and finally organic substances.

Owing to the great increase of data, published during the last twenty years, on the simultaneous solubility of two or more salts in a given solvent, it has been found necessary to plan some arrangement, whereby such data can easily be found, and the plan adopted is as follows. The data for the solubility of two salts in a solvent is placed under the salt which comes first according to the alphabetical arrangement in this dictionary, and the order of the data on various salts under the same heading follows the alphabetical order of the salts considered. Thus the data on the solubility of $\text{NH}_4\text{Cl} + \text{BaCl}_2$, $\text{NH}_4\text{Cl} + \text{CuCl}_2$, and $\text{NH}_4\text{Cl} + \text{PbCl}_2$, and $\text{NH}_4\text{Cl} + (\text{NH}_4)_2\text{SO}_4$ are placed under Ammonium Chloride and arranged in the given order. Certain exceptions have been made to this rule, where the data directly concerns the solubility of a salt in a solution of another salt, in which case, it is placed under the former. Numerous cross references, however, are given, which it is hoped will avoid confusion.

In many cases no definite distinction can be drawn between the phenomena of solution and decomposition. At present the theory of solution is in a confused state, and until what really takes place when a substance dissolves is thoroughly understood no distinct line can be drawn. The whole subject is unsettled at the present time, for while many chemists believe in the so-called "dissociation" theory, yet the "hydrate" theory is not without its supporters. It is not my intention to discuss the theoretical side of the question, which has been so well treated in many recent works. It is, however, obvious that the phenomena are essentially different, when, for example, sodium carbonate is dissolved in water, in which case the original salt is deposited on evaporation, and when iron is dissolved in sulphuric acid, and the solution deposits a sulphate of iron. Yet it is still the custom to speak of iron as soluble in sulphuric acid, although it would be much more accurate to say that the sulphuric acid was decomposed by the iron. It has thus been found impracticable to draw a sharp line between solu-

tion and decomposition, and the term "soluble" has in general been used where a solution of some sort is formed by the action of the solvent

The matter of alphabetical arrangement of chemical compounds, in the present somewhat confused state of chemical nomenclature, has been a difficult question to decide. The plan followed has been practically that of the standard Dictionaries of Chemistry, whereby the compounds of metals with one of the non-metallic elements have been classified under the metals, while the salts of the other acids (the oxygen acids so called and some few others) have been arranged alphabetically under the acids. Thus barium chloride is found under barium, while barium chlorate is found under chloric acid. No exception has been made in the case of the rare metals, as is usually the custom in Dictionaries of Chemistry. Double salts are to be found under the word which comes first alphabetically, thus, "common alum," potassium aluminum sulphate, is found under aluminum sulphate as aluminum potassium sulphate (under sulphuric acid), but ammonia chrome alum is found under ammonium sulphate as ammonium chromium sulphate. In the same way the double sulphate and chromate of potassium is found under potassium chromate (chromic acid), and not under potassium sulphate (sulphuric acid). The double chloride of ammonium and magnesium is found under ammonium chloride (ammonium), while the double chloride of potassium and magnesium is found under magnesium chloride (magnesium). An exception is made, however, in the case of double compounds of salts of oxygen acids with salts containing a single non-metallic element, in which case they are always found under the oxygen acid. Thus the double sulphate and chloride of lead, PbSO_4 , PbCl_2 , is found under lead sulphate (sulphuric acid), and not under lead chloride (lead).

The above method in some cases widely separates analogous compounds but it was found to be the only practical way to strictly alphabetical arrangement, which is no necessary in a book containing so many very short articles.

The ammonia addition-products furnished another difficulty. While their nature is more or less definitely understood in the cobalt-platinum etc., compounds, and a definite nomenclature is in general use, there is an absolute lack of anything of the kind in the less definite compounds. It is good usage to speak of cuprummonium compounds, but how shall we designate the analogous cadmium compounds? "Cadmummonium" has not yet received the sanction of chemists, and AlCl_3 , NH_3 is a still worse case for naming. I have therefore not attempted to name these compounds, but classified them all under the salts to which the ammonia is added, affixing the word ammonium thus aluminum chloride ammonium, cadmium chloride ammonium, and also cupric chloride ammonium for the salt now almost universally known as cuprummonium chloride.

The ammonia compounds of cobalt, chromium, mercury, and the platinum metals are arranged alphabetically according to their universally accepted names, a list of which is given under each of those elements.

It has further been necessary to settle arbitrarily the question whether a substance should be considered as a double salt or a salt of a compound acid con-

taining one of the metals For example, "fluosilicates" (or silicofluorides, as some may prefer) is the general name for the double fluorides of SiF_4 and a metal, but this unanimity in usage gradually disappears as the basic elements become more nearly alike, so that it is impossible to draw a line between such compounds and a compound such as the double chloride of magnesium and potassium, for which indeed the name "potassium chloromagnesate" has been proposed The aim has been in all these cases to follow the best usage rather than make an absolutely homogeneous system of nomenclature out of the existing confusion

In the matter of formulæ no attempt at uniformity has been made Thus in the case above some chemists write the formula of the double chloride of magnesium and potassium as KMgCl_3 , others as KCl, MgCl_3 The form here used has been in most cases that of the author from whom the data are taken

The prefixes mono, di, tri, ortho, pyro, etc, have in general been disregarded in the alphabetical arrangement, and have been printed in italics Exceptions to this have been made, however, in the cobalt, chromium, etc, ammonium compounds, and in a few others, as dithionic, perchloric, etc, acids Cross references have been used, so as to prevent any confusion arising from lack of uniformity in this respect

In the Appendix will be found formulæ and tables for the conversion of the degrees of various hydrometer scales into specific gravity, and a Synchronistic Table of the Periodicals to which references are most frequently made

ABBREVIATIONS

abs —absolute
atmos —atmosphere
b-pt —boiling-point
comp —compound
conc —concentrated
corr —corrected
cryst —crystallised, crystalline
decomp —decompose, decomposes,
decomposition, etc
dil —dilute
eutec —eutectic
insol —insoluble
M —a univalent Metal
Min —Mineral
mol —molecule

m-pt —melting-point
ord —ordinary
n —normal
ppt, pptd, etc —precipitate, pre-
cipitated, etc
pt —part
sat —saturated
sl —slightly
sol —soluble
sp gr —specific gravity
supersat —supersaturated
t° = temperature in Centigrade degrees
temp —temperature
tr pt —transition point
vol —volume

ABBREVIATIONS OF REFERENCES

- A —Annalen der Pharmacie, edited by Liebig and others, 1832-39, continued as Annalen der Chemie und Pharmacie, 1840-73, continued as Justus Liebig's Annalen der Chemie, 1874-1915+ 406 vols
- A ch —Annales de Chimie et de Physique Paris 1st series, 1789-1816, 96 vols, 2nd series, 1817-40, 78 vols, 3rd series, 1841-63, 69 vols, 4th series, 1864-73, 30 vols, 5th series, 1874-83, 30 vols, 6th series, 1884-93, 30 vols, 7th series, 1893-1903, 30 vols, 8th series, 1904-13, 30 vols, 9th series, 1914+, 3 vols
- Acta Lund —Acta Universitatis Lundensis, or Lunds Universitets Års-skrift Lund, 1864+
- Am Chemist —The American Chemist New York, 1870-77 7 vols
- Am Ch J —The American Chemical Journal, edited by Remsen Baltimore, 1879-1913 50 vols
- Am J Sci —American Journal of Science and Arts, edited by Silliman, Dana, and others New Haven 1st series, 1818-45, 50 vols, 2nd series, 1846-70, 50 vols, 3rd series, 1871-95, 50 vols, 4th series, 1896-1915+, 40 vols Also numbered consecutively, 190 vols
- Analyst —The Analyst London, 1876-1915+ 45 vols
- Ann chim farm —Annali di chimica e di farmacologia Milan, 1886-90 5 vols
- Ann des Mines —See Ann Min
- Ann Min —Annales des Mines Paris
- Ann Phil —Annals of Philosophy London 1st series, 1813-20, 16 vols, new series, 1821-26, 12 vols
- Ann Phys —See Pogg and W Ann
- Apoth Z —Apotheker-Zeitung Berlin
- Arb Kais Gesundheitsamt —Arbeiten aus dem Kaiserlichen Gesundheitsamt
- Arch Néer Sc —Archives Néerlandaises des Sciences exactes et naturelles
- Arch Pharm —Archiv der Pharmacie, continued from Archiv des Apothekervereins in Norddeutschland, which forms the 1st series 1st series, 1822-34, 50 vols, 2nd series, 1835-72, 150 vols, 3rd series, 1873-94+, 32 vols Also numbered consecutively, which system is exclusively used after 3rd series, vol 253 (1915)
- Arch sc Phys nat —Archives des sciences physiques et naturelles de la Bibliothèque universelle de Genève
- A Suppl —Annalen der Chemie und Pharmacie Supplement-Bande Vol i 1861, vol ii, 1862-63, vol iii 1864-65, vol iv 1865-66, vol v 1867, vol vi 1868, vol vii 1870, vol viii 1872
- B —Berichte der deutschen chemischen Gesellschaft Berlin, 1868-1915+ 48 vols
- Att Acc Linc —Atti della reale accademia dei Lincei, rendconditi, etc
- B A B —Sitzungsberichte der königlichen preussischen Akademie der Wissenschaften zu Berlin
- Belg Acad Bull —Bulletin de l'Académie Royale des Sciences, des Lettres, et des Beaux-Arts de Belgique
- Berz J B —Jahresbericht über die Fortschritte der physischen Wissenschaften, edited by Berzelius 1822-47 30 vols
- Br Arch —Archiv des Apothekervereins im nördlichen Teutschland, etc, edited by Brandes 1st series, 1822-31, 39 vols, corresponds to 1st series of Arch Pharm
- Bull Acad Crac —Bulletin international de l'Académie des Sciences de Cracovie
- Bull Ac St Pétersb —Bulletin de l'Académie Impériale des Sciences de St Petersburg
- Bull Soc —Bulletin des Séances de la Société chimique de Paris 2nd series, 1864-88, 50 vols, 3rd series, 1889-1906, 36 vols, 4th series, 1907-15+, 18 vols
- Bull Soc chim Belg —Bulletin de la Société chimique Belgique
- Bull Soc ind Mulhouse —Bulletin de la Société industrielle de Mulhouse 1828-49 22 vols
- Bull Soc Min —Bulletin de la société française de Minéralogie 1878-1915+ 37 vols
- C A —Chemical Abstracts American Chemical Society New York
- C C —Chemisches Centralblatt, continued from Pharmaceutisches Centralblatt
- C B Miner —Centralblatt für mineralogie, Geologie und Paläontologie Berlin
- Chem Ind —Die Chemische Industrie, edited by Jacobsen Berlin
- Chem Soc —Journal of the Chemical Society of London 1st series, 1849-62, 15 vols, 2nd series, 1863-78, 17 vols, new series, 1878-1915+ The vols are numbered consecutively from 1849 1878 = vol 32 Total, 108 vols

- Chem-tech Centr-Anz—Chemisch-technischer Central-Anzeiger
 Chem Weekbl—Chemiker Weekblad
 Chem Z—See Ch Z
 Chem Zeitschr—Chemische Zeitschrift
 Ch Gaz—The Chemical Gazette London, 1843-59 17 vols
 Ch Kal—Chemiker Kalender, edited by Biedermann
 Ch Z—Chemiker Zeitung
 Ch Z Repert—Chemisches Repertorium Beiblatt zur Chemiker-Zeitung Gothen
 Cim—Il Cimento Turin, 1852-54 6 vols
 C N—The Chemical News London, 1860-1915+ 112 vols
 Comm—Commentar zur Pharmacopœa germanica by Hager Berlin, 1883
 Compt chim—Comptes-rendus mensuels des Travaux chimiques, edited by Laurent & Gerhardt 1845-51 7 vols
 C R—Comptes-rendus hebdomadaires des Séances de l'Académie des Sciences Pa 1835-1915+ 161 vols
 Crell Ann—Chemische Annalen für die Freunde der Naturlehre, etc, edited by Cr 1784-1803 40 vols
 Dansk Vid For—Oversigt over det kgl danske Videnskabernes Selskabs Forhandling Copenhagen
 Dingl—Dingler's Polytechnisches Journal, edited by Dingler and others 1820-1915 330 vols
 Edinb Trans—Transactions of the Royal Society of Edinburgh 1788-1915+ 51 v
 Ed J Sci—The Edinburgh Journal of Science 1st series, 1824-29, 10 vols, 2nd ser 1829-32, 6 vols Continued as Phil Mag
 Electrochem Ind—Electrochemical Industry (Oct, 1902, to Dec, 1904) later Elect chemical and Metallurgical Industry New York
 Elektrochem Z—Elektrochemische Zeitschrift Berlin
 Eng Min J—The Engineering and Mining Journal New York
 Gazz ch it—Gazzeta chimica italiana Palermo, 1871-1915+ 45 vols
 Gilb Ann—Annalen der Physik, edited by Gilbert 1st series, 1799-1808, 30 vols, 2 series, 1809-18, 30 vols, 3rd series, 1819-24, 26 vols Also numbered consecutive 76 vols Continued as Pogg
 Gm-K—Gmelin-Kraut's Handbuch der anorganischen Chemie, 6te Auflage 1877-19 7te Auflage, 1907-1915+
 Gr-Ot—Graham-Otto's ausführliches Lehrbuch der anorganischen Chemie, 5te Auflage, Michaelis 1878-89
 Jahrb Miner—Jahrbuch für Mineralogie, Geologie und Palæontologie Heidelberg 18 1832 Then Neues Jahrbuch für Mineralogie Stuttgart
 Jahrb d Pharm—Jahresbericht der Pharmacie
 J Am Chem Soc—Journal of the American Chemical Society New York, 1876-1915 37 vols
 J Anal Appl Ch—The Journal of Analytical and Applied Chemistry, edited by H 1887-93 7 vols
 J B—Jahresbericht über die Fortschritte der Chemie, u s w
 J Chim méd—Journal de Chimie médicale, de Pharmacie, et de Toxicologie 1st ser 1825-34, 10 vols, 2nd series, 1835-44, 10 vols, 3rd series, 1845-54, 10 vols, series, 1855-64, 10 vols, 5th series, 1865-76 12 vols
 Jena Zeit—Jenaische Zeitschrift für Medicin und Naturwissenschaften
 J Pharm—Journal de Pharmacie et de Chimie Paris 2nd series, 1815-41, 27 vols, series, 1842-64, 46 vols, 4th series, 1865-79, 30 vols, 5th series, 1879-94, 6th ser: 1895-1909, 30 vols, 7th series, 1910-15+, 10 vols
 J Phys—Journal der Physik, edited by Gren 1790-98 12 vols Continued as Gilb A
 J Phys Ch—The Journal of Physical Chemistry Ithaca, N Y
 J pr—Journal für praktische Chemie, edited by Erdmann, Kolbe, and v Meyer Leipz 1st series, 1834-69, 108 vols, 2nd series, 1870-1915+ 92 vols
 J russ phys Chem Soc—Journal de la Société physico-chimique russe St Pétersbou
 J Russ Soc—Journal of the Russian Chemical Society St Petersburg, 1869-1915 47 vols
 J Soc Chem Ind—Journal of the Society of Chemical Industry London, 1882-1915 34 vols
 J S C I—See above
 J Tok Chem Soc—Journal of the Tokyo Chemical Society
 Kastn Arch—Archiv für die gesammte Naturlehre, edited by Kastner Nuremberg, 18 35 25 vols
 Lasty Chemické—Lasty Chemické, edited by Preis and others Prague
 Lond R Soc Proc—See Roy Soc Proc
 Lund Univ Arsk—Lunds Universitets Års-skrift Lund

- M — Monatshefte für Chemie und verwandter Theile der anderer Wissenschaften Vienna, 1880-1915+ 36 vols
- M A B — Sitzungsberichte der mathematisch-physikalischen Classe der kgl bayerischen Akademie der Wissenschaften zu München
- Mag Pharm — Magazin der Pharmacie 1823-31 36 vols
- Mém Acad St Pétersb — Mémoires de l'Académie Impériale des Sciences de Saint-Pétersbourg
- M Ch — See M
- Mem Coll Sci Kyoto — Memoirs of the College of Science, Kyoto
- Metall — Metallurgie Halle
- Miner Jahrb — Neues Jahrbuch für Mineralogie, etc 1833-73 40 vols
- Miner Mag — Mineralogical Magazine London
- Miner Mitt — Mineralogische und petrographische Mittheilungen Wien
- Monit Scient — Le Moniteur Scientifique, edited by Quesneville Paris
- N Arch Sc ph nat — Nouvelles Archives des Sciences physiques et naturelles Geneva
- N Cim — Il nuovo Cimento Pisa, 1855-61 14 vols
- N Edinb Phil J — New Edinburgh Philosophical Journal 1819-64 90 vols
- N Jahrb Miner — Neues Jahrbuch für Mineralogie Stuttgart
- N Jahrb Pharm — Neues Jahrbuch der Pharmacie 1796-1840 42 vols
- N J Pharm — Neues Journal der Pharmacie für Aerzte, etc, edited by Trommsdorff 1817-34 27 vols
- N Rep Pharm — Neues Repertorium für Pharmacie 1852-76 25 vols
- Pharm Centralbl — Pharmaceutisches Centralblatt 1830-49 20 vols Continued as C C
- Pharm Era — Pharmaceutical Era
- Pharm J Trans — Pharmaceutical Journal and Transactions
- Pharm Post — Pharmaceutische Post Wien
- Pharm Vierteljb — Pharmaceutische Vierteljahresberichte
- Pharm Weekbl — Pharmaceutisches Weekblad
- Pharm Ztg — Pharmaceutische Zeitung
- Phil Mag — The Philosophical Magazine London 1st series, 1814-26, 26 vols, 2nd series 1827-32, 11 vols, 3rd series, 1832-50, 37 vols, 4th series, 1851-75, 50 vols, 5th series, 1876-1900, 50 vols, 6th series, 1901-1915+, 30 vols
- Phil Mag Ann — The Philosophical Magazine and Annals of Chemistry, etc Corresponds to Phil Mag 2nd series
- Phil Trans — The Philosophical Transactions of the Royal Society of London 1665-1915+
- Phys Rev — The Physical Review
- Pogg — Annalen der Physik und Chemie, edited by Poggendorf 1st series, 1824-43, 60 vols, 2nd series, 1844-53, 30 vols, 3rd series, 1854-63, 30 vols, 4th series, 1864-73, 30 vols, 5th series, 1874-77, 10 vols Continued as W Ann
- Polyt Centralbl — Polytechnisches Centralblatt 1st series, 1835-46, 12 vols, 2nd series, 1847-73, 30 vols
- Proc Am A A S — Proceedings of the American Association for the Advancement of Science
- Proc Am Acad — Proceedings of the American Academy of Arts and Sciences Boston, 1846-1915+ 50 vols
- Proc Am Phil Soc — Proceedings of the American Philosophical Society Philadelphia
- Proc Chem Soc — Proceedings of the Chemical Society of London
- Proc K Akad Wet — See Ver K Akad Wet
- Proc Soc Manchester — Proceedings of the Literary and Philosophical Society of Manchester
- Proc Roy Soc — See Roy Soc Proc
- Q J Sci — Quarterly Journal of Science London, 1816-26 22 vols
- Rass Min — Rassegna mineraria, metallurgica e chimica
- Real Ac Linc — Atti di Reale Accademia dei Lincei Rome
- Rend Ac Linc — See Att Ac Linc
- Rep anal Ch — Repertorium der analytischen Chemie 1881-87 7 vols
- Rep Brit Assn Adv Sci — Reports of the Meetings of the British Association for the Advancement of Science
- Repert — See Rep Pharm
- Répert chim appl — Répertoire de Chimie pure et appliquée Paris, 1858-63 9 vols
- Rep Pharm — Repertorium für die Pharmacie, edited by Buchner 1st series, 1815-34, 50 vols, 2nd series, 1835-48, 50 vols, 3rd series, 1849-51, 10 vols Continued as N Rep Pharm
- Rev gén chim — Revue générale de chimie pure et appliquée
- Rev Mét — Revue de Métallurgie Paris
- Roy Soc Proc — Proceedings of the Royal Society of London 1832-1915+ 92 vols

- Roy Soc Trans—Abstracts of Philosophical Transactions of the Royal Society of London 1832-54 6 vols Continued with Roy Soc Proc
- R t c—Recueil des Travaux chimiques des Pays-Bas Leiden, 1882-1915+ 34 vols
- Russ Zeit Pharm—Pharmaceutische Zeitschrift für Russland
- Scheik Verhandel—Scheikundige Verhandelungen en Onderzoekingen, edited by Mulder Rotterdam, 1857-64 3 vols
- Scher J—Allgemeines Journal der Chemie, edited by Scherer 1798-1810 17 vols Continued as Schw J
- Schw J—Journal für Chemie und Physik, edited by Schweigger 1st series, 1811-20, 30 vols, 2nd series, 1821-30, 30 vols, 3rd series, 1831-33, 9 vols Continued as J pr
- Sill Am J—American Journal of Science, edited by Silliman, etc See Am J Sci
- Sitzungsb bohms Gesell—Sitzungsberichte der königlichen böhmischen Gesellschaft der Wissenschaften in Prag
- Storer's Dict—First Outlines of a Dictionary of Solubilities of Chemical Substances, by F H Storer Boston, 1864
- Sv V A F—Öfversigt af kongl Svenska Vetenskaps-Akademien Föreläsningar Stockholm
- Sv V A H—Kongliga Svenska Vetenskaps-Akademiens Handlingar Stockholm
- Sv V A H Bih—Bihang till kongl Svenska Vetenskaps-Akademiens Handlingar Stockholm
- Techn J B—Jahresbericht über die Fortschritte der chemischen Technologie, edited by Wagner, Fischer, etc
- Trans Am Electrochem Soc—Transactions of the American Electrochemical Society Philadelphia
- Trans Faraday Soc—Transactions of the Faraday Society London
- Trans Roy Soc—Philosophical Transactions of the Royal Society of London
- Ver K Akad Wet—Verslag Koninklijke Akademie van Wetenschappen, Amsterdam
- W A B—Sitzungsberichte der mathematisch-naturwissenschaftlichen Classe der kaiserlichen Akademie der Wissenschaften zu Wien
- w Ann—Annalen der Physik und Chemie, edited by Wiedemann Continuation of Pogg 1877-1899 69 vols 4th series, 1900-1915+ 48 vols
- W Ann Beibl—Beiblätter zu Wiedemann's Annalen Leipzig
- Z anal—Zeitschrift für analytische Chemie, edited by Fresenius Wiesbaden, 1862-1915+ 54 vols
- Z anorg—Zeitschrift für anorganische Chemie, edited by Kruss 1892-1915+ 93 vols
- Z B H Sal—Zeitschrift für das Berg, Hutten, und Salinen-Wesen in dem preussischen Staate Berlin
- Zeit angew Ch—Zeitschrift für Chemie Berlin, 1887-1915+ 29 vols
- Zeit Chem—Zeitschrift für Chemie und Pharmacie 1st series, 1858-64, 6 vols, 2nd series, "N F," 1865-71, 7 vols
- Zeit d allgem öster Apothekeiv—Zeitschrift des allgemeinen österreichischen Apotheker vereins
- Zeit ges Nat—Zeitschrift für die gesammten Naturwissenschaften
- Zeit Krist—Zeitschrift für Kristallographie und Mineralogie 1877-1915+ 51 vols
- Zeit Pharm—See Russ Zeit Pharm
- Z Elektrochem—Zeitschrift für Elektrochemie Halle
- Z Phys Ch—Zeitschrift für physikalische Chemie, edited by Oswald und v n t Hoff 1887-1915+ 90 vols
- Z physiol Chem—Zeitschrift für physiologische Chemie Strassburg
- Z Ver Zuckerind—Zeitschrift des Verein der deutschen Zuckerindustrie

A DICTIONARY OF CHEMICAL SOLUBILITIES
INORGANIC

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CHEMICAL SOLUBILITIES

INORGANIC

Actinium emanation

Solubility coefficient of actinium emanation in H_2O at room temp is 2

If the solubility of actinium emanation in H_2O is made=1, the relative solubility of the emanation in sat $KCl+aq=0.9$, in conc $H_2SO_4=0.95$, in ethyl alcohol=1.1, in amyl alcohol=1.6, in benzaldehyde=1.7, in benzene=1.8, in toluene=1.8, in petroleum=1.9, in $CS_2=2.1$ at 18°

(Hevesy, Phys Zeit 1911, 12 1221)

Air, Atmospheric

See also Nitrogen and Oxygen

100 vols H_2O at 15° and 760 mm absorb about 5 vols atmospheric air (Saussure)

1 vol H_2O at t° and 760 mm pressure absorbs V vols atmospheric air reduced to 760 mm and 0°

t°	V	t°	V	t°	V
0	0.02471	7	0.02080	14	0.01822
1	0.02406	8	0.02034	15	0.01795
2	0.02345	9	0.01992	16	0.01771
3	0.02287	10	0.01953	17	0.01750
4	0.02237	11	0.01916	18	0.01732
5	0.02179	12	0.01882	19	0.01717
6	0.02128	13	0.01851	20	0.01701

(Bunsen's Gasometry)

1 l H_2O absorbs cc N and O from air at t° and 760 mm pressure

t°	cc N	cc O	cc N+O
0	16.09	8.62	24.71
5	14.18	7.60	21.78
10	12.70	6.79	19.49
15	11.67	6.25	17.92
20	11.08	5.93	17.01

(Bunsen, Gasometr Methoden, 2te Aufl 209, 220)

1 l H_2O absorbs cc N and O from air at t° and 760 mm pressure (dry)

t°	cc N	cc O	N+O	%O
10	15.47	7.87	23.34	33.74
15	13.83	7.09	20.92	33.86
20	12.76	6.44	19.20	33.55
25	11.78	5.91	17.69	33.40

(Roscoe and Lunt, Chem Soc 55 568)

1 l H_2O absorbs cc N and O from air at t° and 760 mm

t°	cc N	cc O	%O
0	19.53	10.01	33.88
6.0	16.34	8.28	33.60
6.32	16.60	8.39	33.35
9.18	15.58	7.90	33.60
13.70	14.16	7.14	33.51
14.10	14.16	7.05	33.24

(Pettersson and Sondén, B 22 1439)

1 l H_2O absorbs cc N (0° and 760 mm) from atmospheric air at t° and 760 mm pressure (dry)

t°	cc N	t°	cc N	t°	cc N
0	19.14	10	15.14	20	12.63
2	18.20	12	14.53	22	12.27
4	17.34	14	13.98	24	11.95
6	16.54	16	13.48	25	11.81
8	15.81	18	13.03		

(Hamberg, J pr (2) 33 447)

1 l H_2O absorbs cc N from air at t° and 760 mm pressure

t°	cc N	t°	cc N	t°	cc N
0	19.29	10	15.36	20	12.80
5	17.09	15	13.95	25	11.81

(Dittmar, Challenger Expedition, vol 1 pt 1)

1 l H₂O sat with air at t° and 760 mm contains cc O (red to 0° and 760 mm)

t°	cc O	t°	cc O	t°	cc O
0	10 187	11	7 692	22	6 114
1	9 910	12	7 518	23	5 999
2	9 643	13	7 352	24	5 886
3	9 387	14	7 192	25	5 776
4	9 142	15	7 038	26	5 669
5	8 907	16	6 891	27	5 564
6	8 682	17	6 730	28	5 460
7	8 467	18	6 614	29	5 357
8	8 260	19	6 482	30	5 255
9	8 063	20	6 356		
10	7 873	21	6 233		

(Winkler, B 22 1773)

1 vol H₂O absorbs 0.01748 vol air at 24.05° and 760 mm pressure (Winkler, B 21 2851)

Composition of the absorbed air between 0° and 24° is 34.91% O and 65.09% N (Bunsen), between 15° and 16°, 32.17% O and 67.83% N (König and Kranch, Z anal 19 259), 32% O and 68% N (Regnault), at 0°, 35.1% O, 10°, 34.8% O, 20°, 34.3% O, 25°, 33.7% O (Winkler, B 21 2483). See also Roscoe and Lunt, and Pettersson and Söndén, page 1

Solubility of atmos oxygen and nitrogen in 1000 cc H₂O at 760 mm pressure (calc)

Temp	Oxygen	Nitrogen	Temp	Oxygen	Nitrogen
	cc	cc		cc	cc
0°	10 19	18 45	29°	5 33	10 30
1	9 91	17 99	30	5 24	10 15
2	9 64	17 55	31	5 15	9 99
3	9 39	17 12	32	5 07	9 83
4	9 14	16 71	33	4 99	9 67
5	8 91	16 30	34	4 91	9 52
6	8 68	15 91	35	4 83	9 37
7	8 47	15 54	36	4 76	9 22
8	8 26	15 18	37	4 69	9 08
9	8 06	14 83	38	4 62	8 94
10	7 87	14 50	39	4 55	8 81
11	7 69	14 19	40	4 48	8 67
12	7 52	13 89	41	4 42	8 55
13	7 35	13 61	42	4 35	8 43
14	7 19	13 35	43	4 28	8 31
15	7 04	13 07	44	4 22	8 20
16	6 89	12 83	45	4 15	8 09
17	6 75	12 57	46	4 09	7 97
18	6 61	12 34	47	4 03	7 87
19	6 48	12 12	48	3 97	7 76
20	6 35	11 91	49	3 91	7 65
21	6 23	11 71	50	3 85	7 55
22	6 10	11 52	51	3 79	7 45
23	5 98	11 33	52	3 74	7 34
24	5 86	11 14	53	3 68	7 24
25	5 75	10 96	54	3 62	7 13
26	5 64	10 79	55	3 56	7 03
27	5 54	10 62	56	3 51	6 92
28	5 43	10 46	57	3 45	6 81

Solubility of atmos etc—Continued

Temp	Oxygen	Nitrogen	Temp	Oxygen	Nitrogen
	cc	cc		cc	cc
58°	3 39	6 71	80°	1 97	4 03
59	3 34	6 60	81	1 89	3 88
60	3 28	6 50	82	1 81	3 73
61	3 22	6 39	83	1 73	3 57
62	3 16	6 27	84	1 65	3 41
63	3 10	6 16	85	1 57	3 24
64	3 04	6 05	86	1 48	3 07
65	2 98	5 94	87	1 39	2 89
66	2 92	5 82	88	1 30	2 71
67	2 85	5 70	89	1 21	2 52
68	2 79	5 59	90	1 11	2 32
69	2 73	5 47	91	1 02	2 12
70	2 66	5 35	92	0 92	1 91
71	2 60	5 23	93	0 81	1 70
72	2 53	5 10	94	0 71	1 48
73	2 47	4 98	95	0 60	1 25
74	2 40	4 85	96	0 48	1 0
75	2 33	4 72	97	0 37	0 7
76	2 26	4 59	98	0 27	0 5
77	2 19	4 45	99	0 13	0 2
78	2 12	4 32	100	0 00	0 0
79	2 04	4 18			

(Winkler, B 1901, 34 1440)

Absorption of atmospheric air by H₂O at and 760 mm pressure β = coefficient absorption β_1 = "Solubility" (S under oxygen)

t°	β	β_1	t	β	β_1
0	0.02881	0.02864	55	0.01253	0.010
5	0.2543	0.2521	60	0.1216	0.09
10	0.2264	0.2237	65	0.1182	0.08
15	0.2045	0.2011	70	0.1156	0.08
20	0.1869	0.1828	75	0.1137	0.07
25	0.1724	0.1671	80	0.1126	0.06
30	0.1606	0.1539	85	0.1119	0.04
35	0.1503	0.1420	90	0.1113	0
40	0.1418	0.1315	95	0.1109	0.01
45	0.1351	0.1224	100	0.110	0.0
50	0.1297	0.1140			

(Winkler B 1901 34 1409)

Sea-water absorbs less O and N from than pure H₂O, but the ratio between O and N remains constant. In sea-water sat with at 6.22° the oxygen was 33.50% of the gas absorbed (Pettersson and Söndén)

1 l sea-water absorbs cc N and O from at t° and 760 mm pressure

t	cc N	cc O	N+O	% O
0	14 41	7 77	22 18	35.0
5	13 22	6 95	20 15	34.3
10	12 04	6 29	18 37	34.2
15	11 01	5 70	16 71	34.1

(Tørnøe, Norwegian North Atlantic Exp Chem 18)

1 l sea water absorbs cc N from air at t° and 760 mm

t°	cc N	t°	cc N	t°	cc N
0	15 60	10	12 47	20	10 41
5	13 86	15	11 34	25	9 62

(Dittmar)

1 l sea-water absorbs cc N (0° and 760 mm) from atmospheric air at t° and 760 mm pressure (dry)

t	cc N	t°	cc N	t	cc N
0	14 85	10	12 06	20	10 25
2	14 20	12	11 62	22	9 98
4	13 60	14	11 23	24	9 73
6	13 04	16	10 87	25	9 62
8	12 53	18	10 54		

(Hamburg)

Absorption of air which is free from carbonic acid by H_2SO_4 at 18° and 760 mm α = coefficient of solubility

H_2SO_4	α	H_2SO_4	α
98%	0 0173	70%	0 0055
90%	0 0107	60%	0 0059
80%	0 0069	50%	0 0076

(Lower, Z anorg 1900, 50, 388)

Absolute alcohol absorbs 0 11 vol gas from air $\frac{1}{3}$ of which is O and $\frac{1}{3}$ N . On mixing with an equal vol H_2O $\frac{1}{3}$ of the dissolved gas is given off (Dobereiner)
100 vols alcohol (95 1 %) absorb 14 1 vols air (Robinet C R 58 608)

100 vols petroleum absorb 6 8 vols air
oil of lavender 6 89
benzene 14 0
oil of turpentine 24 15
(Robinet $l c$)

1 vol ether at 760 mm pressure absorbs 0 290 vols air at 0° , 0 267 vols at 10° , 0 286 vols at 15° (Christoff Z phys Ch 1912, 79 459)

Alcohol $\text{C}_2\text{H}_5\text{OH}$

γ_p gr of pure ethyl alcohol + Aq at 25°

% alcohol	γ_p gr	% alcohol	γ_p gr
0	0 997077	55	0 898502
2	0 993359	60	0 886990
5	0 988166	65	0 875269
6	0 986563	70	0 863399
10	0 980434	75	0 851336
15	0 973345	80	0 839114
20	0 966392	85	0 826596
25	0 958946	90	0 813622
30	0 950672	95	0 799912
35	0 941459	98	0 791170
40	0 931483	99	0 788135
45	0 920850	100	0 785058
50	0 909852	—	—

(Osborne, McKelvy and Bearce, Bureau of Standards, Sci Paper No 197)

Alum, Ammonia

See Sulphate, aluminum ammonium

Alum, Chrome

See Sulphate, aluminum chromium

Alum, Iron

See Sulphate, aluminum ferric

Alum, Potash

See Sulphate, aluminum potassium

Alumina

See Aluminum oxide

Aluminic acid, $\text{H}_2\text{Al}_2\text{O}_4 = \text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$

Aluminum hydroxide possesses acid properties and salts corresponding to an acid of the above formula exist

See Aluminum hydroxide

Aluminates

All aluminates are insol in H_2O except those of K and Na (Fremy) and Ba (Beckmann, J pr (2) 26 385)

Barium aluminate, $\text{BaAl}_2\text{O}_4 + 4\text{H}_2\text{O}$

Sol in 10 pts H_2O , can be recryst from alcohol (Deville J pr 87 299)

+5H $_2\text{O}$ Sl sol in H_2O with decomp (Allen, Am Ch J 1900, 24 313)

+7H $_2\text{O}$ Sl sol in cold, not completely sol in hot H_2O Sol in cold dil $\text{HCl} + \text{Aq}$ (Beckmann, J pr (2) 26 385)

$\text{BaAl}_2\text{O}_4 + 5\text{H}_2\text{O}$ Sol in 20 pts H_2O by boiling (Beckmann, B 14 2151)

Insol in alcohol

Sl sol in H_2O with decomp insol in alcohol (Allen, Am Ch J 1900, 24 311)

$\text{Ba}_3\text{Al}_2\text{O}_8 + 7 - 11\text{H}_2\text{O}$ Sol in 15 pts H_2O with decomp into $\text{BaAl}_2\text{O}_4 + 5\text{H}_2\text{O}$, insol in alcohol (Beckmann)

Barium aluminate bromide, $\text{BaAl}_2\text{O}_4 \cdot \text{BaBr} + 11\text{H}_2\text{O}$

Sol in H_2O (Beckmann, J pr (2) 26 385, 474)

Barium aluminate chloride, $\text{BaAl}_2\text{O}_4 \cdot 3\text{BaCl}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Beckmann $l c$)

$\text{BaAl}_2\text{O}_4 \cdot \text{BaCl}_2 + 11\text{H}_2\text{O}$ Sol in H_2O (Beckmann, $l c$)

Barium aluminate iodide, $\text{BaAl}_2\text{O}_4 \cdot \text{BaI}$

Sol in H_2O (Beckmann $l c$)

Calcium aluminate, $\text{CaO} \cdot \text{Al}_2\text{O}_3$

Decomp by H_2O but does not "set" Sol in HCl , insol in HNO_3 , H_2SO_4 , and HF (Dufay, C R 1900, 131 545)

$\text{Ca}_2\text{Al}_2\text{O}_5 + 7\text{H}_2\text{O}$ Slowly decomp by H_2O , sl sol in H_2O (Allen, Am Ch J 1900, 24 316)

$\text{Ca}_3\text{Al}_2\text{O}_8$ Insol in H_2O , not decomp by $\text{KOH} + \text{Aq}$, sol in acids (Tissier, C R 48 627)

+6H₂O Ppt, sl sol in H₂O, insol in alcohol (Allen, Am Ch J 1900, 24 316)
 3Al₂O₃·4CaO+3H₂O Ppt (Friedel, Bull Soc Min 1903, 26 121, C C 1904, I 430)

Cobalt aluminate

"*Thénard's* or *Leuthner's* blue" Insol in H₂O

CoAl₂O₄ Insol in H₂O and acids (Ebelmen)

Cobalt magnesium aluminate, [MgCo]Al₂O₄
 "*Spinel Blue*" Insol in H₂O or HCl+Aq (Ebelmen)

Glucinum aluminate, GlAl₂O₄

Min *Chrysoberyll* Not attacked by acids, but decomp by KOH+Aq

Iron (ferrous) aluminate, FeAl₂O₄

Min *Hercynite* Not attacked by acids

Lithium aluminate, LiAlO₂

Sol in H₂O (Weyberg, C C 1906, II 1659)

Lithium hydrogen aluminate, LiHAl₂O₄+5H₂O

Sl sol in H₂O, decomp on boiling (Allen, Am Ch J 1900, 24 310)

Magnesium aluminate, MgAl₂O₄

Min *Spinel* Insol in H₂O

Insol in HNO₃+Aq, very sl sol in HCl+Aq, partly sol in H₂SO₄ at boiling temp (Abich, Pogg 23 316)

Sol by standing 2 hours at 210° with a mixture of 3 pts H₂SO₄ and 1 pt H₂O, or by boiling with this mixture together with HF (Mitscherlich, J pr 81 108)

Sl sol in HCl, HF, and H₂SO₄, insol in HNO₃ (Dufau, Bull Soc 1901, (3) 25 669)

Manganous aluminate

Insol in H₂O and acids (Fbelmen, A ch (3) 22 225)

MnAl₂O₄ Insol in HCl+Aq, readily attacked by HF, HNO₃ and H₂SO₄

Decomp by fusion with alkali chlorate, nitrate, oxide or carbonate (Dufau, C R 1902, 135 963)

Nickel aluminate

Insol in H₂O

Potassium aluminate, K₂Al₂O₄+3H₂O

Decomp by dissolving in pure H₂O with separation of Al₂O₃ (Fremy, A ch (3) 12 362) Can be recrystallised from water containing a little alkali, without decomposition (Fremy)

Insol in alcohol

Sodium aluminate, Na₂Al₂O₄

Easily and completely sol in cold H₂O (Schaffgotsch, Pogg 43 117)

+4H₂O Insol in alcohol (Allen, Am Ch J 1900, 24 308)

Na₂Al₂O₄ Miscible with hot H₂O, and as sol as NaOH in cold H₂O Insol in alcohol but decomp thereby (Tissier, C R 43 102)

Strontium aluminate, Sr₃Al₂O₈+6H₂O

Sl sol in H₂O (with slow decomp in Aq solution) (Allen, Am Ch J 1900, 24 314)

Thallium aluminate, Tl₄Al₂O₅+7H₂O

Not completely sol in, but slowly hydrolysed by H₂O

Readily sol in dil acids and in the fixed alkalies

Insol in abs alcohol (Hawley, J Am Chem Soc 1907, 29 303)

Zinc aluminate, ZnAl₂O₄

Insol in acids or alkalies

Min *Gahnite* (*Automolite*)

+2H₂O Sol in KOH, and NH₄OH+Aq (Berzelius)

Aluminicoantimoniotungstic acid

Ammonium aluminicoantimoniotungstate, 6(NH₄)₂O, 2Al₂O₃, 3Sb₂O₅, 18WO₃+17H₂O

A shellac-like gum (Daniels, J Am Chem Soc 1908, 30 1856)

Barium aluminicoantimoniotungstate, 5BaO, 2Al₂O₃, 3Sb₂O₅, 18WO₃+6H₂O

Somewhat insol in dil HCl (Daniels, J Am Chem Soc 1908, 30 1857)

Silver aluminicoantimoniotungstate, 6Ag₂O, 2Al₂O₃, 3Sb₂O₅, 18WO₃+12H₂O

Ppt

Sol in NH₄OH+Aq but requires HNO₃ (1 10) to dissolve it (Daniels, J Am Chem Soc 1908, 30 1857)

Aluminicoarseniotungstic acid

Ammonium aluminicoarseniotungstate, 6(NH₄)₂O, 2Al₂O₃, 3As₂O₅, 18WO₃+14H₂O

Springly sol in H₂O (Daniels, J Am Chem Soc 1908, 30 1854)

Barium aluminicoarseniotungstate, 4BaO, 2Al₂O₃, 3As₂O₅, 18WO₃+12H₂O

Very sl sol in H₂O

Sol in very dil HCl or HNO₃ (Daniels, J Am Chem Soc 1908, 30 1855)

Cadmium aluminicoarseniotungstate, 4CdO, 2Al₂O₃, 3As₂O₅, 18WO₃+17H₂O

Sol in dil mineral acids and in strong NH₄OH+Aq (Daniels, J Am Chem Soc 1908, 30 1855)

Aluminicomolybdic acid

Ammonium aluminicomolybdate, 3(NH₄)₂O, Al₂O₃, 12MoO₃+19H₂O

Ppt (Hall, J Am Chem Soc 1907, 29 696)

+20H₂O More sol in H₂O than potassium

aluminicomolybdate (Struve, Bull Acad St Petersb 12 147)
+22H₂O (Marckwald, Dissert 1895)

Barium aluminicomolybdate, 4BaO, Al₂O₃, 12MoO₃+14H₂O

Ppt (Hall, J Am Chem Soc 1907, 29 712)

Lead aluminicomolybdate, 4PbO, Al₂O₃, 12MoO₃+21H₂O

Ppt (Hall, J Am Chem Soc 1907, 29 712)

Potassium aluminicomolybdate, 3K₂O, Al₂O₃, 12MoO₃+20H₂O

1 pt of the salt is sol in 40 67 pts H₂O at 17°. Very difficultly sol in acids (Struve)
H₃Al(MoO₄)₃, 2KHM₂O₄ Sol in H₂O (Parmentier, C R 94 1713)

Silver aluminicomolybdate, 4Ag₂O, Al₂O₃, 12MoO₃+16H₂O

Ppt (Hall, J Am Chem Soc 1907, 29 712)

Sodium aluminicomolybdate, 3Na₂O, Al₂O₃, 12MoO₃+22H₂O

Efflorescent Easily sol in H₂O (Gentele J pr 81 413)

Aluminicophosphotungstic acid.

Ammonium aluminicophosphotungstate, 9(NH₄)₂O, 2Al₂O₃, 4P₂O₅, 9WO₃+13H₂O

Sl sol in cold and in hot H₂O (Daniels, J Am Chem Soc 1908, 30, 1851)

Barium aluminicophosphotungstate, 4BaO, 2Al₂O₃, 4P₂O₅, 9WO₃+13H₂O

Sl sol in H₂O Sol in very dil HCl or HNO₃ (Daniels, J Am Chem Soc 1908, 30 1853)

Silver aluminicophosphotungstate, 4Ag₂O, 2Al₂O₃, 4P₂O₅, 9WO₃+6H₂O

Nearly insol in H₂O Sol in NH₄OH and in dil HNO₃ Insol in acetic acid (Daniels, J Am Chem Soc 1908, 30 1852)

Zinc aluminicophosphotungstate, 5ZnO, 2Al₂O₃, 4P₂O₅, 9WO₃+11H₂O

Sol in dil acids and in a large quantity of conc ammonia when NH₄Cl is present (Daniels, J Am Chem Soc 1908, 30 1853)

Aluminicotungstic acid

Ammonium aluminicotungstate, 3(NH₄)₂O, Al₂O₃, 9WO₃+4H₂O

Sol in conc HNO₃ and in conc HCl When the solution in conc HCl was boiled, a yellow colored ppt separated (F F Smith J Am Chem Soc 1903, 25 1230)

Ammonium silver aluminicotungstate, 11Ag₂O, 21(NH₄)₂O, 4Al₂O₃, 36WO₃

The dry salt is insol in pure H₂O, but

readily sol in H₂O containing NH₃ or HNO₃ (E F Smith, J Am Chem Soc 1903, 25 1231)

Barium aluminicotungstate, 8BaO, Al₂O₃, 9WO₃+7H₂O

Not sol in acids when dry Somewhat decomp by boiling with conc HCl, HNO₃ or aqua regia (Daniels, J Am Chem Soc 1908, 30 1848)

Copper aluminicotungstate, 2CuO, Al₂O₃, 9WO₃+16½H₂O

Sol in large quantities of H₂O (Daniels, J Am Chem Soc 1908, 30 1847)

Mercurous aluminicotungstate, 5Hg₂O, Al₂O₃, 9WO₃

Sl sol in H₂O Sol in HNO₃ (1 5) (Daniels, J Am Chem Soc 1908, 30 1849)

Zinc aluminicotungstate, 1½ZnO, Al₂O₃, 9WO₃+8H₂O

Insol in H₂O (Daniels, J Am Chem Soc 1908, 30 1850)

ZnO, Al₂O₃, 9WO₃+20H₂O Sol in H₂O (Daniels)

Aluminum, Al

Less easily attacked than ordinary metals (iron, copper, lead, zinc, tin) by air, H₂O, wine, beer, coffee, milk, oil, butter, fats, etc Vinegar dissolves 0 349 g from a sq decimetre in 4 months, and 5 % NaCl+Aq, only 0 045 g in the same time (Ballaud, C R 114 1536)

The action of various substances contained in foods and drinks on compact Al as it occurs in utensils is very slight Hard or soft water, whether cold or hot, showed no action in 8 days, 1 % solutions of tartaric, tannic, and acetic acids had no action in same time, also 5 % boric, carbolic, and salicylic acids 4 % and 10 % acetic acid dissolved only 0 4 mg of Al, while 10 % acetic acid dissolved 2 1 mg from a roughened piece of Al foil in 8 days 1 % soda solution dissolved 15 mg in 8 days (Rupp, Dingl 283 119)

Similar results were obtained by Arche (Dingl 284 255)

Liquids which are ordinarily contained in foods and drinks do not attack sheet Al except in a very small degree The following losses in weight in mg by the action of the given liquids on 100 sq centimetres sheet aluminum for 6 days were obtained

Liquids	Loss in mg
Claret	2 84
Hock	3 27
Brandy	1 08
5 % alcohol	0 61
5 % tartaric acid + Aq	1 69
1 % " " " "	2 58
5 % acetic acid + Aq	3 58
1 % " " " "	4 38

Liquids	Loss in mg
5 % citric acid + Aq	2 15
1 % " " "	1 90
5 % lactic acid + Aq	4 77
5 % butyric acid + Aq	1 31
Coffee	0 50
Tea	0
Beer	0
4 % boric acid + Aq	1 77
5 % carbolic acid + Aq	0 23
1 % " " "	0 49
1/2 % salicylic acid + Aq	6 35

(Lunge, C N 65 110)

The apparent solubility of this metal in H₂O is due to the presence of minute quantities of Na. Absolutely pure Al does not lose any weight to H₂O and the H₂O remains perfectly clear. Also dil acids remain perfectly clear (Moissan, C R 1895, **121** 794-98, C C 1896, I 193).

Sl attacked by H₂O at 80° (W Smith, J Soc Chem Ind 1904, **23** 475).

Easily sol in dil or conc HCl + Aq, whether hot or cold, also in HBr, HI, or HF + Aq. Insol in dil H₂SO₄ + Aq (de la Rive), sl attacked by cold, easily by hot conc H₂SO₄. Not attacked by HNO₃ + Aq even when conc and boiling (Wohler), easily sol in dil H₂SO₄, or HNO₃ + Aq in vacuo (Weeren, B 24 1798), slowly sol in 27 % HNO₃ + Aq, 100 cem HNO₃ + Aq requiring 2 months to dissolve 2 g Al (Montemartini, Gazz ch it 22 397), very sl sol in most organic acids, but solubility is increased by presence of NaCl.

Not attacked by dil or conc HNO₃ at ord temp, but attacked by hot HNO₃. Attacked by H₃PO₄ (Smith, J Soc Chem Ind 1904, **23** 475).

Completely sol at 100° in two hours in HNO₃, sp gr 1.15-1.16 (Stillman, J Am Chem Soc 1897 19 714).

Very easily sol in HNO₃ (contrary to the usual statement in text books) (Woy, C C 190, 11 94).

Slowly attacked by HNO₃ + Aq (20-25 %) at 25-30° (Deventer, Chem Weekbl 1907 4 69).

Dil HNO₃ or H₂SO₄ does not attack Al on account of formation of layer of gas. Action is increased by vacuum. Solutions of metallic chlorides, the metal of which is insol and attaches itself to the Al (Pt, Au, Cu, Hg) increase the solubility, but when metal is soluble in the acid (Fe, Zn, etc.) there is no increase of solubility (Ditte, C R 1890, **110** 573).

Violently attacked by dil or conc H₃PO₄ + Aq (Winteler).

Not attacked by solution of HCl in liquid HCN (Kahlenberg, J phys Chem 1902, **6** 662).

Very easily sol in conc or dil KOH, or NaOH + Aq. Slowly attacked by NH₄OH +

Aq (Wohler), sol in BaO₂H₂ + Aq (Beckmann, J pr (2) **26** 385), slowly sol in CaO H₂ + Aq.

Sl in excess of 10 % KOH + Aq and in NaOH and LiOH + Aq, sol in hot conc Ba(OH)₂, Sr(OH)₂ and Ca(OH)₂ + Aq (Allen, Am Ch J 1900, **24** 304-331).

Attacked by hot conc NH₄OH + Aq (Smith, J Soc Chem Ind 1904, **23** 475).

Sl attacked by sulphates, or nitrates + Aq, but all chlorides, bromides, and iodides, except those of the alkalis and alkaline earths, even AlCl₃ + Aq, dissolve the metal. Insol in alum, or in NaCl + Aq, but sol in alum + NaCl + Aq (Tissier, C R 41 362), sol in NaCl + Aq (Deville, A ch (3) **43** 14), sol in neutral FeCl₃ + Aq in vacuo (Weeren, B 24 1798). Violently attacked by CuCl + Aq (Tommasi, Bull Soc (2) **37** 443).

Rapidly sol in K₂S₂O₈ + Aq, more slowly sol in (NH₄)₂S₂O₈ + Aq (Levi, Gazz ch it 1908, **38** (1) 583).

Attacked by (NH₄)₃PO₄ + Aq. Sl attacked by NaNO₃ + Aq or KNO₃ + Aq at 100° (Smith, J Soc Chem Ind 1904 **23** 475).

Not affected by NH₄NO₃ + Aq (Hodgkinson, C N 1904, **90** 142).

Attacked by POCl₃ at 100° (Renzler, B 13 845).

Insol in liquid NH₃ (Gore, Am Ch J 1898, **20** 826).

Insol in liquid CO (Buchner, J phys Ch 1906, **54** 674).

Attacked by NOCl (Sudborough, Chem Soc 1891, **59** 659).

92 % alcohol attacks Al less than H₂O. Pure Al is attacked less than commercial (Hugonnet, J Pharm 1895 (6) **1** 537).

Sol in organic acids containing chlorides (Smith, J Soc Chem Ind 1904 **23** 475).

Acetic tartaric and citric acids attack Al only at first. Metal is covered by layer of hydroc. but on addition of hydrol salts gradual solution ensues (Ditte, C P 1898, **127** 919).

Not attacked by sugar + Aq (Klein, C R 102 1170).

Aluminum arsenide

Decomp by H₂O with evolution of AsH₃ (Wohler, Pogg. **11** 160).

Decomp by H₂O (Langes, Diction C R 1900 **130** 131).

Aluminum boride, AlB₂

Very slowly sol in hot conc HCl + Aq and hot NaOH + Aq, but easily in moderately strong warm HNO₃ + Aq (Humpel, A **183** 7).

AlB₂ Not attacked by HCl or KOH + Aq. Scarcely attacked by boiling H₂SO₄. Hot conc HNO₃ + Aq dissolves gradually but completely (Humpel, l.c.).

Aluminum borocarbide, Al₃C B₄

Insol in H₂O, HCl + Aq, H₂SO₄ + Aq, or

KCH + Aq, slowly sol in hot conc HNO_3 + Aq (Hampe, l c)

Aluminum bromide, AlBr_3

Anhydrous Dissolved by H_2O with great violence and evolution of much heat Very sol in alcohol More sol in CS_2 than AlI_3 (Weber, Pogg 103 264)

Sol in SOCl_2 (Besson, C R 1896, 123 884)

Sol in $\text{C}_2\text{H}_5\text{Br}$ (Plotnikoff, C C 1902, II 617)

Sol in acetone (Naumann, B 1904, 37 4328), (Fidmann, C C 1899, II 1014)

Solubility of AlBr_3 in organic liquids

Solvent	t°	Mols per 100	t°	Mols per 100	t°	Mols per 100
Benzo-phenone	48°	0	130°	43 2	50°	66 0
	45	8 5	140	48 4	38	67 2
	42	13 8	142	50	50	70 7
	38	18 3	140	52 1	60	74 2
	50	21	130	54 5	70	78 3
	60	23 4	120	56 7	80	83 3
	70	25 7	110	58 6	85	86 7
	80	28 1	100	60 3	90	90 7
	90	30 6	90	61 7	93	94 8
	100	33 4	80	62 9	96	100
	110	36 3	70	64 1		
	120	39 6	60	65 1		
Ethylene bromide	10°	0	20°	33 9	70°	72 7
	6	8 4	30	40 1	80	82 3
	2	16 0	40	47 2	90	92 2
	—2	22 9	50	55 1	96	100
	10	28 4	60	63 6		
Benzoyl chloride	—0 5	0	5	47	40°	72 6
	—2 5	6 5	90	50 8	60	79 4
	5	13 0	80	52 8	70	83 9
	10	17 4	60	56	80	89 2
	30	24 6	40	59 5	90	95 5
	50	31 8	20	63 1	96	100
	70	40	7	65 5		
	80	44 3	20	67 9		

(Menschutkin, Ann Inst Pol P-1-c-Ga, 13 1)

+6H O Very sol in H O

+15H O (Plotnikoff, J B 1895 785)

Aluminum antimony bromide, $2\text{AlBr}_3 \cdot \text{SbBr}_3$ + 24H O

Hygroscopic Decomp by H_2O (Wenland, B 1903, 36 258)

Aluminum potassium bromide, $\text{AlBr}_3 \cdot \text{KBr}$

Sol in H O (Weber, Pogg 103 267)

Aluminum bromide ammonia, $\text{AlBr}_3 \cdot x\text{NH}_3$

Decomp by H O (Weber, Pogg 103 267)

Aluminum perbromide carbon bisulphide, $\text{AlBr}_3 \cdot \text{Br}_4 \cdot \text{CS}_2$

Sol in ether, ethyl bromide, ethylene bromide and benzene, decomp by H O (Plotnikoff, J Russ phys Chem Soc 1901, 33 91, C C 1901, I 1193)

$2\text{AlBr}_3 \cdot \text{Br}_4 \cdot \text{CS}_2$ Sol in ether and benzene, insol in petroleum ether (Plotnikoff, l c)

Aluminum bromochloride, AlClBr

Deliquescent Somewhat less violently dissolved by H O than is AlBr_3 (v Bartal, Z anorg 1907, 55 154)

+6H O Deliquescent Sol in H O without evolution of heat (v Bartal, Z anorg 1907, 55 155)

Aluminum carbide, Al_4C_3

Decomp by fused KOH at 100°, insol in fuming HNO_3 in the cold, decomp by H_2O , and dil acids (Moissan, Bull Soc 1894, (3) 11 1012, C R 1894, 119 16-20)

Insol in acetone (Naumann, B 1904, 37 4328)

Aluminum chloride, basic, $\text{AlO}_4\text{H}_{10}$, HCl

Easily sol in H O (Schlumberger, Bull Soc 1895, (3) 13 56)

Aluminum chloride, AlCl_3

Anhydrous Very deliquescent Sol in H_2O with a hissing noise and evolution of heat Solution of AlCl_3 in H O loses HCl on evaporation, and AlCl_3 is finally wholly converted into AlO_3

Sol in 1 432 pts H_2O at 15° (Gerlach)

AlCl_3 + Aq containing 19 15 % AlCl_3 boils at 103 4° AlCl_3 + Aq containing 38 3 % AlCl_3 boils at 112 8° (Gerlach)

Sp gr of AlCl_3 + Aq at 15°

% AlCl_3	Sp gr	% AlCl_3	Sp gr
1	1 0072	22	1 1709
2	1 0144	23	1 1795
3	1 0216	24	1 1881
4	1 0289	25	1 1968
5	1 0361	26	1 2058
6	1 0435	27	1 2149
7	1 0510	28	1 2241
8	1 0585	29	1 2331
9	1 0659	30	1 2422
10	1 0734	31	1 2518
11	1 0812	32	1 2615
12	1 0890	33	1 2711
13	1 0968	34	1 2808
14	1 1047	35	1 2905
15	1 1125	36	1 3007
16	1 1207	37	1 3109
17	1 1290	38	1 3211
18	1 1372	39	1 3313
19	1 1455	40	1 3415
20	1 1537	41	1 3522
21	1 1632		

(Gerlach, Z anal 8 281)

Sp gr at 20° of $\text{AlCl}_3 + \text{Aq}$ containing mg
mols AlCl_3 per liter

M	Sp gr
0 01	1 00104
0 025	1 00282
0 05	1 00588
0 075	1 00870
0 10	1 01158
0 25	1 02911
0 55	1 05706
1 0	1 11054
1 5	1 16308
2 0	1 21378

(Jones & Pearce, Am Ch J 1907, 38 726)

Sol in 1 pt strong alcohol at 12.5° (Wenzel), easily sol in ether, sl sol in CS_2 , insol in ligroine or benzene

Difficultly sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84 26)

Insol in liquid NH_3 (Franklin, Am Ch J 1893, 20 826)

Insol in CS_2 at ord temp (Arctowski, Z anorg 1894, 6 257)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in methylal (Eidmann, C C 1899, II 1014)

Solubility of AlCl_3 in organic liquids

Solvent	t°	Mols per 100	t°	Mols per 100	t	Mols per 100
Benzo-phenone	48°	0	130°	43 2	130°	66 0
	44	8 5	125	48 4	140	67 2
	39 5	13 8	120	50	150	70 7
	50	18 3	110	52 1	160	74 2
	60	21	100	54 5	170	78 3
	70	23 4	90	56 7	180	83 3
	80	25 7	80	58 6	185	86 7
	90	28 1	70	60 3	190	90 7
	100	30 6	60	61 7	192	94 9
	110	33 4	80	62 9	194	100
	120	36 3	100	64 1		
	125	39 6	120	65 1		
Benzoyl chloride	-0 5°	0	60°	33 0	80°	52 9
	-4	7 9	70	37 5	70	55 1
	-7 5	12 7	80	42 2	60	57 2
	0	14 1	90	47 1	40	61 0
	20	18 8	93	48 7		
	40	25 0	90	50 6		

(Menschutkin, Ann Inst Pol P-le-Gr, 13 1)

+6H₂O Very deliquescent, very sol in H₂O Sol in 0.25 pt H₂O (Thomson)

Sol in 2 pts abs alcohol at ordinary temp, and 1.5 pts at b-pt (Thomson)

Completely insol in a solution of ether in H₂O sat with HCl (Havens, Am J Sci 1898, (4) 6 46)

Aluminum ammonium chloride, $\text{AlCl}_3 \cdot \text{NH}_4\text{Cl}$ (Baud, A ch 1904, (8) 1 46)

Aluminum antimony chloride

See Chlorantimonate, aluminum

Aluminum barium chloride, $2\text{AlCl}_3 \cdot \text{BaCl}_2$ (Baud, C R 1901, 133 869)

Aluminum calcium chloride, basic

$3\text{CaO} \cdot \text{CaCl}_2 \cdot \text{Al}_2\text{O}_3 + 10\text{H}_2\text{O}$ (Steinmetz, Z phys Ch 1905, 52 466)

$10\text{CaO} \cdot \text{CaCl}_2 \cdot 6\text{Al}_2\text{O}_3$ Slowly decomp by boiling H₂O (Gorgeu, Bull Soc 1887, (2) 48 51)

Aluminum calcium chloride, $4\text{AlCl}_3 \cdot 3\text{CaCl}_2$ (Baud, A ch 1904, (8) 1 51)

Aluminum nitrosyl chloride, $\text{AlCl}_3 \cdot \text{NOCl}$

Deliquescent, and decomp by H₂O (Weber Pogg, 118 471)

Aluminum palladium chloride, $\text{AlCl}_3 \cdot \text{PdCl}_2 + 10\text{H}_2\text{O}$

See Chloropalladite, aluminum

Aluminum phosphorus pentachloride, $\text{AlCl}_3 \cdot \text{PCl}_5$

Decomp violently by H₂O (Baudrimont)

Aluminum phosphoryl chloride, $\text{AlCl}_3 \cdot \text{POCl}_3$

Deliquescent Sol in H₂O with decomp Sol in warm POCl_3 , from which it separates on cooling (Casselmann, A 98 220)

Aluminum platinum chloride, $\text{AlCl}_3 \cdot \text{PtCl}_4 + 15\text{H}_2\text{O}$

See Chloroplatinite, aluminum

Aluminum potassium chloride, $\text{AlCl}_3 \cdot \text{KCl}$

Slowly deliquescent Sol in H₂O with evolution of heat and decomp (Degen, A 18 332)

Aluminum selenium chloride, $2\text{AlCl}_3 \cdot \text{SeCl}_4$

Sol in H₂O with evolution of heat and separation of traces of selenium (Weber, Pogg 104 427)

Aluminum sodium chloride, $\text{AlCl}_3 \cdot \text{NaCl}$

Much less deliquescent than AlCl_3 Sol in H₂O with evolution of heat Upon evaporating, NaCl crystallises out (Wohler)

Aluminum strontium chloride, $4\text{AlCl}_3 \cdot 3\text{SrCl}_2$ (Baud, A ch 1909, (8) 1 52)

Aluminum sulphur chloride, $2\text{AlCl}_3 \cdot \text{SCl}_4$

Decomp by H₂O with evolution of much

Heat and separation of some sulphur (Weber, Pogg, 104 421)

$\text{AlCl}_3, \text{SCL}_4$ Decomp by H_2O (Ruff, B 901, 34 1757)

Aluminum tellurium chloride, $2\text{AlCl}_3, \text{TeCl}_4$
Very sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Weber, J pr 16 313)

Aluminum chloride ammonia, $\text{AlCl}_3, \text{NH}_3$

Sol in H_2O (Rose, Pogg, 24 248)

Completely sol in H_2O (Baud, C R 1901, 132 135)

$\text{AlCl}_3, 2\text{NH}_3$ Very hygroscopic (Stillman, Am Ch J 1895, 17 750)

$\text{AlCl}_3, 3\text{NH}_3$ Decomp by H_2O

$\text{AlCl}_3, 5\text{NH}_3$ M pt 380° (Baud, C R 1901, 132 135)

$\text{AlCl}_3, 6\text{NH}_3$ Decomp by H_2O (Stillman, Am Ch J 1895, 17 752) Somewhat hygroscopic (Baud, C R 1901, 132 135)

Aluminum chloride nitric oxide, $2\text{AlCl}_3, \text{NO}$

Very hygroscopic Decomp rapidly in the air Sol in $\text{KOH} + \text{Aq}$ (Thomas, C R 1895, 121 130)

Aluminum chloride phosphine, $3\text{AlCl}_3, \text{PH}_3$

Decomp by H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ (Rose Pogg, 24 295)

Aluminum chloride hydrogen sulphide

Deliquescent Decomp by H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ (Wohler)

Aluminum chloride sulphur dioxide, $\text{AlCl}_3, \text{SO}_2$

Decomp by H_2O , alcohol, or benzene (Adrianowski, B 12 688)

$2\text{AlCl}_3, \text{SO}$ (Baud, A ch 1904, (8) 1 32)

Aluminum cobalt, Co_3Al_4

Sol in strong acids (Brunck, B 1901, 34 2734)

Aluminum copper, Cu_4Al_9

Sol in aqua regia, decomp by HCl (Brunck, B 1901, 34 2733)

Aluminum fluoride, AlF_3

Anhydrous Not attacked by H_2O or acids, and only very slightly by boiling conc H_2SO_4 Insol in boiling $\text{KOH} + \text{Aq}$ (Deville, C R 42 49)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4328)

$+ \frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O Sl sol in HF (Baud, C R 1902, 135 1104)

$+ \text{H}_2\text{O}$ Completely but only sparingly sol in H_2O (Mazzuchelli, Real Ac Linc 1907, (5) 16, I 775, Chem Soc 1907, 92, (2) 549)

$+ 3\frac{1}{2}\text{H}_2\text{O}$ Two modifications (1) Easily sol in H_2O Sol in HF (2) Insol in H_2O Sl sol in HF (Baud, C R 1902, 135 1104)

$+ 7\text{H}_2\text{O}$ Sol in H_2O (Deville, A ch (3) 61 329)

Min *Fluellite*

$+ 8\frac{1}{2}\text{H}_2\text{O}$ Very efflorescent Sat solution contains 3.85 g AlF_3 per 100 g at 11° and 1.2 g at -0.2° (Mazzuchelli, Real Ac Linc 1907, (5) 16, I 775, Chem Soc 1907, (2), 92 549)

Aluminum hydrogen fluoride, $3\text{AlF}_3, 2\text{HF} + 5\text{H}_2\text{O}$

Sol in H_2O , precipitated by alcohol (Deville)

$2\text{AlF}_3, \text{HF} + 5\text{H}_2\text{O}$ (Deville, A ch (6) 61 329)

Aluminum ammonium fluoride, $\text{AlF}_3, \text{NH}_4\text{F}$

Somewhat sol in H_2O , insol in H_2O containing NH_4OH or NH_4F (Berzelius, Pogg 1 45)

$\text{AlF}_3, 2\text{NH}_4\text{F} + 15\text{H}_2\text{O}$ Sol in 100 pts H_2O at 16° (Baud, C R 1902, 135 1338)

$\text{AlF}_3, 3\text{NH}_4\text{F}$ Nearly insol in H_2O , easily sol in dil acids (Petersen, J pr (2) 40 35)

Quite easily sol in H_2O , but insol in $\text{NH}_4\text{F} + \text{Aq}$ (Helmholtz, Z anorg 3 129)

Aluminum barium fluoride

Apparently not obtained in pure state (Roder)

Aluminum calcium fluoride, $\text{AlF}_3, \text{CaF} + \text{H}_2\text{O}$

Min *Engtokite*

Aluminum calcium sodium fluoride, $\text{AlF}_3, \text{CaF}_2, \text{NaF} + \text{H}_2\text{O}$

Min *Pachnolite*

Aluminum cobaltous fluoride, $\text{AlF}_3, \text{CoF} + 7\text{H}_2\text{O}$

Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 272)

Aluminum cupric fluoride, $2\text{AlF}_3, \text{CuF}$

Very slowly but completely sol in H_2O (Berzelius)

$\text{AlF}_3, 2\text{CuF} + 11\text{H}_2\text{O}$ Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 272-76)

$2\text{AlF}_3, 3\text{CuF} + 18\text{H}_2\text{O}$ Sol in dil $\text{HF} + \text{Aq}$ (Weinland)

Aluminum cupric hydrogen fluoride, $\text{AlF}_3, \text{CuF}, \text{HF} + 8\text{H}_2\text{O}$

Efflorescent in the air Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 272)

Aluminum iron (ferrous) fluoride, $\text{AlF}_3, \text{FeF}_2 + 7\text{H}_2\text{O}$

Sl sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 270)

Aluminum lithium fluoride

Insol in H_2O (Berzelius)

Aluminum magnesium fluoride

$2\text{AlF}_3, \text{MgF}$ (?) (Roder)

Aluminum nickel fluoride, $\text{AlF}_3, \text{NiF}_2 + 7\text{H}_2\text{O}$

Sl sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, **22** 271)

Aluminum potassium fluoride, $\text{AlF}_3, 3\text{KF}$

Very sl sol in acid solutions, and still less in H_2O (Gay-Lussac and Thénard)

$\text{AlF}_3, 2\text{KF}$ As above

Aluminum silicon fluoride

See Fluosilicate, aluminum

Aluminum sodium fluoride

$2\text{AlF}_3, 3\text{NaF}$ Min *Chiolite*

$\text{AlF}_3, 2\text{NaF}$ Min *Chodnevite*

$\text{AlF}_3, 3\text{NaF}$ Min *Cryolite* Sl sol in H_2O Insol in $\text{HCl} + \text{Aq}$ Decomp by H_2SO_4 , or by boiling with $\text{NaOH} + \text{Aq}$

Aluminum strontium fluoride

As the Ba salt (Roder)

Aluminum thalious fluoride, $2\text{AlF}_3, 3\text{TlF}$

Ppt Sl sol in H_2O (Ephraim, Z anorg 1909, **61** 243)

Aluminum zinc fluoride, $\text{AlF}_3, \text{ZnF} + 7\text{H}_2\text{O}$

Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, **22** 272)

$2\text{AlF}_3, \text{ZnF}$ Slowly but completely sol in H_2O (Berzelius)

Aluminum hydroxide, $\text{Al}_2\text{O}_3, \text{H}_2\text{O}$

$= \text{Al}_2\text{O}_3(\text{OH})_3$

Dehydrated by conc acids, without dissolving (Bequerel, C R, **67** 108)

Min *Diaspore* Insol in $\text{HCl} + \text{Aq}$, and not attacked by boiling conc H_2SO_4 , unless it has been ignited

$\text{Al}_2\text{O}_3, 2\text{H}_2\text{O} = \text{Al}_2\text{O}_3(\text{OH})_3$ Pptd Al hydroxide, when boiled twenty hours with H_2O is insol in acids and alkalis and has the above composition (St Gilles, A ch **(3)** 46 57)

Min *Bauxite*

Soluble modifications—(1) *Meta aluminum hydroxide from basic Al acetate* Sol in H_2O and more readily in $\text{HC}_2\text{H}_3\text{O}_2$. The aqueous solution is coagulated by traces of alkalis, many acids, and salts, while other acids and salts have no effect. Thus, 1 pt H_2SO_4 in 1000 pts H_2O added to 7000 pts of above solution containing 20 pts Al_2O_3 , converts the liquid into a nearly solid mass. Citric, tartaric, oxalic, chromic, molybdic, racemic, suberic, salicylic, benzoic, gallic, lactic, cinnamic, butyric, valeric, camphoric, picric, uric, meconic, comenic, and hemipinic acids act in the same way. HCl and HNO_3 have far less action, 600 mols being necessary to produce the same effect as 1 mol H_2SO_4 , while acetic, formic, boric, arsenious, pyro-

meconic, and opianic acids do not coagulate the solution, except when moderately conc. 1 pt KOH in 1000 pts H_2O coagulates 9000 pts of the solution. NaOH , NH_4OH , and $\text{Ca}(\text{OH})_2$ have the same effect.

The solution is not coagulated by acetates, unless added in large quantity, and even then the ppt is redissolved when treated with H_2O . Nitrates and chlorides coagulate with difficulty, Na_2SO_4 , MgSO_4 , and $\text{CaSO}_4 + \text{Aq}$, however, have as strong an action as a liquid containing the same amount of H_2SO_4 . A teaspoonful of the solution introduced into the mouth solidifies at once from the action of the saliva. The ppt formed by acids is not sol in an excess of the acid, but by the long continued action of conc H_2SO_4 especially if hot, the ppt is dissolved, boiling conc $\text{HCl} + \text{Aq}$ also dissolves it, but less readily than H_2SO_4 . The ppt is sol in boiling conc $\text{KOH} + \text{Aq}$. The residue, when the solution is evaporated at 100° , has composition $\text{Al}_2\text{O}_3, 2\text{H}_2\text{O}$, and is insol in acids (Cium, Chem Soc **6** 225)

(b) *By Dialysis* Sol in H_2O from which it is separated by extremely small amounts of various substances, as acids, ammonia, salts (especially K_2SO_4), caramel, etc. An excess of acid dissolves the coagulum. If the solution contains 0.5% Al_2O_3 or less, it may be boiled without change, but the hydroxide separates out suddenly when it is reduced to $\frac{1}{2}$ its vol, and even very dil solutions gelatinise spontaneously in a few days. The solution is not coagulated by alcohol or sugar (Graham A **121** 41)

$\text{Al}_2\text{O}_3, 3\text{H}_2\text{O} = \text{Al}(\text{OH})_3$ **Crystallised** Difficultly sol in acids and alkalis (Cossa N Csm **(2)** **3** 228) Insol in boiling $\text{HCl} + \text{Aq}$ (Wohler, A **113** 249) Sl sol in $\text{KOH} + \text{Aq}$ nearly insol in cold H_2SO_4 , HCl , $\text{HNO}_3 + \text{Aq}$ very slowly sol in hot $\text{HCl} + \text{Aq}$ more readily in hot H_2SO_4 (v. Bonsdorff, Pogg. **27** 27)

α -modification Unstable. Changes into **β -modification**. Sol in N-NaOH at ord temp. Sol in N-NaOH and in hot NaOH of concentration 5N:100H₂O (Russ Z anorg 1904 **41** 226)

β -modification Insol in $\text{N-H}_2\text{SO}_4$ at ord temp. Difficulty sol in warm N-NaOH but easily sol in hot NaOH of concentration 5N:100H₂O. Its solubility in NaOH increases with increase in concentration of the hydroxyl ions (Russ)

δ -modification Easily sol in conc H_2SO_4 , only sl sol in HCl , HNO_3 , or acetic acids, or in alkali + Aq (Commers C C **1905**, II 605)

Min *Gibbsite* Sol in $\text{HCl} + \text{Aq}$ and dil $\text{H}_2\text{SO}_4 + \text{Aq}$. Readily sol in conc KOH and $\text{NaOH} + \text{Aq}$

Preprecipitated Completely insol in H_2O or $\text{H}_2\text{CO}_3 + \text{Aq}$. Easily sol in acids when freshly pptd, but solubility diminishes on standing.

Easily sol in KOH or $\text{NaOH} + \text{Aq}$ (Sonnenschein)

Herz (Z anorg 25 155) found that aluminum hydroxide which has been dried in a vacuum desiccator requires for solution in $\text{NaOH} + \text{Aq}$ 3 atoms Na to 1 atom Al (Z Elektrochem 1911, 17 261) was unable to obtain this result. Herz says Slade's error is due to insufficient shaking of the solution (Herz, Z Elektrochem 1911, 17 403).

New solubility determinations verify the statement of Herz (Z anorg 25, 155) that the solubility of $\text{Al}(\text{OH})_3$ in $\text{NaOH} + \text{Aq}$ is proportional to the concentration of NaOH . They do not, however, verify his statement that the ratio Na : Al in the solutions is always 3 : 1, for the author finds that the ratio Na : Al varies from 2 : 1 to 10 : 1 depending on the conditions of precipitation and the method and duration of drying of the $\text{Al}(\text{OH})_3$ (Slade, Z Elektrochem, 1912, 18 1).

Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ when freshly pptd, but presence of NH_4 salts diminish its solubility, and it separates out completely after long standing (Fresenius).

Somewhat sol in $\text{NH}_4\text{OH} + \text{Aq}$, the more easily the larger the vol of H_2O . Somewhat sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, but less than in $\text{NH}_4\text{OH} + \text{Aq}$. Sl sol in dil $\text{NH}_4\text{Cl} + \text{Aq}$, unless that salt be in large excess. It is finally wholly pptd if allowed to stand several days.

18752 pts $\text{NH}_4\text{OH} + \text{Aq}$ (4 % NH_4OH) dissolve an amt of $\text{Al}(\text{OH})_3$ corresponding to one pt Al_2O_3 . NH_4Cl prevents this solubility almost completely (Hanamann, Pharm Verh 12 527).

$\text{Al}(\text{OH})_3$, prepared by ppt of a solution of $\text{Al}(\text{NO}_3)_3$ with NH_4OH , filtered and washed, is insol in $\text{NH}_4\text{OH} + \text{Aq}$.

$\text{Al}(\text{OH})_3$, prepared by pptn of a solution of potassium aluminate with NH_4Cl is sol in a large excess of NH_4OH if this is added to the ppt at once. This modification which is sol in NH_4OH is unstable and easily goes over into the modification which is insol in NH_4OH (Renz, B 1903, 36 2751).

Conc $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ does not dissolve $\text{Al}(\text{OH})_3$ and not trace is dissolved by boiling conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Weeren Pogg 92 97).

With $\text{NH}_4\text{I} + \text{Aq}$, it forms a double salt, $\text{AlI}_3 \cdot 3\text{NH}_4\text{I}$ which is sol in H_2O but not in $\text{NH}_4\text{I} + \text{Aq}$ (Helmholtz Z anorg 3 127).

Insol in $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Mulaguti and Durocher, A ch (3) 17 421). Fuchs found, on the contrary, that it is not wholly insol in $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Fresenius Quant).

Insol in $\text{FeCl}_3 + \text{Aq}$ (Bechunp).

Determinations of the solubility of aluminum hydroxide in $\text{AlCl}_3 + \text{Aq}$ show that part goes into solution to form a compound while the greater part is in the colloidal form (Fischer, Z anorg 1904, 40 46).

Only sl sol in conc $\text{Al}(\text{SO}_4)_3 + \text{Aq}$, but solubility increases with decrease in concentration of $\text{Al}_2(\text{SO}_4)_3$ until it reaches a maximum at a concentration of 32 % $\text{Al}(\text{SO}_4)_3$ at 20°, 28 % at 40°, and 38 % at 60°. With further decrease in concentration of $\text{Al}(\text{SO}_4)_3$

the solubility of $\text{Al}(\text{OH})_3$ in $\text{Al}_2(\text{SO}_4)_3$ diminishes (Kremann, C A 1909 2422).

Sol in $\text{Ba}(\text{OH})_2 + \text{Aq}$ (Rose).

Sol in boiling $\text{Fe}(\text{NO}_3)_3$, $\text{Cr}(\text{NO}_3)_3$, $\text{Bi}(\text{NO}_3)_3$, $\text{Hg}(\text{NO}_3)_2$, HgNO_3 , SnCl_2 , and $\text{SbCl}_3 + \text{Aq}$ (Persoz).

Insol in HCN or cold $\text{KCN} + \text{Aq}$, but sl sol in hot $\text{KCN} + \text{Aq}$ (Rose).

Insol in $\text{KC}_2\text{H}_3\text{O} + \text{Aq}$ (Osann, 1821).

When moist, sol in $\text{H}_2\text{SO}_4 + \text{Aq}$, from which it is pptd on boiling (Berthier, A ch (3) 7 76).

Somewhat sol in $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Mercer).

Not pptd by $\text{NH}_4\text{OH} + \text{Aq}$ in presence of Na citrate (Spiller).

Sol in ethyl amine, amyl amine, sinkaline, ethyl picoline hydroxide, stubethylum hydroxide, triethyltoluanyl ammonium hydroxide + Aq (Friedlander).

Sol in alkyl amines (Renz, B 1903, 36 2751).

Insol in acetone (Naumann, B 1904, 37 4328).

Sol to a considerable extent in $\text{K}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$.

Very sl sol in cane sugar + Aq (Ramsey).

Solubility in glycerine + Aq containing about 60 % by vol of glycerine. 100 cc of the solution contain 0.25 g Al_2O_3 (Muller, Z anorg 1905, 43 322).

$\text{Al}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$. Insol in H_2O , $\text{NH}_4\text{OH} + \text{Aq}$ and alcohol. Sol in HCl and $\text{HNO}_3 + \text{Aq}$ (Zunino, Gazz ch it 1900 30 (1) 194).

$\text{Al}_6\text{O}_{14}\text{H}_{10}$. Trialuminum hydroxide.

Not sol in conc acids in the cold, not sol in KOH (cold) and only sl sol in hot KOH . Characterized by its solubility in exactly one mol dil HCl . Dil solutions do not gelatinize even on long standing. Conc solution of NH_4Cl and other salts cause ppt which redissolves on addition of H_2O .

Alkalis and alkali carbonates decompose the salt with HCl and ppt trialuminum hydroxide. H_2SO_4 and sol sulphates give insol compds with the hydrate. HNO_3 like HCl gives soluble compds with the hydrate (Structural formula given) (Schlumberger Bull Soc 1895 (5) 13 41-65 C C 1895, 1 421).

Aluminum iodide, AlI_3

Anhydrous. Fumes on air and deliquesces. Sol in H_2O with evolution of much heat. Sol in CS_2 and crystallizes from the hot sat solution on cooling (Weber). Sol in alcohol (Weber), ether and tetrachloroethane (Gustavson).

Sol in AlBr_3 (Ischekow Z anorg 1913 84 26).

+6 H_2O . Very sol in H_2O .

Aluminum mercuric iodide, $\text{AlI}_3 \cdot \text{HgI}_2 + 8\text{H}_2\text{O}$

Very deliquescent, sol in H_2O without decomposition (Dubois, C R 1908, 146 1028).

Aluminum potassium iodide, AlI_3 , KI

Sol in H_2O with evolution of much heat (Weber, Pogg **101** 469)

Aluminum iodide ammonia, AlI_3 , $3NH_3$

Decomp by H_2O (Weber, Pogg **103** 263)

Aluminum iodide mercuric oxyiodide, $2AlI_3$, HgO , $3HgI_2 + 15H_2O$

(Duboin, C R **1907**, **145** 714)

Aluminum iron, $FeAl_3$

Readily sol in strong HNO_3 (Brunck, B **1901**, **34** 2734)

Aluminum manganese, Mn_2Al_7

Sol in strong HCl (Brunck, B **1901**, **34** 2735)

Aluminum molybdenum, Al_4Mo

Easily sol in hot HNO_3 or HCl (Wohler, A **1860**, **115** 103)

Al_2Mo (Guillet, C R **1901**, **133** 293)

$AlMo$ (Guillet)

$AlMo_4$ Not attacked by dil $HCl + Aq$ (Guillet)

$AlMo_{20}$ Not attacked by $HCl + Aq$ (Guillet)

Aluminum nickel, Al_3Ni

Sol in strong acids (Brunck, B **1901**, **34** 2734)

Aluminum nitride, Al_2N

Slowly attacked by hot or cold H_2O . Decomp by acids and aqueous solutions of the alkalis, especially when they are concentrated (Mallet, A **186** 155)

Easily decomp H_2O when finely powdered (Rossi, C R **1895**, **121** 942)

Decomp by moist air and by boiling H_2O and by alkalis + Aq (Frank, Ch Z **1897**, **21** 263)

Aluminum oxide, Al_2O_3

Crystalline Min *Corundum*, *sapphire*, *ruby*, *emery* Insol in acids

Amorphous Ignited Al_2O_3 is insol in acids except that it dissolves slowly when heated with a mixture of 1 pt H_2SO_4 and 1 pt H_2O (Berzelius). Slowly sol in boiling $HCl + Aq$ (Rose, Pogg **52** 595)

Sol in 22 pts of a mixture of 8 pts H_2SO_4 and 1 pt H_2O (Mitscherlich). The lower the temperature at which Al_2O_3 has been heated, the more sol is it in acids and alkalis

Solubility in (calcium succate + sugar) + Aq

1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 1.35 g Al_2O_3 , 1 l solution containing 296.5 g sugar and 24.2 g CaO dissolves 0.32 g Al_2O_3 , 1 l solution containing 174.4 g sugar and 14.1 g CaO dis-

solves 0.19 g Al_2O_3 (Bodenbender, J B **1865** 600)

Insol in acetone (Naumann, B **1904**, **37** 4328)

See also **Aluminum hydroxide**

Aluminum peroxide, Al_2O_3 , $Al_2O_4 + 10H_2O$

Ppt, sol in acids with decomp (Term, C A **1912** 3068)

Aluminum oxybromide

Basic aluminum bromides containing three equivalents or less of Al_2O_3 to one of $AlBr_3$ are sol in H_2O . Those containing more than three equivalents are insol (Ordway, Am J Sci (2) **26** 203)

Aluminum oxychloride

Sol in dil acids or alkalis. Decomp by H_2O (Hautefeuille and Perrey, C R **100** 1220)

Basic aluminum chlorides containing two equivalents or less of Al_2O_3 to one of $AlCl_3$ are sol in H_2O . Those containing more than two equivalents are insol (Ordway)

Al_2O_3 , $3AlCl_3 + 3H_2O$ (Tommasi, Bull Soc (2) **37** 443)

Al_2O_3 , $8AlCl_3 + 3H_2O$ (Tommasi)

$3Al_2O_3$, $AlCl_3 + 15H_2O$ (Tommasi)

Aluminum phosphide, Al_3P

Unstable (Frank, Ch Z **1898**, **22** 240)

Al_2P_2 Decomp by H_2O (Fonze-Diacon, C R **1900**, **130** 1315)

Unstable (Frank, Ch Z **1898**, **22** 240)

Al_3P_7 Decomp by H_2O and acids (Frank, Ch Z **1898**, **22** 255)

Al_5P_3 Unstable (Frank, Ch Z **1898**, **22** 240)

Aluminum platinum, Pt_3Al_{10}

The Al is dissolved out by HCl (Brunck, B **1901**, **34** 2735)

Aluminum selenide, Al_2Se_3

Decomp by H_2O (Fonze-Diacon, C R **1900**, **130** 1315)

Aluminum silicide, $AlSi_4$

More easily sol in acids than Al (Winkler, J pr **91** 193)

Aluminum chromium silicide, $AlCr_4Si_6$

Insol in hot conc HCl , HNO_3 , H_2SO_4 and aqua regia. Sol in cold HF or in $HF + HNO_3$. Sol in molten alkali. Insol in $NaOH + Aq$, $KOCl + Aq$ or fused $KClO_3$ or $KHSO_4$ (Manchot and Kieser, A **1904**, **337**, **356**)

$Al_2Cr_4Si_6$ Insol in hot conc HCl , HNO_3 , H_2SO_4 and aqua regia. Sol in HF and in molten alkali (Manchot and Kieser, A **1904**, **337**, **358**)

Aluminum tungsten silicide

Insol in most acids and aqua regia. Easily sol in HF, HNO_3 and in molten alkali. Not attacked by dil $\text{NaOH} + \text{Aq}$ (Manchot and Kieser, A 1904, **337** 360)

Aluminum vanadium silicide, $\text{Al}_2\text{V}_3\text{Si}_3$

Sol in HF. Not attacked by hot conc HCl , HNO_3 , H_2SO_4 or aqua regia. Decomps by fusing with NaOH . Stable toward fused KClO_3 (Manchot, A 1907, **357** 134)

Aluminum sulphide, Al_2S_3

Decomp by H_2O . Sol in acids and alkalis (Regelsberger, Z Elektrochem, 1898, **4** 548). Al_2S_3 Decomps in moist air and by H_2O (Wohler). Insol in acetone (Naumann, B 1904, **37** 4328)

Aluminum chromium sulphide, $\text{Al}_2\text{S}_3 \cdot \text{CrS}$

Sl attacked by $\text{HCl} + \text{Aq}$. Gradually decomp by HNO_3 (Houdard, C R 1907, **144** 1115)

Aluminum magnesium sulphide, $\text{Al}_2\text{S}_3 \cdot \text{MgS}$

Decomp by H_2O , alcohol and acids (Houdard, C R 1907, **144** 1116)

Aluminum potassium sulphide

Violently decomposed by H_2O (St Clare Deville, J pr **71** 293)

Does not exist (Gratama, R t c **3** 4)

Aluminum silver sulphide, $5\text{Al}_2\text{S}_3 \cdot 4\text{Ag}_2\text{S}$

(Cambi, Real Ac Linc (5) **21**, II 838)

Aluminum telluride

Decomp by H_2O (Wohler, Pogg **11** 160)

Aluminum titanide, Al_4T_3

Not attacked by H_2O or by cold HNO_3 . Sl sol in warm HNO_3 . Sol in cold conc H_2SO_4 or HCl . Sol in warm $\text{KOH} + \text{Aq}$ (Levy, A ch 1902, (6) **25** 449)

Sol in HCl and in aqua regia (Guillet). Al_3T_3 Sol in hot dil H_2SO_4 and in hot $\text{KOH} + \text{aq}$. Sol in hot conc acids (Manchot, A 1907, **357** 142)

Al_3T_{12} Aluminothermic product is sol in HCl and aqua regia (Guillet)

Aluminosulphuric acid, $\text{Al}_2(\text{SO}_4\text{H})_6 + 7\text{H}_2\text{O}$

Sol in H_2O with decomp into $\text{Al}_2(\text{SO}_4)_3$ and H_2SO_4 (Silberberger, M 1904, **25** 222)

Diamide, N_2H_4

See Hydrazine

Amidochromic acid**Amidochromates**

Do not exist. Those described by Darm-

städter and Lowenthal are impure bichromates (Wyrouboff, Bull Soc 1894, (3) **11** 845-53, C C 1894, II 610)

Ammonium amidochromate, $(\text{NH}_4)\text{NH}_2\text{CrO}_3$

Very sol in H_2O (Lowenthal, Z anorg 1894, **6** 363)

Is ammonium dichromate (Wyrouboff, Bull Soc (3) **11** 845)

Lithium amidochromate, $\text{LiNH}_2\text{CrO}_3$

Very sol in H_2O and acids (Lowenthal, Z anorg 1894, **6** 364)

Potassium amidochromate, $\text{KCrO}_3 \cdot \text{NH}_2$

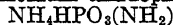
Sol only in H_2O . Sat solution in H_2O contains 13 % of the salt (Heintze, J pr (2) **4** 214)

Amidophosphoric acid, $\text{HPO}_3(\text{NH}_2) = \text{PO}(\text{NH}_2)(\text{OH})_2$

Sol in H_2O , but decomp on standing or by heat (Stokes, Am Ch J **15** 198)

Aluminum amidophosphate

Ppt Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Stokes)

Ammonium amidophosphate,

Very sol in H_2O (Stokes)

Barium amidophosphate, $\text{BaPO}_3(\text{NH}) + \text{H}_2\text{O}$

Very sl sol in H_2O (Stokes). $\text{BaH}_2(\text{PO}_3\text{NH}_2)_2 + 2\frac{1}{4}\text{H}_2\text{O}$ Quite difficultly sol in H_2O (Stokes)

Calcium amidophosphate, $\text{CaPO}_3(\text{NH}_2)$

Much less sol in H_2O than Ba salt (Stokes)

$\text{CaH}_2(\text{PO}_3\text{NH}_2)_2$ Much less sol in H_2O than the Ba salt (Stokes)

Chromic amidophosphate

Ppt Sol in warm $\text{NH}_4\text{OH} + \text{Aq}$ (Stokes)

Cobalt amidophosphate

Neutral Ppt

Acid Sl sol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$

Cupric amidophosphate

Neutral Sl sol in H_2O

Acid Nearly insol in H_2O

Ferrous amidophosphate

Neutral Sol in much H_2O , and in $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{NH}_4\text{OH} + \text{Aq}$

Acid Nearly insol in H_2O or $\text{NH}_4\text{Cl} + \text{Aq}$. Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Ferric amidophosphate

Neutral Ppt Sol in excess of alkali

amidophosphate and in $\text{NH}_4\text{OH} + \text{Aq}$ Insol
in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$

Acid As the neutral salt

Hydroxylamine amidophosphate,
 $(\text{NH}_3\text{O})\text{HPO}_3(\text{NH}_2)$

Sl sol in H_2O (Stokes)

Lithium amidophosphate, $\text{LiHPO}_3(\text{NH})$

Sl sol in H_2O (Stokes)

Magnesium amidophosphate, $\text{MgPO}_3(\text{NH}_2) + 7\text{H}_2\text{O}$

Very sl sol in H_2O , quite easily sol in dil
 $\text{NH}_4\text{Cl} + \text{Aq}$ Sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Stokes)

$\text{MgH}_2(\text{PO}_3\text{NH}_2)_2 + 3\frac{1}{4}\text{H}_2\text{O}$ Insol in
 $\text{NH}_4\text{Cl} + \text{Aq}$ (Stokes)

Manganese amidophosphate

Neutral Ppt

Acid Sl sol in H_2O

Nickel amidophosphate

Neutral Ppt Sol in $\text{HC}_2\text{H}_3\text{O}_2$ or
 $\text{NH}_4\text{OH} + \text{Aq}$

Acid Sl sol in H_2O

Potassium amidophosphate, $\text{K PO}_3(\text{NH}_2)$

Very sol in H_2O and not decomp by boiling (Stokes)

$\text{KHPO}_3(\text{NH}_2)$ Easily sol in cold H_2O ,
insol in alcohol (Stokes)

Silver amidophosphate, $\text{Ag}_2\text{PO}_3(\text{NH})$

Almost insol in H_2O Sol in HNO_3 or
 $\text{NH}_4\text{OH} + \text{Aq}$

$\text{AgHPO}_3(\text{NH}_2)$ Sl sol in H_2O , easily sol
in dil HNO_3 or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, also in
 $\text{NH}_4\text{OH} + \text{Aq}$

Sodium amidophosphate, $\text{Na}_2\text{PO}_3(\text{NH})$

Not deliquescent, very sol in H_2O pptd
from aqueous solution by alcohol (Stokes)

$\text{NaHPO}_3(\text{NH}) + \frac{1}{4}(\text{?})\text{H}_2\text{O}$ Newly insol
in cold, and decomp by hot H_2O Insol in
alcohol

Zinc amidophosphate

Neutral Perceptibly sol in H_2O

Acid Sl sol in H_2O , sol in NH_4OH or
 $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$

Diamidophosphoric acid, $\text{PO}(\text{NH}_2)_2\text{OH}$

Sol in cold H_2O , almost insol in alcohol,
stable in the air but decomp when heated and
by boiling in aq solution (Stokes, Am Ch
J 1894, 16 130)

Barium diamidophosphate, $[\text{PO}(\text{NH}_2)_2\text{O}]_2\text{Ba}$

Very sol in H_2O , insol in alcohol, aq
solution decomp slowly (Stokes, Am Ch
J 1894, 16 134)

Magnesium diamidophosphate, $[\text{PO}(\text{NH}_2)_2\text{O}]_2\text{Mg}$

Sol in H_2O , insol in alcohol (Stokes)

Potassium diamidophosphate, $\text{PO}(\text{NH}_2)_2\text{OK}$

Sol in H_2O , not deliquescent, insol in
alcohol (Stokes)

Silver diamidophosphate, $\text{PO}(\text{NH}_2)_2\text{OAg}$

Very stable, insol in H_2O Very sol in
 $\text{NH}_4\text{OH} + \text{Aq}$ (Stokes)

Sodium diamidophosphate, $\text{PO}(\text{NH}_2)_2\text{ONa}$

Sol in H_2O , not deliquescent, insol in
alcohol (Stokes)

Diamidotrihydroxylphosphoric acid

Silver diamidotrihydroxylphosphate,

$(\text{AgO})_3\text{P}(\text{NHAg})_2$

(Stokes, Am Ch J 1894, 16 147)

$(\text{AgO})_3\text{P}(\text{NH}_2)(\text{NHAg})$ Insol in cold
 H_2O (Stokes)

$(\text{AgO})_3\text{P}(\text{NH}_2)_2$ Decomp by cold H_2O
(Stokes)

$+ 2\text{H}_2\text{O}$ Decomp by boiling H_2O
(Stokes)

Amidoimidophosphoric acid

**Amidoheximidoheptaphosphoric acid, OH
 $\text{PO}(\text{NH}_2)[\text{NH PO}(\text{OH})]_5\text{NH PO}(\text{OH})_2$
 $= \text{P}_7\text{N}_7\text{O}_{15}\text{H}_{16}$**

Known only in solution in H_2O (Stokes
Am Ch J 1898 20 758)

Silver diamidopyrimidophosphate,

$\text{NH}(\text{PO NH OAg})$

Almost insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$
(Stokes, Am Ch J 1894 16 136)

Silver amidoheptamido pentaphosphate,

$\text{P}_5\text{N}_5\text{O}_{11}\text{H}_5\text{Ag}_5$

Ppt (Stokes Am Ch J 1898 20 752)

Silver amidoheximidoheptaphosphate,

$\text{P}_7\text{N}_7\text{O}_{15}\text{H}_5\text{Ag}_7$

Ppt, decomp by acetic acid (Stokes
Am Ch J 1898, 20 759)

Sodium amidoimidodiphosphate,

$\text{NH PO}(\text{ONa})$

$\text{PO ONa} < \text{NHPO}(\text{ONa})\text{NH}$

$= \text{P}_3\text{N}_3\text{O}_7\text{H}_4\text{N}_4 + \text{H}_2\text{O}$

Unstable sol in H_2O , insol in alcohol
(Stokes, Am Ch J 1896, 18 643)

Sodium amidoheximidoheptaphosphate,

$\text{P}_7\text{N}_7\text{O}_{15}\text{H}_5\text{Na}_7$

Sol in H_2O , pptd by alcohol (Stokes,
Am Ch J 1898, 20 758)

Amidophosphoric acid**Silver amidophosphumate**, $P(NH)NH_2(OAg)_2$

Decomp by heat, decomp in contact with H_2O (Stokes, Am Ch J 1894, 16 139)
 $(AgO)_2P(NAg)(NHAg)$ (?) Sl sol in $NH_4OH + Aq$ (Stokes, Am Ch J 1894, 16 149)

Amidosulphonic acid, $HOSO_2NH_2$

Easily sol in H_2O , less easily in alcohol (Berglund, B 9 252 and 1896)
 Very stable, less easily sol in H_2O than its K salt (Raschig, A 241 177)

Stable in air Non-deliquescent when cold
 Sol in 5 pts H_2O at 0° and in $2\frac{1}{2}$ pts H_2O at 70° Solution in H_2O can be boiled several minutes without decomp Solubility is decreased by addition of H_2SO_4 , so that if $1\frac{1}{5}$ – $1\frac{1}{4}$ pt H_2SO_4 is added to H_2O , 100 pts of the liquid dissolve only 3 pts $HOSO_2NH_2$ in the cold Pptd from solution by HNO_3 or glacial acetic acid, but not by HCl Solubility is decreased by presence of $NaHSO_4$ (Divers and Haga, Chem Soc 1896, 69 1641)

Amidosulphonates

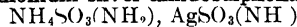
Easily sol in H_2O , sl sol in alcohol

Aluminum amidosulphonate

Very sol in H_2O (Berglund, Bull Soc (2) 29 422)

Ammonium amidosulphonate, $(NH_4)NH_2SO_3$

Deliquescent Sol in H_2O , insol in alcohol

Ammonium silver amidosulphonate,

(Ephraïm & Gurcivitch, B 1910, 43 148)

Barium amidosulphonate, $Ba(NH SO_3)_2$

Sol in 3 pts H_2O (Berglund, l c)

Cadmium amidosulphonate, $Cd(NH SO_3)_2 + 5H_2O$

Very sol in H_2O (B)

Calcium amidosulphonate, $Ca(NH SO_3)_2 + 4H_2O$

Very sol in H_2O (B)

Cobalt amidosulphonate, $Co(NH SO_3)_2 + 3H_2O$

Sol in H_2O (B)

Copper amidosulphonate, $Cu(NH SO_3)_2 + 2H_2O$

Sol in H_2O (B)

Gold (auric) potassium amidosulphonate, $K_2Au_2(NSO_3)_3$

Very sl sol in cold, more easily sol in hot

H_2O Sol in dil $HCl + Aq$ (Hofmann, B 1912, 45 1735)

Lead amidosulphonate, $Pb(NH_2SO_3)_2 + H_2O$

The most sol of all amidosulphonates (B)

Lithium amidosulphonate, $LiNH SO_3$

Deliquescent (B)

Magnesium amidosulphonate

Very sol in H_2O

Manganese amidosulphonate, $Mn(NH_2SO_3)_2 + 3H_2O$

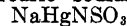
Very sol in H_2O (B)

Mercuric amidosulphonate, basic,

Insol in 35 % $HNO_3 + Aq$ Very sol in 3 % $HCl + Aq$ (Hofmann, B 1912, 45 1733)
 $+ 2H_2O$ Insol in hot H_2O Sol in $KOH + Aq$ (Divers and Haga, Chem Soc 1896, 69 1649)

Mercuric potassium amidosulphonate, $KHgNSO_3$

Very sl sol in cold H_2O and cold dil $KOH + Aq$ Sol in 3 % $HCl + Aq$ (Hofmann, B 1912, 45 1732)

Mercuric sodium amidosulphonate,

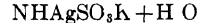
Nearly completely sol in hot H_2O (Hofmann, B 1912, 45 1734)

Nickel amidosulphonate, $Ni(NH SO_3)_2 + 3H_2O$

Sol in H_2O (B)

Potassium amidosulphonate, $KNH SO_3$

Sol in H_2O (Berglund)

Potassium silver amidosulphonate,

Decomp by H_2O , sol in $NH_4OH + Aq$ (Hofmann, B 1912, 45 1734)

Silver amidosulphonate, $AgNH SO_3$

Sol in 15 pts H_2O at 19° (B)

Sodium amidosulphonate, $NaNH_2SO_3$

Sol in H_2O

Strontium amidosulphonate, $Sr(NH SO_3)_2 + 4H_2O$

Sol in H_2O

Thallium amidosulphonate, $TlNH SO_3$

Sol in H_2O

Uranyl amidosulphonate

Sol in H_2O

Zinc amidosulphonate, $Zn(NH SO_3)_2 + 4H_2O$

Sol in H_2O

Amidosulphurous acid**Ammonium amidosulphite, $\text{NH}_4 \text{SO}_2 \text{NH}_4$**

Very deliquescent Decomp in the air with loss of NH_3 Sol in H_2O with decomp Sol in anhydrous alcohol Sl sol in dry ether (Divers, Chem Soc 1900, 77 330)

Ammonia, NH_3

Very sol in H_2O , with evolution of much heat

1 vol H_2O absorbs 670 vols ($\frac{1}{2}$ pt by weight) NH_3 at $+10^\circ$ and 29.8 in pressure sp gr of solution = 0.875 (Davy)

At low temperatures H_2O absorbs more than $\frac{1}{2}$ its weight of NH_3 and sp gr of solution = 0.850 (Dalton)
100 pts H_2O absorb 8.41 pts NH_3 at 24° 5.96 pts at 55° (Osann)

1 vol H_2O absorbs 780 vols NH_3 6 vols H_2O increasing to 10 vols sat $\text{NH}_4\text{OH} + \text{Aq}$ 1 vol sat $\text{NH}_4\text{OH} + \text{Aq}$ contains 468 vols NH_3 (Thomson)

1 vol H_2O absorbs 450 vols NH_3 at 15° (Dumas)
1 vol H_2O absorbs 700 vols NH_3 at ordinary temperature (Otto)

100 pts H_2O absorb in NH_3 gas 47.7 pts NH_3 by weight (Berzelius)

1 vol H_2O absorbs 505 vols NH_3 and vol is increased to 1.5 vol and sp gr becomes 0.900 (Ure)

1 vol H_2O at 0° and 760 mm absorbs 1177.3 vols NH_3 (Sims)

1 vol H_2O at 0° and 760 mm absorbs 1146 vols NH_3 (Roscoe and Dittmar)

1 vol H_2O at 0° and 760 mm absorbs 1049.6 vols NH_3 (Carius)

1 vol H_2O at 0° and 760 mm absorbs 1270 vols NH_3 (Berthelot)

1 vol H_2O at 0° and 760 mm absorbs 1050 vols NH_3 (Bunsen)

100 cc H_2O absorb 64.50 g NH_3 (Raoult)

Solubility of NH_3 in H_2O at 760 mm and t°

1 g H_2O absorbs g NH_3 , according to Roscoe and Dittmar (A 122 347) (RD), and according to Sims (A 118 345) (S)

t°	g NH_3 RD	g NH_3 S	t°	g NH_3 RD	g NH_3 S
0	0.875	0.899	36	0.343	0.363
2	0.833	0.853	38	0.324	0.350
4	0.792	0.809	40	0.307	0.338
6	0.751	0.765	42	0.290	0.326
8	0.713	0.724	44	0.275	0.315
10	0.679	0.684	46	0.259	0.304
12	0.645	0.646	48	0.244	0.294
14	0.612	0.611	50	0.229	0.284
16	0.582	0.578	52	0.214	0.274
18	0.554	0.546	54	0.200	0.265
20	0.526	0.518	56	0.186	0.256
22	0.499	0.490	58		0.247
24	0.474	0.467	60		0.238
26	0.449	0.446	70		0.194
28	0.426	0.426	80		0.154
30	0.403	0.408	90		0.114
32	0.382	0.393	98		0.082
34	0.362	0.378	100		0.074

Solubility of NH_3 by vol in H_2O at 760 mm and t° 1 vol H_2O at 760 mm and t° dissolves V vols NH_3 gas, vols reduced to 0° and 760 mm

t°	V	t°	V
0	1049.60	13	759.55
1	1020.78	14	743.11
2	993.26	15	727.22
3	966.98	16	711.82
4	941.88	17	696.85
5	917.90	18	682.26
6	894.99	19	667.99
7	873.09	20	653.99
8	852.14	21	640.19
9	831.98	22	626.54
10	812.76	23	612.98
11	794.32	24	599.46
12	776.60	25	585.94

(Carius, A 99 144)

Solubility of NH_3 in H_2O at P mm pressure and 0° 1 pt H_2O absorbs pts NH_3 at P mm pressure and 0°

P	Pts NH_3	P	Pts NH_3
10	0.044	900	0.968
20	0.084	950	1.101
30	0.120	1000	1.037
40	0.149	1050	1.075
50	0.175	1100	1.117
75	0.228	1150	1.161
100	0.275	1200	1.208
125	0.315	1250	1.258
150	0.351	1300	1.310
175	0.382	1350	1.361
200	0.411	1400	1.415
250	0.465	1450	1.469
300	0.515	1500	1.526
350	0.561	1550	1.584
400	0.607	1600	1.645
450	0.646	1650	1.707
500	0.690	1700	1.770
550	0.731	1750	1.835
600	0.768	1800	1.906
650	0.804	1850	1.976
700	0.840	1900	2.046
750	0.872	1950	2.120
800	0.906	2000	2.195
850	0.937		

(Roscoe and Dittmar, A 112 349)

In proportion as the temperature is higher, so much the more nearly does the solubility of NH_3 in H_2O conform to the law of Henry and Dalton, but only obeys it completely when the temperature is 100° , as is seen in the following table

solubility of NH_3 in H_2O at various pressures and temperatures P =partial pressure, p e total pressure minus the tension of aqueous vapour at the given temperature, G =grams NH_3 dissolved in 1 g H_2O at the given pressure, G at 760=grams NH_3 that would be contained in 1 g H_2O if the solubility was proportional to the pressure

P	0°		20°		40°		100°	
	G at P	G at 760	G at P	G at 760	G at P	G at 760	G at P	G at 760
20	0 082	3 113						
30	0 117	2 960						
40	0 148	2 820						
60	0 169	2 522	0 119	1 513				
80	0 240	2 280	0 141	1 337	0 052	0 497		
100	0 280	2 127	0 158	1 200	0 064	0 490		
120	0 316	2 000	0 173	1 095	0 076	0 483		
140	0 346	1 880	0 187	1 017	0 088	0 476		
160	0 375	1 780	0 202	0 962	0 099	0 470		
180	0 398	1 684	0 207	0 918	0 109	0 462		
200	0 421	1 598	0 232	0 881	0 120	0 454		
250	0 472	1 434	0 266	0 810	0 145	0 440		
300	0 519	1 315	0 296	0 750	0 168	0 426		
350	0 563	1 223	0 325	0 705	0 191	0 414		
400	0 606	1 152	0 353	0 670	0 211	0 402		
450	0 650	1 100	0 378	0 638	0 232	0 399		
500	0 692	1 052	0 403	0 612	0 251	0 382		
550	0 732	1 012	0 425	0 587	0 269	0 372		
600	0 770	0 975	0 447	0 566	0 287	0 363		
650	0 809	0 946	0 470	0 550	0 304	0 355		
700	0 850	0 923	0 492	0 534	0 320	0 347	0 068	0 074
750	0 891	0 903	0 514	0 521	0 335	0 339	0 073	0 074
760	0 899	0 899	0 518	0 518	0 338	0 338	0 074	0 074
800	0 937	0 888	0 535	0 504	0 349	0 332	0 078	0 074
850	0 980	0 876	0 556	0 497	0 363	0 325	0 083	0 074
900	1 029	0 869	0 574	0 485	0 378	0 319	0 088	0 074
950	1 077	0 862	0 594	0 475	0 391	0 313	0 092	0 073
1000	1 126	0 855	0 613	0 466	0 404	0 307	0 096	0 073
1050	1 177	0 852	0 632	0 457	0 414	0 300	0 101	0 073
1100	1 230	0 850	0 651	0 450	0 425	0 294	0 106	0 073
1150	1 283	0 848	0 669	0 442	0 434	0 287	0 110	0 073
1200	1 336	0 846	0 685	0 433	0 445	0 282	0 115	0 073
1250	1 338	0 844	0 704	0 428	0 454	0 276	0 120	0 073
1300	1 442	0 843	0 722	0 422	0 463	0 271	0 125	0 073
1350	1 496	0 842	0 741	0 417	0 472	0 266	0 130	0 073
1400	1 549	0 841	0 761	0 413	0 479	0 260	0 135	0 073
1450	1 603	0 840	0 780	0 409	0 486	0 255		
1500	1 656	0 839	0 801	0 406	0 493	0 250		
1600	1 755	0 835	0 842	0 400	0 511	0 242		
1700	1 861	0 832	0 881	0 394	0 530	0 237		
1800	1 966	0 830	0 919	0 388	0 547	0 231		
1900	2 070	0 828	0 955	0 382	0 565	0 226		
2000			0 992	0 377	0 579	0 220		
2100					0 594	0 215		

Solubility of NH_3 in H_2O at temps below
 0° One gram H_2O dissolves
 grams NH_3 Temp
 0 947 -3.9°
 1 115 -10°
 1 768 -20°
 2 781 -30°
 2 946 -40°

(Mallet, Am Ch J 1897, 19 807)

The solubility of NH_3 in H_2O does not follow Dalton's law at ord temp, but does at temp near 100° (Konowaloff, J Russ Phys Chem Soc 1894, 26 48, Chem Soc 1896, 70 (2) 351)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$

% NH_3	Sp gr	% NH_3	Sp gr
32 3*	0 8750	14 53	0 9435
29 25	0 8857	13 46	0 9476
26	0 9000	12 40	0 9513
25 37*	0 9054	11 56	0 9545
22 07	0 9166	10 82	0 9573
19 54	0 9255	10 17	0 9597
17 52	0 9326	9 6	0 9616
15 88	0 9385	9 5*	0 9632

(H Davy, Elements, 1 241)

* By direct experiment The other numbers were obtained by calculation making no allowance for compensation

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 16° , according to Otto in his Lehrbuch

% NH_3	Sp gr	% NH_3	Sp gr
12 000	0 9517	8 500	0 9650
11 875	0 9521	8 375	0 9654
11 750	0 9526	8 250	0 9659
11 625	0 9531	8 125	0 9664
11 500	0 9536	8 000	0 9669
11 375	0 9540	7 875	0 9673
11 250	0 9545	7 750	0 9678
11 125	0 9550	7 625	0 9683
11 000	0 9555	7 500	0 9688
10 950	0 9556	7 375	0 9692
10 875	0 9559	7 250	0 9697
10 750	0 9564	7 125	0 9702
10 625	0 9569	7 000	0 9707
10 500	0 9574	6 875	0 9711
10 375	0 9578	6 750	0 9716
10 250	0 9583	6 625	0 9721
10 125	0 9588	6 500	0 9726
10 000	0 9593	6 375	0 9730
9 875	0 9597	6 250	0 9735
9 750	0 9602	6 125	0 9740
9 625	0 9607	6 000	0 9745
9 500	0 9612	5 875	0 9749
9 375	0 9616	5 750	0 9754
9 250	0 9621	5 625	0 9759
9 125	0 9626	5 500	0 9764
9 000	0 9631	5 375	0 9768
8 875	0 9636	5 250	0 9773
8 750	0 9641	5 125	0 9778
8 625	0 9645	5 000	0 9783

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$, according to Ure in Dict of Arts

% NH_3	Sp gr	% NH_3	Sp gr
27 940	0 8914	15 900	0 9363
27 633	0 8937	14 575	0 9410
27 038	0 8967	13 250	0 9455
26 751	0 8983	11 925	0 9510
26 500	0 9000	10 600	0 9564
25 175	0 9045	9 275	0 9614
23 850	0 9090	7 950	0 9662
22 525	0 9133	6 625	0 9716
21 200	0 9177	5 300	0 9768
19 875	0 9227	3 975	0 9828
18 550	0 9275	2 650	0 9887
17 225	0 9320	1 325	0 9945

Sp gr, b-pt, and vols gas in $\text{NH}_4\text{OH} + \text{Aq}$

% NH_3	Sp gr	B pt	Vols gas in 1 vol liquid
35 3	0 85	-3.3°	494
32 6	0 86	$+3.3^\circ$	456
29 9	0 87	10°	419
27 3	0 88	16.6°	382
24 7	0 89	23.3°	346
22 2	0 90	30°	311
19 8	0 91	36.6°	277
17 4	0 92	43.3°	244
15 1	0 93	50°	211
12 8	0 94	56.6°	180
10 5	0 95	63.3°	147
8 3	0 96	70°	116
6 2	0 97	78.3°	87
4 1	0 98	86.1°	57
2 0	0 99	91.1°	28

(Dalton, in New System 2 422)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at t

t	Sp gr	t	Sp gr	t	Sp gr
0	0 8533	9	0 8746	18	0 8901
1	0 8561	10	0 8766	19	0 8916
2	0 8587	11	0 8785	20	0 8928
3	0 8611	12	0 8804	21	0 8940
4	0 8633	13	0 8823	22	0 8952
5	0 8658	14	0 8841	23	0 8965
6	0 8681	15	0 8858	24	0 8974
7	0 8703	16	0 8874	25	0 8984
8	0 8725	17	0 8889		

(Carius, A 99 141)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 14° according to Carius (A 99 148)

% NH_3	Sp gr	% NH_3	Sp gr
36 0	0 8844	35 2	0 8860
35 8	0 8848	35 0	0 8864
35 6	0 8852	34 8	0 8868
35 4	0 8856	34 6	0 8872

gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 14° , etc —Cont

NH_3	Sp gr	% NH_3	Sp gr
34 4	0 8877	22 2	0 9185
34 2	0 8881	22 0	0 9191
34 0	0 8885	21 8	0 9197
33 8	0 8889	21 6	0 9203
33 6	0 8894	21 4	0 9209
33 4	0 8898	21 2	0 9215
33 2	0 8903	21 0	0 9221
33 0	0 8907	20 8	0 9227
32 8	0 8911	20 6	0 9233
32 6	0 8916	20 4	0 9239
32 4	0 8920	20 2	0 9245
32 2	0 8925	20 0	0 9251
32 0	0 8929	19 8	0 9257
31 8	0 8934	19 6	0 9264
31 6	0 8938	19 4	0 9271
31 4	0 8944	19 2	0 9277
31 2	0 8948	19 0	0 9283
31 0	0 8953	18 8	0 9289
30 8	0 8957	18 6	0 9296
30 6	0 8962	18 4	0 9302
30 4	0 8967	18 2	0 9308
30 2	0 8971	18 0	0 9314
30 0	0 8976	17 8	0 9321
29 8	0 8981	17 6	0 9327
29 6	0 8986	17 4	0 9333
29 4	0 8991	17 2	0 9340
29 2	0 8996	17 0	0 9347
29 0	0 9001	16 8	0 9353
28 8	0 9006	16 6	0 9360
28 6	0 9011	16 4	0 9366
28 4	0 9016	16 2	0 9373
28 2	0 9021	16 0	0 9380
28 0	0 9026	15 8	0 9386
27 8	0 9031	15 6	0 9393
27 6	0 9036	15 4	0 9400
27 4	0 9041	15 2	0 9407
27 2	0 9047	15 0	0 9414
27 0	0 9051	14 8	0 9420
26 8	0 9057	14 6	0 9427
26 6	0 9063	14 4	0 9434
26 4	0 9068	14 2	0 9441
26 2	0 9073	14 0	0 9449
26 0	0 9078	13 8	0 9456
25 8	0 9083	13 6	0 9463
25 6	0 9089	13 4	0 9470
25 4	0 9094	13 2	0 9477
25 2	0 9100	13 0	0 9484
25 0	0 9106	12 8	0 9491
24 8	0 9111	12 6	0 9498
24 6	0 9116	12 4	0 9505
24 4	0 9122	12 2	0 9512
24 2	0 9127	12 0	0 9520
24 0	0 9133	11 8	0 9527
23 8	0 9139	11 6	0 9534
23 6	0 9145	11 4	0 9542
23 4	0 9150	11 2	0 9549
23 2	0 9156	11 0	0 9556
23 0	0 9162	10 8	0 9563
22 8	0 9168	10 6	0 9571
22 6	0 9174	10 4	0 9578
22 4	0 9180	10 2	0 9586

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 14° , etc —Cont

% NH_3	Sp gr	% NH_3	Sp gr
10 0	0 9593	5 0	0 9790
9 8	0 9601	4 8	0 9799
9 6	0 9608	4 6	0 9807
9 4	0 9616	4 4	0 9815
9 2	0 9623	4 2	0 9823
9 0	0 9631	4 0	0 9831
8 8	0 9639	3 8	0 9839
8 6	0 9647	3 6	0 9847
8 4	0 9654	3 4	0 9855
8 2	0 9662	3 2	0 9863
8 0	0 9670	3 0	0 9873
7 8	0 9677	2 8	0 9882
7 6	0 9685	2 6	0 9890
7 4	0 9693	2 4	0 9899
7 2	0 9701	2 2	0 9907
7 0	0 9709	2 0	0 9915
6 8	0 9717	1 8	0 9924
6 6	0 9725	1 6	0 9932
6 4	0 9733	1 4	0 9941
6 2	0 9741	1 2	0 9950
6 0	0 9749	1 0	0 9959
5 8	0 9757	0 8	0 9967
5 6	0 9765	0 6	0 9975
5 4	0 9773	0 4	0 9983
5 2	0 9781	0 2	0 9991

Hager also gives a table in his *Commentar zur Pharmacopoea*, which is practically identical with those here given

Strength of $\text{NH}_4\text{OH} + \text{Aq}$ of certain sp gr at 12°

Sp gr	1 kg solution contains g NH_3	1 l solution contains g NH_3	1 litre consists of	
			H O in cc	liquid NH_3 in cc
0 870	384 4	334 5	535 5	464 5
0 880	347 2	305 5	574 5	425 5
0 890	311 6	277 3	612 7	387 3
0 900	277 3	249 5	650 5	349 5
0 910	244 9	222 8	687 2	312 8
0 920	213 4	196 3	723 7	276 3
0 930	182 9	170 1	759 9	240 1
0 940	152 9	143 7	796 3	203 7
0 950	124 2	118 0	832 0	168 0
0 960	97 0	93 1	866 9	133 1
0 970	70 2	68 0	902 0	98 0
0 980	45 3	44 3	935 7	64 3
0 990	21 0	20 7	969 3	30 7

(Wachsmuth, *Arch Pharm* (3) 8 510)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 15°
(Most careful experiments)

Sp gr	% NH_3	Sp gr	% NH_3
0 990	2 15	0 926	19 50
0 974	6 10	0 916	22 50
0 950	12 54	0 910	24 40

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 15° —*Continued*

Sp gr	% NH_3	Sp gr	% NH_3
0 900	27 70	0 882	34 8
0 890	31 40	0 880	35 5
0 885	33 5		

(Gruneberg, Chem Ind 12 97)

The following table is calculated from the above by interpolation —

Sp gr	% NH_3	Sp gr	% NH_3
0 995	1 05	0 935	16 90
0 990	2 15	0 930	18 35
0 985	3 30	0 925	19 80
0 980	4 50	0 920	21 30
0 975	5 75	0 915	22 85
0 970	7 05	0 910	24 40
0 965	8 40	0 905	26 00
0 960	9 80	0 900	27 70
0 955	11 20	0 895	29 50
0 950	12 60	0 890	31 40
0 945	14 00	0 885	33 40
0 940	15 45	0 880	35 50

(Gruneberg)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 14°

% NH_3	Sp gr	% NH_3	Sp gr
31	0 8933	15 6	0 9400
23 8	0 9116	11 7	0 9536
20 4	0 9246	5 1	0 9780

(Iunge and Smith, B 17 777)

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 15° , according to Iunge and Wiernik (Zeit f angew Ch 1889 183)

(Most carefully worked out and calculated)

Sp gr	% NH_3	1 l contains g NH_3	Correction for $\pm 1^\circ$
1 000	0 00	0 0	0 00018
0 998	0 45	4 5	0 00018
0 996	0 91	9 1	0 00019
0 994	1 37	13 6	0 00019
0 992	1 84	18 2	0 00020
0 990	2 31	22 9	0 00020
0 988	2 80	27 7	0 00021
0 986	3 30	32 5	0 00021
0 984	3 80	37 4	0 00022
0 982	4 30	42 2	0 00022
0 980	4 80	47 0	0 00023
0 978	5 30	51 8	0 00023
0 976	5 80	56 6	0 00024
0 974	6 30	61 4	0 00024
0 972	6 80	66 1	0 00025
0 970	7 31	70 9	0 00025
0 968	7 82	75 7	0 00026

Sp gr of $\text{NH}_4\text{OH} + \text{Aq}$ at 15° , etc—*Continued*

Sp gr	% NH_3	1 l contains g NH_3	Correction for $\pm 1^\circ$
0 966	8 33	80 5	0 00026
0 964	8 84	85 2	0 00027
0 962	9 35	89 9	0 00028
0 960	9 91	95 1	0 00029
0 958	10 47	100 3	0 00030
0 956	11 03	105 4	0 00031
0 954	11 60	110 7	0 00032
0 952	12 17	115 9	0 00033
0 950	12 74	121 0	0 00034
0 948	13 31	126 2	0 00035
0 946	13 88	131 3	0 00036
0 944	14 46	136 5	0 00037
0 942	15 04	141 7	0 00038
0 940	15 63	146 9	0 00039
0 938	16 22	152 1	0 00040
0 936	16 82	157 4	0 00041
0 934	17 42	162 7	0 00041
0 932	18 03	168 1	0 00042
0 930	18 64	173 4	0 00042
0 928	19 25	178 6	0 00043
0 926	19 87	184 2	0 00044
0 924	20 49	189 3	0 00045
0 922	21 12	194 7	0 00046
0 920	21 75	200 1	0 00047
0 918	22 39	205 6	0 00048
0 916	23 03	210 9	0 00049
0 914	23 68	216 3	0 00050
0 912	24 33	221 9	0 00051
0 910	24 99	227 4	0 00052
0 908	25 65	232 9	0 00053
0 906	26 31	238 3	0 00054
0 904	26 98	243 9	0 00055
0 902	27 65	249 4	0 00056
0 900	28 33	255 0	0 00057
0 898	29 01	260 5	0 00058
0 896	29 69	266 0	0 00059
0 894	30 37	271 5	0 00060
0 892	31 05	277 0	0 00060
0 890	31 75	282 6	0 00061
0 888	32 50	288 6	0 00062
0 886	33 25	294 6	0 00063
0 884	34 10	301 4	0 00064
0 882	34 95	308 3	0 00065

NH_3 is much less sol in KOH , or $\text{NaOH} + \text{Aq}$ than in H_2O

Solubility of NH_3 in H_2O , and $\text{KOH} + \text{Aq}$ of various strengths 100 pts solvent absorbs g NH_3 at t°

t°	H_2O	$\text{KOH} + \text{Aq}$ 11.2% K_2O	$\text{KOH} + \text{Aq}$ 25.5% K_2O
0	90 00	72 00	49 50
8	72 75	57 00	37 50
16	59 75	46 00	28 50
24	49 50	37 25	21 75

(Raoult, A ch (5) 1 262)

100 pts sat KOH + Aq dissolve only 1 pt NH_3

Solubility in NaOH + Aq is the same as in KOH + Aq of the same strength

NH_4Cl + Aq absorbs slightly less NH_3 than the same vol H_2O NaNO_3 , and NH_4NO_3 + Aq absorb almost the same amount NH_3 as the same vol H_2O (Raoult, *l c*)

Solubility of NH_3 in 100 pts $\text{Ca}(\text{NO}_3)_2$ + Aq

t°	H_2O	$\text{Ca}(\text{NO}_3)_2$ + Aq 29 38% $\text{Ca}(\text{NO}_3)_2$	$\text{Ca}(\text{NO}_3)_2$ + Aq 59 03% $\text{Ca}(\text{NO}_3)_2$
0	90 00	96 25	104 50
8	72 75	78 50	84 75
16	59 75	65 00	70 50

(Raoult, *l c*)

Solubility in salt solutions at 25°C

Salt	Mols NH_3 soluble in 1 liter of		
	0 normal solution	1 normal solution	1 5 normal solution
KCl	0 930	0 866	0 809
KBr	0 950	0 904	0 857
KI	0 970	0 942	0 900
KOH	0 852	0 716	0 607
NaCl	0 938	0 889	0 843
NaBr	0 965	0 916	0 890
NaI	0 995	0 992	0 985
NaOH	0 876	0 789	0 716
LiCl	0 980	1 008	1 045
LiBr	1 001	1 040	1 090
LiI	1 030	1 094	1 190
LiOH	0 861	0 808	0 768
KF	0 539	0 722	0 626
KNO_3	0 923	0 862	0 804
KNO	0 920	0 855	0 798
KCN	0 926	0 858	0 802
KCNS	0 932	0 868	0 814
$\frac{1}{2}\text{K}_2\text{SO}_4$	0 875	0 772	0 678
$\frac{1}{2}\text{K}_2\text{SO}_3$	0 865	0 768	0 675
$\frac{1}{2}\text{K}_2\text{CO}_3$	0 788	0 650	0 554
$\frac{1}{2}\text{K}_2\text{C}_2\text{O}_4$	0 866	0 771	0 675
$\frac{1}{2}\text{K}_2\text{Cr}_2\text{O}_4$	0 866	0 771	0 675
CH_3COOK	0 866	0 765	0 685
HCOOK	0 868	0 760	0 678
KBO_2	0 814	0 677	0 560
$\frac{1}{2}\text{K}_2\text{HPO}_4$	0 860	0 749	0 664
$\frac{1}{2}\text{Na}_2\text{S}$	0 887	0 795	0 726
KClO_3 0 25-norm	0 927		
KBrO_3 0 25-norm	0 940		
KIO_3 0 25-norm	0 951		

(Abegg & Riesenfeld, Z phys Ch 1902, 40 100)

Solubility in salts + Aq at 35°C

Salt	Concentration of the aq solution	Mols NH_3 soluble in 1 liter of solution
KCl	0 5 normal	0 923
NaCl	"	0 966
CH_3COOK	"	0 902
$\frac{1}{2}(\text{COOK})_2$	"	0 902
KOH	"	0 870
NaOH	"	0 896
$\frac{1}{2}\text{K}_2\text{CO}_3$	0 426 normal	0 914
$\frac{1}{2}\text{Na}_2\text{CO}_3$	"	0 932

(Riesenfeld, Z phys Ch 1903, 45 462)

The solubility of NH_3 in NaNO_3 , NH_4NO_3 and in $\text{AgNO}_3 \cdot 2\text{NH}_3$ + Aq is nearly the same as in pure H_2O (Konowaloff, C C 1898, II 659)

Distribution-coefficient of NH_3 between water and CHCl_3 = 26 3 at 20° , 24 9 at 25° , 23 2 at 30°

The distribution-coefficient of NH_3 between CHCl_3 and a number of salt solutions has been determined for the purpose of studying the nature of metal-ammonia compounds in aqueous solution (Dawson, Chem Soc 1900, 77 1242)

Distribution of NH_3 between H_2O and CHCl_3 at 18°

NH_3 concentration in aqueous solution mols / litre	NH_3 concentration in CHCl_3 solution mols / litre
0 9280	0 03506
1 921	0 07703
2 064	0 08350
2 274	0 09317
2 590	0 1083
3 700	0 1639
4 333	0 1996

(Dawson, Z phys Ch 1909, 69 120)

Distribution of NH_3 between hydroxides + Aq and CHCl_3 at 18°

Aqueous solution	NH_3 concentration in the aqueous solution mols / litre	NH_3 concentration in the CHCl_3 solution mols / litre
0 2-N KOH	1 949	0 0841
0 5-N KOH	1 978	0 0951
0 2-N NaOH	2 016	0 0869
0 5-N NaOH	1 944	0 0907
0 2-N $\frac{1}{2}\text{Ba}(\text{OH})_2$	2 076	0 08905
0 5-N $\frac{1}{2}\text{Ba}(\text{OH})_2$	3 397	0 1560

(Dawson, *l c*)

Distribution of NH_3 between $\text{Cu}(\text{OH})_2 + \text{Aq}$ and CHCl_3 at 18°

Conc of $\text{Cu}(\text{OH})_2$ equivalents/litre	NH_3 concentration in aqueous solution mols /litre	NH_3 concentration in CHCl_3 solution mols /litre
0 041	2 014	0 07968
0 0705	2 653	0 1087
0 081	3 011	0 1247

(Dawson, *l c*)

Sol in alcohol and ether

Sol in 3 pts alcohol of 38° (Boullay)
 1 vol alcohol of 0 829 sp gr absorbs about 50 vols NH_3 (Davy)

Much less sol in ethyl, propyl, or amyl alcohol than in H_2O (Paghano and Emo, Gazz ch it 13 278)

Solubility of NH_3 in ethyl alcohol () solut at t°

t°	% NH_3	Pts NH_3 pts	per 100 ohol
0	19 7	2	5
6	17 1	2	6
11 7	14 1	1	4
14 7	13 2	1	2
17	12 6	1	7
22	10 9	1	2
28 4	9 2	1	1

(de Bruyn, R t e 11 112)

1 vol abs alcohol at 20° and 0 mm pressure absorbs 340 vols NH_3 gas (Müller W Ann 1891, 43 567)

1 l methyl alcohol sat with NH_3 contains 218 g NH_3 at 0° , sp gr of solution = 0 776 coefficient of solubility = 425 0 (De pine)

Solubility of NH_3 in alcohol at t° weight NH_3 = weight NH_3 contained in a litre of solution sat at 760 mm and t° , sp gr = sp gr of solution, C = coefficient of solubility

Temp	Degree of Alcohol	100°	90°	80°	70°	60°	50°
0°	Weight NH_3	130 5	146 0	206 5		246 0	304 5
	Sp gr	0 782	0 783	0 808		0 830	0 835
	C	209 5	245 0	390 0		504 5	97 7
10°	Weight NH_3	108 5	120 0	167 0		198 25	27 0
	Sp gr	0 787	0 803	0 800		0 831	0 850
	C	164 3	186 0	288 0		373 0	38 6
20°	Weight NH_3	75 0	97 5	119 75	137 5	152 5	82 7
	Sp gr	0 791	0 788	0 821	0 829	0 842	0 869
	C	106 6	147 8	190 5	223 0	260 8	38 2
30°	Weight NH_3	51 5	74 0	81 75	100 3	129 5	52 0
	Sp gr	0 798	0 791	0 826		0 846	0 883
	C	97 0	186 7	121 6		211 6	52 0

(Delépine, J Pharm (5) 25 496)

Solubility of NH_3 in methyl alcohol (absolute) at t°

t°	% NH_3	Pts NH_3 per 100 pts alcohol
0	29 3	41 5
6	26 0	35 2
11 7	23 5	30 7
14 7	21 8	27 9
17	20 8	26 3
22	18 3	22 4
28 4	14 8	17 4

(de Bruyn, *l c*)

Readily sol in ether

Sol in 0 4 vol petroleum from Amiano (Saussure)

1 vol oil of turpentine absorbs 7 5 vols NH_3 at 16°

1 vol oil of lemon absorbs 8 5 vols NH_3 at 16°

1 vol oil of rosemary absorbs 9 5 vols NH_3 at 29°

1 vol oil of lavender absorbs 47 vols NH_3 at 20° (Saussure)

1 vol caoutchine absorbs 3 vols NH_3 (Himly)

Valerol absorbs much NH_3 (Carrardt, A ch (3) 7 278)

1 vol ether at 760 mm pressure absorbs 17 13 vols NH_3 at 0° , 12 35 vols at 0° and 10 27 vols at 15° (Christoff, Z p ys Ch 1912 79 459)

+ H_2O Colorless crystals

+ $\frac{1}{2}\text{H}_2\text{O}$ Large transparent crystals (Rupert, J Am Chem Soc 1909, 3 868)

Ammonia, with metal salts

For the ammonia addition-products of metal salts, see under the respective metal salts, except in the case of Co, Cr, Hg and the Pt metals, for which see cobalt ammonium, chromium ammonium, etc, compounds, for

further reference New data on Co and Cr ammonium compounds and those of the Pt metals, published since the first edition, has not been included in the present edition

Ammonium amalgam, NH_4, zHg

Decomp by H_2O , but more easily in presence of naphtha, alcohol, or ether

Ammonium azoimide, $\text{N}_4\text{H}_4 = \text{NH}_4\text{N}_3$

Easily sol in H_2O , sl sol in absolute alcohol, easily in 80% alcohol Insol in ether or benzene (Curtius, B 24 3344)

Ammonium cobalt azoimide, $\text{NH}_4\text{N}_3, \text{CoN}_3$

Rather sol in H_2O (Curtius and Rissom, J pr 1898, (2) 58 302)

Ammonium bromide, NH_4Br

Easily sol in H_2O with absorption of much heat

1 pt NH_4Br dissolves in pts H_2O at t°

t°	Pts H_2O	t°	Pts H_2O	t°	Pts H_2O
10	1 51	30	1 23	100	0 78
16	1 39	50	1 06		

(Eder, W A B 82 (2) 1284)

$\text{NH}_4\text{Br} + \text{Aq}$ containing 41 09% NH_4Br is sat at 15° (Gerlach)

Sp gr of $\text{NH}_4\text{Br} + \text{Aq}$ at 15°

% NH_4Br	Sp gr	% NH_4Br	Sp gr
5	1 0326	20	1 1285
10	1 0652	30	1 1921
15	1 0960	41 09	1 2920

(Eder)

Sp gr of $\text{NH}_4\text{Br} + \text{Aq}$ at 16°

% NH_4Br	Sp gr	% NH_4Br	Sp gr
2	1 0119	22	1 1375
3	1 0181	23	1 1440
4	1 0242	24	1 1506
5	1 0303	25	1 1573
6	1 0364	26	1 1642
7	1 0425	27	1 1713
8	1 0486	28	1 1787
9	1 0547	29	1 1862
10	1 0609	30	1 1938
11	1 0672	31	1 2018
12	1 0735	32	1 2098
13	1 0798	33	1 2180
14	1 0862	34	1 2260
15	1 0926	35	1 2342
16	1 0988	36	1 2425
17	1 1051	37	1 2509
18	1 1115	38	1 2594
19	1 1181	39	1 2679
20	1 1246	40	1 2765
21	1 1310	41	1 2850

(Hager, Comm 1883)

25 g $\text{NH}_4\text{Br} + 50$ g H_2O lower the temp from 15.1° to -1.1° (Rudorff)

Sol in liquid NH_3 at -50° (Moissan C R 1901, 133 713)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

Sl sol in alcohol

1 pt NH_4Br dissolves in 32.3 pts alcohol (0.806 sp gr) at 15° , 9.5 pts at 78° (Eder, l c)

100 pts absolute methyl alcohol dissolve 12.5 pts at 19° , 100 pts absolute ethyl alcohol dissolve 3.22 pts at 19° (de Bruyn, Z phys Ch 10 783)

Solubility in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the solvent
G = g NH_4Br in 10 cc of the solution
S = sp gr of the sat solution at $25^\circ/4^\circ$

P	G	S
0 00	0 255	0 8065
4 37	0 299	0 8083
10 40	0 321	0 8117
41 02	0 506	0 8252
80 69	0 813	0 8501
84 77	0 847	0 8508
91 25	0 934	0 8551
100 00	0 983	0 8605

(Herz, Z anorg 1908, 60 156)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NH_4Br in 10 cc of the solution
S = Sp gr of the sat solution at $25^\circ/4^\circ$

P	G	S
0	0 953	0 8605
11 11	0 551	0 8521
23 5	0 690	0 8426
65 2	0 308	0 8181
91 5	0 128	0 8097
93 75	0 125	0 8089
100	0 095	0 8059

(Herz, l c)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NH_4Br in 10 cc of the solution
S = Sp gr of the sat solution at $25^\circ/4^\circ$

P	G	S
0	0 255	0 8065
8 1	0 251	0 8062
17 85	0 237	0 8032
36 6	0 163	0 8018
58 6	0 111	0 8012
91 2	0 105	0 8019
95 2	0 101	0 8039
100	0 095	0 8059

(Herz, l c)

Sol in 809 pts ether (0.729 sp gr) (Eder, *lc*)
 Sol in acetone (Eidmann, C C 1899 II, 1014), (Naumann, B 1904, 37 4328)
 Insol in benzonitrile (Naumann, B 1914, 47 1370)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)
 Insol in ethylacetate (Naumann, B 1910, 43 314)

Ammonium tribromide, NH_4Br_3

Gives off Br in air Sol in H_2O (Roozeboom, B 14 2398)

Decomp in the air Very sol in H_2O (Chattaway, Chem Soc 1915, 107 106)

Ammonium antimony bromide, $3\text{NH}_4\text{Br} \cdot 2\text{SbBr}_3$

Easily sol in abs alcohol (Caven, C C 1905 II, 293)

$7\text{NH}_4\text{Br} \cdot 3\text{SbBr}_3$ Easily sol in abs alcohol (Caven, C C 1905 II, 293)

See also Bromantimonate, ammonium

Ammonium bismuth bromide, $\text{NH}_4\text{Br} \cdot \text{BiBr}_3 + \text{H}_2\text{O}$

Deliquescent Decomp by H_2O Sol in alcohol (Nicklès, C R 51 1097)

Ammonium cadmium bromide, $\text{NH}_4\text{Br} \cdot \text{CdBr}_2 + \frac{1}{2}\text{H}_2\text{O}$

Sol in 0.73 pt H_2O , 5.3 pts abs alcohol, 280 pts ether (sp gr 0.729), and 24 pts alcohol ether (1 l) (Eder, Dingl 221 89)

Sol in H_2O without decomp between 1° and 110°

100 pts of the solution contain at

1° 14.8° 52° 110°

53.82 58.01 65.32 75.83 pts of the salt (Rimbach, B 1905, 38 1555)

$4\text{NH}_4\text{Br} \cdot \text{CdBr}_2$ Sol in 0.96 pt H_2O , from which it is pptd. by alcohol or ether (Eder)

Solubility in H_2O at t°

Below 160° the salt is decomp by H_2O , at 160° it is sol in H_2O without decomp

t°	100 pts of the solution contain			Solid phase
	Pts Cd	Pts Br	Pts NH_4	
0.8	14.72	50.46	6.67	Double salt + NH_4Br
13.0	14.94	51.48	6.85	"
44.5	15.01	53.85	7.35	"
76.4	15.60	55.28	7.80	"
123.5	15.50	59.50	8.45	"
160.0	14.70	62.67	9.43	Double salt

(Rimbach, B 1905, 38 1558)

Not sol in $\text{HBr} + \text{Aq}$ without decomp (Rimbach)

Not sol without decomp in $\text{LiBr} + \text{Aq}$, $\text{CaBr}_2 + \text{Aq}$, $\text{MgBr}_2 + \text{Aq}$, $\text{NiBr}_2 + \text{Aq}$, or

$\text{CoBr}_2 + \text{Aq}$, even though very conc solution are used Sol without decomp in $\text{ZnBr}_2 + \text{Aq}$ (Rimbach, B 1905, 38 151)

Ammonium chloromolybdenum bromide, $2\text{NH}_4\text{Br} \cdot \text{Cl}_4\text{Mo}_3\text{Br}_2$

Decomp by pure H_2O Can't crystallize from $\text{HBr} + \text{Aq}$ Apparently sol without decomp in alcohol (Blomstrand)

Ammonium cuprous bromide

$4\text{NH}_4\text{Br} \cdot \text{Cu}_2\text{Br}_2$ Fairly stable in air
 $2\text{NH}_4\text{Br} \cdot \text{Cu}_2\text{Br}_2 + \text{H}_2\text{O}$ Fairly stable in air (Wells, Z anorg 1895, 10 159)

Ammonium cuprous bromide ammonium, $\text{NH}_4\text{Br} \cdot \text{Cu}_2\text{Br}_2 \cdot 3\text{NH}_3$

(Fleurent, C R 1891, 113 107)

Ammonium cupric bromide, $2\text{NH}_4\text{Br} \cdot \text{CuBr}_2 + 2\text{H}_2\text{O}$

Very sol in H_2O (de Koning, B 21 777 R)

Ammonium indium bromide

See Bromindate, ammonium

Ammonium iron (ferric) bromide, $(\text{NH}_4)_2\text{FeBr}_4 + 2\text{H}_2\text{O}$

Very deliquescent, sol in H_2O (Walden Z anorg 1894, 7 332)

Ammonium lead bromide, $12\text{NH}_4\text{Br} \cdot 7\text{PbBr}_2 + 7\text{H}_2\text{O}$

Decomp on air, or with cold H_2O (André G R 96 1502)

$6\text{NH}_4\text{Br} \cdot \text{PbBr}_2 + \text{H}_2\text{O}$ Decomp by cold H_2O (A)

$7\text{NH}_4\text{Br} \cdot \text{PbBr}_2 + 1\frac{1}{2}\text{H}_2\text{O}$ Stable on air decomp by cold H_2O (A)

None of the above compounds 1st (Wells Sill Am J 146 25)

$2\text{NH}_4\text{Br} \cdot \text{PbBr}_2$ Decomp by H_2O Sol in conc $\text{KOH} + \text{Aq}$ and in strong acids (Fonze-Diacon, Bull Soc 1897 3) 17 351
 $\text{NH}_4\text{Br} \cdot 3\text{PbBr}_2$ (Wells)

Ammonium magnesium bromide, $\text{NH}_4\text{Br} \cdot \text{MgBr}_2 + 6\text{H}_2\text{O}$

Deliquescent Sol in H_2O (Rich, J pr (2) 28 338)

Ammonium mercuric bromide, $2\text{HgBr}_2 \cdot \text{NH}_4\text{Br}$

Decomp by H_2O into its constituent salts (Rây, Chem Soc 1902, 81 648)

Ammonium molybdenum bromide, $2\text{NH}_4\text{Br} \cdot \text{MoBr}_3 + \text{H}_2\text{O}$

Easily sol in H_2O (Rosenheim, Z anorg 1905, 46 322)

Ammonium molybdenum bromide chloride, See Ammonium chloromolybdenum bromide

Ammonium osmium bromide*See* Bromosmate, ammonium**Ammonium osmyl bromide**, $(\text{NH}_4)_2\text{OsO}_2\text{Br}_4$
Sol in H_2O (Wintrebert, A ch 1903, (7) 28 95)**Ammonium osmyl oxybromide**,
 $(\text{NH}_4)_2\text{OsO}_3\text{Br}_2$

(Wintrebert, A ch 1903 (7) 28 117)

Ammonium palladium bromide*See* Bromopalladate, ammonium, and
Bromopalladite, ammonium**Ammonium platinum bromide***See* Bromoplatinate, ammonium**Ammonium rhodium bromide***See* Bromorhodite, ammonium**Ammonium selenium bromide***See* Bromoselenate, ammonium**Ammonium tellurium bromide***See* Bromotellurate, ammonium**Ammonium thallic bromide**, NH_4Br , $\text{TlBr}_3 + 2\text{H}_2\text{O}$ Sol in H_2O (Willm) $+4\text{H}_2\text{O}$ Efflorescent Sol in H_2O
(Nicklès) $+5\text{H}_2\text{O}$ Sol in H_2O (Nicklès)**Ammonium stannous bromide (ammonium bromostannite)**, NH_4Br , $\text{SnBr}_2 + \text{H}_2\text{O}$ Sol in H_2O (Benas, C C 1884 958) $2\text{NH}_4\text{Br}$, SnBr_2 Sol in H_2O (Raymann
and Preis, A 223 323) $+ \text{H}_2\text{O}$ Sol in H_2O (Benas, l c) $+ 2\text{H}_2\text{O}$ (Richardson, Am Ch J 14 96) NH_4Br , 2SnBr_2 (?) (Benas)**Ammonium stannic bromide**, $2\text{NH}_4\text{Br}$, SnBr_4 *See* Bromostannate, ammonium**Ammonium uranyl bromide**, $2\text{NH}_4\text{Br}$, $\text{UO}_2\text{Br}_2 + 2\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O (Sclaf-
ner)**Ammonium zinc bromide**, $2\text{NH}_4\text{Br}$, ZnBr_2 Deliquescent, and sol in H_2O (Bodeker,
J B 1860 17) $+ \text{H}_2\text{O}$ Very deliquescent, and sol in H_2O
(André, A ch (6) 3 104) $+ x\text{H}_2\text{O}$ (Lphrum, Z anorg 1908, 59 66) NH_4Br , ZnBr_2 Sol in H_2O Decomp
only by great dilution (Jones & Knight, Am
Ch J 1899, 22 136) $+ \text{H}_2\text{O}$ Not hygroscopic (Lphrum, Z
anorg 1908, 59 66)**Ammonium bromide arsenic trioxide***See* Arsenite bromide, ammonium**Ammonium bromide mercuric chloride**, NH_4Br , 2HgCl_2

Ppt (Rây, Chem Soc 1902, 81 649)

Ammonium bromide mercuric iodide, $2\text{NH}_4\text{Br}$, HgI_2 Decomp by H_2O Sol in alcohol without
decomp (Grossmann, B 1903, 36 1602) $3\text{NH}_4\text{Br}$, 2HgI_2 Decomp by H_2O Sol
in alcohol without decomp (Grossmann, B
1903, 36 1602)**Ammonium lead bromochloride**, $\text{NH}_4\text{Pb}_2\text{Br}_4\text{Cl}$ Decomp by H_2O (Fonzes-Diacon, Bull
Soc 1897, (3) 17 350) $\text{NH}_4\text{Pb}_2\text{Cl}_4\text{Br}$ Decomp by H_2O (Fonzes-
Diacon, Bull Soc 1897, (3) 17 349)**Ammonium bromochloroiodide**, NH_4ClBrI Very stable, sol in H_2O (Chattaway,
Chem Soc 1915, 107 108)**Ammonium lead bromiodide**, $\text{NH}_4\text{PbBrI}_2 + 2\text{H}_2\text{O}$ and $\text{NH}_4\text{Pb}_2\text{BrI}_4$ Decomp by H_2O Sol in conc $\text{KOH} + \text{Aq}$
and in strong acids (Fonzes-Diacon, Bull
Soc 1897, (3) 17 352)**Ammonium bromodobromide**,Decomp in the air Sol in
son, Am Ch J 1900, 24 28)**Ammonium chloride**, NH_4Cl (Sal-ammoniac) Not deliquescent Sol
in H_2O with reduction of tempSol in 2 24 pts H_2O (Wenzel) $\text{NH}_4\text{Cl} + \text{Aq}$ sat at 10° has sp gr = 1.072 (1)Sol in 2 72 pts cold and 1 pt boiling H_2O (M R
and P)Sol in 3 pts H_2O at 18.7° (Abl)Sol in 6 cc¹ 11 pt boiling H_2O (Lourcrov)100 pts dissolve 36.7 pts NH_4Cl $\text{NH}_4\text{Cl} + \text{Aq}$ sat at its b pt (114.2) contains 88.9pts NH_4Cl in 100 pts of the solution (Berzelius)100 pts H_2O at 15° dissolve 33.36 pts and at 100100 pts NH_4Cl (Ures Diet) $\text{NH}_4\text{Cl} + \text{Aq}$ sat at 15° has sp gr 1.07209 andcontains at least 31.83 pts NH_4Cl dissolved in every100 pts H_2O (Michel and Kraft, A ch (3) 41 178) $\text{NH}_4\text{Cl} + \text{Aq}$ sat at 10° contains 23.86 NH_4Cl

(Liller)

 $\text{NH}_4\text{Cl} + \text{Aq}$ sat in the cold contains 11.3 NH_4Cl

(Lourcrov)

Sol in 1 pt H_2O at 113 b pt of sat solution

(Cristoflus)

Sol in 2 7 pts H_2O at 18.7° forming a liquid of 108

sp gr (Karsten 1810)

Sol in 2 727 pts H_2O at 10° (Claus Hambruch)100 pts H_2O at 718 mm pressure melt dissolve pts NH_4Cl

t°	Pts NH_4Cl	t°	Pts NH_4Cl	t°	Pts NH_4Cl	t°	Pts NH_4Cl
0	28.40	30	41.72	60	55.04	90	68.36
10	32.84	40	46.16	70	59.48	100	72.80
20	37.28	50	50.60	80	63.92	110	77.24

(Allard C R 59 500)

Solubility in 100 pts H ₂ O at t°						Solubility of NH ₄ Cl in H ₂ O			t°
t°	Pts NH ₄ Cl	t°	Pts NH ₄ Cl	t°	Pts NH ₄ Cl	t°	g NH ₄ Cl in 100 g of the solution	Sc	l phase
0	29 7	30	41 4	60	55 2	90	71 3		
1	30 0	31	41 8	61	55 7	91	71 9		
2	30 3	32	42 2	62	56 2	92	72 5		
3	30 6	33	42 7	63	56 7	93	73 1		
4	31 0	34	43 1	64	57 2	94	73 7		
5	31 4	35	43 6	65	57 7	95	74 3		
6	31 8	36	44 0	66	58 2	96	74 9		
7	32 2	37	44 4	67	58 7	97	75 5		
8	32 6	38	44 9	68	59 2	98	76 1		
9	33 0	39	45 3	69	59 7	99	76 7		
10	33 3	40	45 8	70	60 2	100	77 3		
11	33 7	41	46 2	71	60 7	101	78 0		
12	34 1	42	46 7	72	61 2	102	78 6		
13	34 5	43	47 1	73	61 7	103	79 2		
14	34 8	44	47 6	74	62 3	104	79 9		
15	35 2	45	48 0	75	62 8	105	80 5		
16	35 6	46	48 5	76	63 4	106	81 2		
17	36 0	47	49 0	77	63 9	107	81 8		
18	36 4	48	49 5	78	64 5	108	82 5		
19	36 8	49	49 9	79	65 1	109	83 1		
20	37 2	50	50 4	80	65 6	110	83 8		
21	37 6	51	50 9	81	66 2	111	84 4		
22	38 0	52	51 3	82	66 7	112	85 1		
23	38 4	53	51 8	83	67 3	113	85 7		
24	38 8	54	52 3	84	67 8	114	86 4		
25	39 3	55	52 8	85	68 4	115	87 1		
			53 2	86	69 0	115 65	87 3		
			53 7	87	69 6				
			54 2	88	70 2				
			54 7	89	70 7				
40 9	59								

Mulder, calculated from his own and other observations Scheik Verhandel 1864 57)

Solubility in 100 pts H₂O at t°

t°	Pts NH ₄ Cl	t°	Pts NH ₄ Cl	t°	Pts NH ₄ Cl
0	29 7	10 8	33 9	64 9	57 9
6 2	32 2	31 6	42 2	90 6	67 2

(Lindstrom, Pogg 136 315)

NH₄Cl + Aq sat at 13–16° contains 26 16% NH₄Cl (v Hauer, J pr 103 114)

Sol in 272 pts H₂O at 19° (Schiff, A 109 326)

Sol in 2803 pts H₂O at 15° (Gerlach)

Sat NH₄Cl + Aq at 75° contains 38 23% NH₄Cl (Tschugaeff, Z anorg 1914, 86 161)

NH₄Cl + Aq sat at 30° contains 29 5% NH₄Cl (Meerburg, C C 1904 II, 1362)

Solubility in H₂O at t°

t°	1000 mols H ₂ O dissolve mols NH ₄ Cl	100 g H ₂ O dissolve g NH ₄ Cl
3 5	105 2	31 25
25 0	129 7	38 5
50 0	167 0	49 6

(Biltz and Marcus, Z anorg 1911, 71 169)

(Meerburg, Z anorg 1903, 37 103)

100 g H₂O dissolve 29 5 g NH₄Cl at 30° (Schreinmakers, Arch near Sc (2 15 17)

Spec gravity of NH₄Cl + Aq G = according to Gerlach at 15° (Z anal 8 31), S = according to Schiff at 19° (A 1 74)

% NH ₄ Cl	Sp gr		% NH ₄ Cl	Sp gr	
	G	S		G	S
1	1 00316	1 0029	17	1 050	1 0495
2	1 00632	1 0058	18	1 053	1 0523
3	1 00948	1 0087	19	1 056	1 0551
4	1 01264	1 0116	20	1 059	1 0579
5	1 01580	1 0145	21	1 062	1 0606
6	1 01880	1 0174	22	1 064	1 0633
7	1 02180	1 0203	23	1 067	1 0660
8	1 02481	1 0233	24	1 070	1 0687
9	1 02781	1 0263	25	1 073	1 0714
10	1 03081	1 0293	26	1 073	1 0741
11	1 03370	1 0322	26 297	1 076	
12	1 03658	1 0351	27		1 0768
13	1 03947	1 0380	28		1 0794
14	1 04325	1 0409	29		1 0802
15	1 04524	1 0438	30		1 0846
16	1 04805	1 0467			

For older determinations, see Storck's Dict

Sp gr of NH₄Cl + Aq at 18°

% NH ₄ Cl	Sp gr	% NH ₄ Cl	Sp gr
5	1 0142	20	0571
10	1 0289	25	0710
15	1 0430		

(Kohlrausch, W Ann 1879 1

Sp gr at 20°/4° of a normal solution of NH_4Cl = 1.01454 (Haigh, J Am Chem Soc 1912, **34** 1151)

NH_4Cl + Aq containing 6.52% NH_4Cl has sp gr 20°/20° = 1.0195 (Le Blanc & Rohland, Z phys Ch 1896, **19** 272)

Temp of maximum density of NH_4Cl + Aq	g mol NH_4Cl in 1000 g H_2O
2.640°	0.1899
0.055°	0.5407

(de Coppet, C R 1900, **131** 178)

Sp gr of dil NH_4Cl + Aq at 20.004° and 731 mm (corr)
Conc = g equiv NH_4Cl per l at 20.004°

Conc	Sp gr
0.0000	1.000,000,0
0.0001	1.000,001,8
0.0002	1.000,003,7
0.0005	1.000,009,3
0.0010	1.000,018,5
0.0020	1.000,036,9
0.0050	1.000,091,3
0.0100	1.000,180,3

(Lamb and Lee, J Am Chem Soc 1913, **35** 1688)

Sp gr of dil NH_4Cl + Aq

NH_4Cl g in 1000 g of solution	Sp gr 16°/16°
0	1.000000
0.4431	1.000150
0.9061	1.000304
1.5085	1.000606
3.5947	1.001196
7.7845	1.002562
13.3425	1.004994
31.2364	1.010018

(Dijkn, Z phys Ch 1897, **24** 107)

B-pt of NH_4Cl + Aq, containing pts NH_4Cl to 100 pts H_2O G = according to Gerlach (Z anal **26** 439), I = according to Isgard (A ch (2) **59** 436)

B pt	G	I	B pt	G	L
101°	6.5	7.8	109°	50.6	53.5
102	12.8	13.9	110	56.2	59.9
103	19.0	19.7	111	61.9	66.4
104	24.7	25.2	112	67.8	73.3
105	29.7	30.5	113	74.2	80.5
106	34.6	35.7	114	81.3	88.1
107	39.6	41.3	114.2		88.9
108	45.0	47.3	114.8	87.1	

Sat NH_4Cl + Aq boils at 115.8° at 718 mm pressure (Alluard, C R **59** 500)

NH_4Cl + Aq containing 74.2 pts NH_4Cl to 100 pts H_2O forms a crust at 113°, highest temperature observed, 114.8° (Gerlach, Z anal **26** 426)

NH_4Cl + Aq containing 10% NH_4Cl boils at 101.7°, 20% NH_4Cl at 104.4° (Gerlach)

NH_4Cl + Aq containing 10.6% NH_4Cl gives off NH_3 at 37° (Leeds, Am J Sci (3) **7** 197)

When NH_4Cl + Aq is boiled, or even evap on water bath, a little NH_3 is expelled (Fresenius)

30 pts NH_4Cl mixed with 100 pts H_2O lower the temp from 13.3° to -5.1°, that is 18.4° (Rudorff, B **2** 68)

Freezing-point of sat solution is -15.4°, the same temp which is caused by mixing 25 pts NH_4Cl with 100 pts snow (Rudorff, Pogg **122** 337)

Conc HCl + Aq precipitates part of NH_4Cl from sat NH_4Cl + Aq (Vogel, J pr **2** 199)

Solubility of NH_4Cl in HCl + Aq at 0° NH_4Cl = mols NH_4Cl (in milligrammes) dissolved in 10 cc of the liq, HCl = mols HCl (in milligrammes) dissolved in 10 cc of the liq

NH_4Cl	HCl	Sum of mols	Sp gr
46.125	0.0	46.125	1.076
43.6	2.9	46.5	1.0695
41.0	5.5	46.5	1.0705
39.15	7.85	47.0	1.0715
36.45	10.85	47.30	1.073
27.57	21.4	48.77	1.078
10.875	53.0	63.875	1.106
8.8	61.0	69.8	1.114

(Engcl, Bull Soc (2) **45** 655)

Solubility of NH_4Cl in HCl + Aq

t	HCl concentration g mol per 100 g H_2O	Weight NH_4Cl in 100 g	Molecular solubility
0°	0	298.40	5.59
"	1.1	286.45	5.56
"	1.2	271.23	5.08
"	1	245.35	4.60
25°	0	395.10	7.40
"	1.1	350.85	7.13
"	1	366.00	6.85
"	1	339.05	6.35

(Armstrong & Evre, Proc R Soc (A) **84** 127)

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ $\text{NH}_4\text{Cl} = \text{mols}$
 NH_4Cl (in mgs) in 10 cc solution,
 $\text{NH}_3 = \text{mols}$ NH_3 (in mgs) in 10 cc
 solution

NH_4Cl	NH_3	Sp gr
46 125	0	1 076
45 8	5 37	1 067
45 5	12 025	1 054
45 125	23 4	1 044
44 5	38 0	1 031
44 0	47	1 025
43 625	54 5	1 017
43 125	80 0	0 993
44 0	90 0	0 992
44 375	95 5	0 983
49 75	130	0 953
60 0	169 75	0 931

(Engel, Bull Soc (3) 6 17)

$\text{NH}_4\text{Cl} + \text{BaCl}_2$ 100 pts H_2O dissolve 33 8
 pts $\text{NH}_4\text{Cl} + 11$ 6 pts BaCl_2 at 20° (Rudorff,
 Pogg 148 467)

Solubility of NH_4Cl and BaCl_2 in H_2O

t°	Wt per 100		Solid phase
	NH_4Cl	BaCl_2	
-16 2°	16 10	8 07	$\text{NH}_4\text{Cl} +$ $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$
0	19 26	8 22	
30	24 89	8 19	
40	26 93	8 40	
	29 53	8 55	

Schreinemakers, Chem Weekbl 1910, 7 333)
 See also $\text{BaCl}_2 + \text{NH}_4\text{Cl}$ under BaCl_2

$\text{NH}_4\text{Cl} + \text{CdCl}_2$ Solubility of NH_4Cl and
 CdCl_2
 See Ammonium cadmium chloride

$\text{NH}_4\text{Cl} + \text{CuCl}_2$ Solubility of NH_4Cl in
 H_2O at 30° in presence of varying amounts of
 CuCl_2

% by wt CuCl_2	% by wt NH_4Cl	Solid phase
0	29 5	NH_4Cl $\text{NH}_4\text{Cl} + \text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$ $\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$
1 9	28 6	
3 6	25 9	
7 7	19 8	
10 5	16 5	
12 3	14 9	$\text{CuCl}_2 \cdot 2\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O} + \text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$
15 6	12 1	
19 9	9 4	
24 0	7 1	
29 4	4 9	
35 1	3 4	
41 4	2 1	
43 2	2 0	
43 9	0	

(Meerburg, Z anorg 1905, 45 3)

$\text{NH}_4\text{Cl} + \text{PbCl}_2$ Solubility of NH_4Cl and
 PbCl_2 in H_2O at 22°

g equivalent in 1000 g H_2O		Solid phase
NH_4Cl	PbCl_2	
0 0	0 0749	PbCl_2
0 1	0 0325	"
0 2	0 0194	"
0 3	0 0153	"
0 4	0 0138	"
0 5	0 0130	"
0 52	0 0127	$\text{PbCl}_2 + \text{NH}_4\text{Cl}$
0 55	0 0123	$\text{NH}_4\text{Cl} \cdot 2\text{H}_2\text{O}$
0 6	0 0113	"
0 65	0 0105	"
0 7	0 0099	"
0 8	0 0087	"
0 9	0 0083	"
1 0	0 0080	"
1 2	0 0075	"
1 5	0 0073	"
2 0	0 0077	"
2 5	0 0092	"
3 0	0 0112	"
4 0	0 0182	"
5 0	0 0296	"
6 0	0 0473	"
7 0	0 0774	"
7 29	0 0898	$\text{NH}_4\text{Cl} + \text{NH}_4\text{Cl}$
7 29	0 0000	NH_4Cl

(Bronstedt, Z phys Ch 1911, 77 132)

Solubility of NH_4Cl and 2PbCl_2 in
 H_2O at 100°

NH_4Cl g equivalent		PbCl_2 g equivalent		Solid phase
in 1000 g solution	in 1000 g H_2O	in 1000 g solution	in 1000 g H_2O	
1 277	1 404	0 160	0 176	NH_4Cl $+ 2\text{PbCl}_2$

(Bronstedt, l c)

$\text{NH}_4\text{Cl} + \text{MgCl}_2$ Solubility of NH_4Cl and
 $\text{NH}_4\text{MgCl}_3 \cdot 6\text{H}_2\text{O}$

t°	In 1000 g mols H_2O		Solid phase
	mols NH_4Cl	mols MgCl_2	
3 5°	27 5	55 7	$\text{NH}_4\text{Cl} + \text{NH}_4\text{MgCl}_3$ $\cdot 6\text{H}_2\text{O}$
25	42 1	56 4	
50	62 9	59 1	

(Biltz and Marcus, Z anorg 1911, 170)

Solubility of $\text{NH}_4\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ and $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$

t°	In 1000 g mol H_2O		Solid phase
	g mol NH_4Cl	g mol MgCl_2	
3 5°	0 5	99 5	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O} + \text{NH}_4\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
25°	0 5	103 8	
50°	0 8	111 2	

(Biltz and Marcus, Z anorg 1911, 71 170)

$\text{NH}_4\text{Cl} + \text{NH}_4\text{NO}_3$ 100 pts H_2O dissolve 29 1 pts $\text{NH}_4\text{Cl} + 173$ 8 pts NH_4NO_3 at 19 5° (Rudorff, B 6 482)

$\text{NH}_4\text{Cl} + \text{Ba}(\text{NO}_3)_2$ 100 pts H_2O dissolve at 18 5°—

	1	2	3	4	5
NH_4Cl	36 7	38 6	38 06	39 18	
$\text{Ba}(\text{NO}_3)_2$		8 6	16 73	17 02	8 9

2, sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ treated with NH_4Cl , 3, sat $\text{NH}_4\text{Cl} + \text{Aq}$ treated with $\text{Ba}(\text{NO}_3)_2$, 4, simultaneous treatment of both salts with H_2O (Karsten)

$\text{NH}_4\text{Cl} + \text{KNO}_3$ 100 pts H_2O dissolve at 18 5°—

	1	2	3	4	5	6
KNO_3	29 9	30 56	37 68	38 62		34 2
NH_4Cl		44 33	37 98	39 84	36 7	38 8
		74 89	75 66	78 46		73 0

1 and 5, according to Mulder, 2, sat $\text{KNO}_3 + \text{Aq}$ treated with NH_4Cl , 3, sat $\text{NH}_4\text{Cl} + \text{Aq}$ treated with KNO_3 , 4, simultaneous treatment of NH_4Cl and KNO_3 (Karsten), 6, by warming solution with excess of both salts, and cooling to 14 8° The amount of excess of one or the other salt has no influence (Rudorff)

$\text{NH}_4\text{Cl} + \text{NaN}_3$ Slowly sol in sat $\text{NaN}_3 + \text{Aq}$ at first to a clear solution, but afterwards NaN_3 separates out (Karsten)

$\text{NH}_4\text{Cl} + \text{KCl}$ 100 pts H_2O dissolve—

	(Rudorff) 15	(Karsten) 18 75
KCl	16 97	34 4
NH_4Cl	25 90	16 27 29 83
		37 02

	(Rudorff) 22	(Mulder) At b pt
KCl	19 1	58 5
NH_4Cl	30 4	21 9 67 7
		87 3

100 pts sat solution of $\text{NH}_4\text{Cl} + \text{KCl}$ contain 30 61 pts of the two salts at 13–16° (v Hauer, J pr 103 114)

$\text{NH}_4\text{Cl} + \text{NaCl}$ 100 pts H_2O dissolve—

	10–20°	(Mulder) 10°	10°	(v Hauer) 13–16°
NH_4Cl		19 50	33 3	18 8–20 3
NaCl	35 8	30 00		24 6–26 1
		49 50		43 4–46 4

	(Karsten) 18 75°	(Rudorff) 18 7°	(Mulder) At b pt
NH_4Cl	22 06	22 9	87 3
NaCl	37 02	23 9	78 5
	26 38		22 3
	48 44	46 8	100 8

Sp gr of sat solution of $\text{NH}_4\text{Cl} + \text{NaCl}$ is 1 179 (Karsten)

$\text{NH}_4\text{Cl} + (\text{NH}_4)_2\text{SO}_4$ 100 pts H_2O dissolve 26 8 pts $\text{NH}_4\text{Cl} + 46$ 5 pts $(\text{NH}_4)_2\text{SO}_4$ at 21 5° (Rudorff, B 6 484)

Solubility in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 30°

Composition of the solution		Solid phase
% by wt NH_4Cl	% by wt $(\text{NH}_4)_2\text{SO}_4$	
0	44	$(\text{NH}_4)_2\text{SO}_4$
6 86	36 15	
14 62	28 6	
17 60	25 69	$(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4\text{Cl}$
17 93	25 81	
19 07	23 22	NH_4Cl
19 97	21 3	
22 3	16 33	
24 06	12 72	
29 5	0	

(Schreinmakers, Z phys Ch 1909, 69 562)

$\text{NH}_4\text{Cl} + \text{CuSO}_4$ Sol in sat $\text{CuSO}_4 + \text{Aq}$, at first to a clear solution, but a double sulphate of NH_4 and Cu soon separates (Karsten)

$\text{NH}_4\text{Cl} + \text{MgSO}_4$ Slowly and difficultly sol in sat $\text{MgSO}_4 + \text{Aq}$ with subsequent separation of double sulphate (Karsten)

$\text{NH}_4\text{Cl} + \text{K}_2\text{SO}_4$ 100 pts H_2O dissolve, at 18 75°—

		a	b	c	
K_2SO_4	10 8	11 1	13 26	15 25	
NH_4Cl		38 2	37 94	37 92	36 7
		49 3	51 20	51 20	

In (a) NH_4Cl was added to sat $\text{K}_2\text{SO}_4 + \text{Aq}$
In (b) K_2SO_4 was added to sat $\text{NH}_4\text{Cl} + \text{Aq}$
In (c) NH_4Cl and K_2SO_4 were treated together with H_2O (Karsten)

100 pts H_2O at 14° dissolve 14.1 pts $K_2SO_4 + 36.8$ pts $NH_4Cl = 50.9$ pts $K_2SO_4 + NH_4Cl$ under all conditions (Rudorff, Pogg 148 565)

100 pts H_2O dissolve at b-pt —

K_2SO_4	26.75	33.3–33.9	87.3
NH_4Cl		90.4–111.8	
		123.7–145.7	

(Mulder)

$NH_4Cl + Na_2SO_4$ 100 pts H_2O dissolve 28.9 pts $NH_4Cl + 24.7$ pts Na_2SO_4 , if $NH_4Cl + Aq$ sat at 10° is sat with Na_2SO_4 at 11°

100 pts H_2O dissolve 31.8 pts $NH_4Cl + 90$ pts Na_2SO_4 , if $Na_2SO_4 + Aq$ sat at 10° is sat with NH_4Cl at 11° (Mulder, J B 1866 68)

Sol in sat $Na_2SO_4 + Aq$ (Karsten)

Sol in sat $ZnSO_4 + Aq$ (Karsten)

Sl sol in liquid NH_3 at -50° (Moissan, C R 1901, 133 713)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

Very sl sol in absolute alcohol

100 pts alcohol of 0.939 sp gr dissolve—
at 4° 8° 27° 38° 56°

11.2 12.6 19.4 23.6 30.1 pts NH_4Cl
(Gerardin, A ch (4) 5 129)

boiling highest rectified spirit dissolve 1 pt (Wenzel)

alcohol of—

900 sp gr dissolve 6.5 pts NH_4Cl

0.872 4.75

0.834 1.5

(Kirwan)

Though somewhat sol in pure absolute alcohol, NH_4Cl is absolutely insol in alcohol in presence of methyl amine chlorides (Winkles, A 93 324)

100 pts absolute methyl alcohol dissolve 3.35 pts at 19°

100 pts absolute ethyl alcohol dissolve 0.62 pt at 19° (de Bruyn, Z phys Ch 10 783)

Solubility of NH_4Cl in methyl alcohol

t°	Alcohol concentration mol g alcohol for 1000 g H_2O	Solubility in 1000 g H_2O	Molecular solubility
0°	0	298.40	5.59
"	$\frac{1}{4}$	297.35	5.57
"	$\frac{1}{2}$	296.55	5.55
"	1	292.60	5.47
"	3	283.15	5.30
25°	0	395.10	7.40
"	$\frac{1}{4}$	394.75	7.39
"	$\frac{1}{2}$	393.55	7.37
"	1	392.90	7.36
"	3	386.20	7.23

(Armstrong and Eyre, Proc R Soc Lond (A) 84 127)

Solubility of NH_4Cl in ethyl alcohol 0°

Alcohol concentration mol g alcohol for 1000 g H_2O	Solubility in 1000 g H_2O	Mol sol	ular dity
0	298.40	5.59	
$\frac{1}{4}$	295.50	5.53	
$\frac{1}{2}$	291.95	5.47	
1	286.40	5.37	
3	266.25	4.99	

(Armstrong and Eyre, l c)

See also ammonium cupric chloride

Solubility of NH_4Cl in propyl alcohol

t°	Alcohol concentration mol g alcohol for 1000 g H_2O	Solubility in 1000 g H_2O	Mol sol	ular dity
0°	0	298.46	5.59	
"	$\frac{1}{4}$	295.40	5.53	
"	$\frac{1}{2}$	291.30	5.45	
"	1	284.00	5.32	
25°	0	395.10	7.40	
"	$\frac{1}{4}$	393.50	7.37	
"	$\frac{1}{2}$	390.80	7.32	
"	1	384.80	7.21	

(Armstrong and Eyre, l c)

Solubility in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the solvent

G = g NH_4Cl in 10 cc of the solution

S = sp gr of the sat solution at 25°

P	G	S
0.00	0.0533	0.790
4.37	0.0583	0.790
10.40	0.0658	0.791
41.02	0.118	0.795
50.69	0.217	0.802
54.77	0.227	0.802
91.25	0.247	0.804
100.00	0.276	0.806

(Herz, Z anorg 1908, 60 155)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent

G = g NH_4Cl in 10 cc of the solution

S = sp gr of the sat solution at 25°

P	G	S
0	0.276	0.806
11.11	0.231	0.803
23.8	0.182	0.800
65.2	0.071	0.800
91.8	0.026	0.800
93.75	0.023	0.800
100.00	0.018	0.800

(Herz, Z anorg 1908, 60 157)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent

G = g NH_4Cl in 10 cc of the solution

S = Sp gr of the sat solution at 25°/4°

P	G	S
0	0 0533	0 7908
8 1	0 0505	0 7910
17 85	0 0455	0 7916
56 6	0 0312	0 7963
88 6	0 0210	0 7996
91 2	0 0203	0 8001
95 2	0 0190	0 8003
100	0 0177	0 8009

(Herz, Z anorg 1908, 60 160)

Insol in ether and CS_2 (Fordos and Gélis, A ch (3) 32 393)

Very sl sol in acetone (Krug and M'Elroy, J anal appl Ch 6 184)

Solubility of NH_4Cl in acetone + Aq at 25°

A = cc acetone in 100 cc acetone + Aq

NH_4Cl = millimols NH_4Cl in 100 cc of the solution

A	NH_4Cl	Sp gr
0	585 1	1 0793
10	534 1	1 0618
20	464 6	1 0451
30	396 7	1 0263
40	328 5	0 99984
46 5	283 7	0 97998
to		
85 7	18 9	0 8390
90	9 4	0 8274

(Herz, Z anorg 1905 45 263)

Solubility of NH_4Cl in glycerine + Aq at 25°

G = g glycerine in 100 g glycerine + Aq

NH_4Cl = millimols NH_4Cl in 100 cc of the solution

G	NH_4Cl	Sp gr
0	585 1	1 0793
15 28	544 6	1 0947
25 98	502 9	1 1127
45 36	434 4	1 1452
54 23	403 5	1 1606
83 84	291 4	1 2225
100	228 4	1 2617

(Herz, *loc*)

Insol in acetone (Naumann, B 1904, 37 4328), (Lindmann, C C 1899 II, 1014)

Insol in anhydrous pyridine Sol in 97% pyridine + Aq, 95% pyridine + Aq and in 93% pyridine + Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

Insol in CS_2 (Aitowski, Z anorg 1894, 6 267)

Very sol in ethyl amine (Shinn, J phys Chem 1907, 11 538)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Sol in formic acid (Zanninovich-Tessarini, Z phys Ch 1896, 19 251)

Ammonium antimony chloride, $\text{SbCl}_5(\text{NH}_4)_2$, $\text{SbCl}_5(\text{NH}_4)_3$

Ppt Decomp by H_2O (Weinland, B 1905, 38 1085)

$\text{SbCl}_5(\text{NH}_4)_2$, SbCl_5 , NH_4OH Very deliquescent, sl sol in H_2O with decomp (Weinland, B 1901, 34 2635)

Ammonium antimonous chloride, NH_4Cl , SbCl_3

Deliquescent (Dehéran, C R 52 734)

$2\text{NH}_4\text{Cl}$, $\text{SbCl}_3 + 2\text{H}_2\text{O}$ Permanent in dry air, decomp by much H_2O (Poggiale)

$3\text{NH}_4\text{Cl}$, $\text{SbCl}_3 + 3\text{H}_2\text{O}$ As above

Ammonium antimonic chloride, $3\text{NH}_4\text{Cl}$, SbCl_5

Decomp by H_2O (Dehéran, C R 52 734)

$4\text{NH}_4\text{Cl}$, SbCl_5 Decomp by H_2O (D)

See also Chlorantimonate, ammonium

Ammonium antimony platinum chloride, $(\text{Sb}, \text{Pt})\text{Cl}_6(\text{NH}_4)_2$

Ppt (Weinland, B 1905, 38 1084)

Ammonium antimony tin chloride, $(\text{Sb}, \text{Sn})\text{Cl}_6(\text{NH}_4)_2$

Ppt (Weinland, B 1905, 38 1085)

Ammonium arsenyl chloride, $2\text{NH}_4\text{Cl}$, $\text{AsOCl}_2 + \frac{1}{2}\text{H}_2\text{O}$

(Wallace, Phil Mag (4) 16 358)

Ammonium bismuth chloride, NH_4Cl , 2BiCl_3

Deliquescent (Dehéran, C R 54 724)

$2\text{NH}_4\text{Cl}$, BiCl_3 Decomp by H_2O (Arppe) Pogg 64 237)

$+ 2\frac{1}{2}\text{H}_2\text{O}$ (Rammelsberg)

$3\text{NH}_4\text{Cl}$, BiCl_3 Decomp by H_2O (Arppe)

$5\text{NH}_4\text{Cl}$, 2BiCl_3 (Rammelsberg)

Ammonium bismuth potassium chloride, $2\text{NH}_4\text{Cl}$, BiCl_3 , KCl

(Dehéran, C R 54 724)

Ammonium cadmium chloride, NH_4Cl , CdCl_2

Solubility of NH_4Cl (CdCl_2 in H_2O at t°

t	Pts by weight in 100 pts of solution			g in 100 g solution	Grams in 100 H ₂ O	Mol H ₂ O free salt dissolved by 100 mol H ₂ O
	Cl	Cd	NH_4			
2 4°	13 44	14 26	2 24	29 94	42 74	3 25
16 0	15 07	15 82	2 56	33 45	50 26	3 55
41 2	17 46	18 61	2 89	38 96	63 83	4 86
63 8	19 73	20 92	3 34	43 99	78 54	5 98
105 9	23 52	24 70	4 01	52 58	109 33	5 30

(Rimbach, B 1897, 30 3076)

+ $\frac{1}{2}$ H₂O Sl sol in H₂O, alcohol, and wood spirit (v Hauer, W A B 13 449)
 4NH₄Cl, CdCl₂ Sol in H₂O (v Hauer)
 Decomp by H₂O to NH₄Cl, CdCl₂ Decomp increases with decrease of temp. At 39° approximately wholly decomp to NH₄Cl, CdCl₂. At 113.9° very nearly all is 4NH₄Cl, CdCl₂ (Rimbach, B 1897, 30 3077)

Solubility of 4NH₄Cl, CdCl₂ in H₂O at t°

t°	Pts dissolved in 100 pts by weight of solution		
	Cd	Cl	NH ₄
3 9	5 75	18 17	7 37
16 1	6 93	20 26	7 97
40 2	9 91	23 84	8 92
58 5	12 50	26 53	9 35
112 9	16 66	31 79	10 78
113 9	16 51	32 71	11 30

(Rimbach, B 1897, 30 3071)

Sol without decomp in 37.3% HCl(d=1.19) and 24.8% HCl(d=1.125) (Rimbach, B 1905, 38 1569)

Solubility of 4NH₄Cl, CdCl₂+NH₄Cl in H₂O at t°

t°	In 100 pts by wt of the solution			Composition of the solid phase	
	Pts by wt Cd	Pts by wt Cl	Pts by wt NH ₄	Mol % NH ₄ Cl	Mol % salt
1 0	2 82	17 11	7 82	59 0	41 0
13 2	2 76	18 84	8 71	74 0	26 0
40 1	3 16	22 56	10 49	71 0	29 0
58 2	3 51	25 21	11 72	69 0	31 0

(Rimbach, B 1902, 35 1300)

Solubility of 4NH₄Cl, CdCl₂+NH₄Cl, CdCl₂ in H₂O at t°

t°	In 100 pts by wt of the solution			Composition of the solid phase	
	Pts by wt Cd	Pts by wt Cl	Pts by wt NH ₄	Mol % Mono salt	Mol % Tetra salt
1 1	5 34	17 62	7 27	49 6	50 4
14 0	7 12	19 86	7 84	47 0	53 0
40 7	10 24	23 82	8 85	77 0	23 0
58 5	12 50	26 53	9 35		

(Rimbach, B 1902, 35 1300)

Sol without decomp in 50% LiCl+Ag, 33.3% CaCl₂+Ag and 50% MgCl₂+Ag (Rimbach, B 1905, 38 1569)

Ammonium chloromolybdenum chloride, 2NH₄Cl, Cl₄Mo₃Cl₂+2H₂O

Decomp by pure H₂O, can be crystallized from HCl+Ag (Blomstrand)

Ammonium chromium chloride, 2NH₄Cl, CrCl₃+H₂O

Sol in H₂O with decomp (Neumann, A 244 229)

+6H₂O=2NH₄Cl, [CrCl₂ 4H₂O]Cl+2H₂O

Hygroscopic Decomp by H₂O and b alcohol (Weinland, B 1907, 40 770)

Ammonium cobaltous chloride, NH₄Cl, CoCl₂+6H₂O

Deliquescent in moist air Very easily so in H₂O (Hautz, A 66 284)

Ammonium cobaltous chloride, NH₄Cl, CoCl₂, NH₃ (F Roë)

Ammonium cuprous chloride, 4NH₄Cl, Cu₂Cl₂

Decomp in the air 4NH₄Cl, 3Cu₂Cl₂ Decomp by H₂O, not by alcohol (Ritthausen, J pr 56 369)

Fairly stable in air (Wells, Z a org 1891 10 158)

Ammonium cupric chloride, NH₄Cl, CuCl₂

Solubility of NH₄Cl, CuCl₂ in absolute alcohol at 25°

CuCl ₂ %	Solid phase	CuCl ₂ %	Solid phase
4 65	NH ₄ Cl+NH ₄ Cl, CuCl ₂	12 90	NH ₄ Cl, CuCl ₂
4 74	NH ₄ Cl+NH ₄ Cl, CuCl ₂	34 92	NH ₄ Cl, CuCl ₂ +C ₂ H ₅ OH
6 45	NH ₄ Cl, CuCl ₂	34 50	

(Foote and Walden, J Am Ch Soc 1911, 33 1032)

+2H₂O Sol in 2 pts H₂O (Hautz, A 66 280)

Does not exist, (Meerburg, C 1904 II 1362)

2NH₄Cl, CuCl +2H₂O Easily sol in H₂O also in alcohol, even when absolute (Carr and Henry, J pr 13 184)

Solubility of 2NH₄Cl, CuCl₂ in H₂O at t°

g 2NH ₄ Cl CuCl ₂ in 100 g of the solution	t°	Solid phase
3 87	-1 5°	
5 88	-2 48	
8 78	-3 95	
9 97	-4 60	
13 12	-6 40	
15 84	-5 04	
17 64	-7 24	
20 12	-10 80	
20 3	-11 0	rec+2NH ₄ Cl, CuCl 2H ₂ O
20 46	-10	2NH ₄ Cl, CuCl 1 2H ₂ O
21 16	-5	
22 02	0	
24 26	+12	
25 95	20	
27 70	30	
30 47	40	
33 24	50	
36 13	60	
39 25	70	
43 36	80	

(Meerburg, Z anorg 1905, 4 8)

Somewhat sol in liquid NH_3 (Franklin and Kraus, Am Ch J 1898, 20 827)

Is the only hydrate of $2\text{NH}_4\text{Cl}$, CuCl_2 existing between -11° and $+80^\circ$ (Meerburg, C C 1904 II, 1362)

$+3\text{H}_2\text{O}$ (Bourgeois, Bull Soc 1898, (3) 19 786)

Ammonium cupric chloride ammonia, $2\text{NH}_4\text{Cl}$, CuCl_2 , 2NH_3

Decomp by H_2O , less easily by alcohol
Decomp by acids (Rutthausen)

Ammonium indium chloride, $2\text{NH}_4\text{Cl}$, $\text{InCl}_3 + \text{H}_2\text{O}$

Easily sol in H_2O (Meyer)

Ammonium iodine chloride, NH_4Cl , ICl_3

More sol in H_2O than KCl , ICl_3 (Fihol, J Pharm 25 441, Berz J B 20 (2) 110)

Ammonium iridium trichloride

See Chloriridate, ammonium

Ammonium iridium tetrachloride

See Chloriridate, ammonium

Ammonium iron (ferrous) chloride, NH_4Cl , FeCl_2

Easily sol in H_2O , insol in alcohol (Winkler)

Ammonium iron (ferric) chloride, $2\text{NH}_4\text{Cl}$, $\text{FeCl}_3 + \text{H}_2\text{O}$

Deliquescent Sol in H_2O without decomp (Fritzche), sol in 3 pts H_2O at 18.75° (Abl)
Sol in H_2O (Walden, Z anorg 1894, 1 332)

Ammonium iron (ferric) potassium chloride, NH_4Cl , FeCl_3 , $\text{KCl} + 1\frac{1}{2}\text{H}_2\text{O}$

Min *Kremersite* Deliquescent

Ammonium lead chloride, NH_4Cl , $2\text{PbCl}_2 + 3\text{H}_2\text{O}$

Sol in H_2O without decomp (?) (André, C R 96 1502)

$6\text{NH}_4\text{Cl}$, $\text{PbCl}_2 + \text{H}_2\text{O}$

$9\text{NH}_4\text{Cl}$, $\text{PbCl}_2 + 1\frac{1}{2}\text{H}_2\text{O}$

$9\text{NH}_4\text{Cl}$, $2\text{PbCl}_2 + 2\frac{1}{2}\text{H}_2\text{O}$

$10\text{NH}_4\text{Cl}$, $\text{PbCl}_2 + \text{H}_2\text{O}$

$11\text{NH}_4\text{Cl}$, $2\text{PbCl}_2 + 3\frac{1}{2}\text{H}_2\text{O}$

$18\text{NH}_4\text{Cl}$, $\text{PbCl}_2 + 4\frac{1}{2}\text{H}_2\text{O}$

All these salts are decomp by H_2O (André, A ch (6) 3 104)

Of the salts prepared by André, only one NH_4Cl , 2PbCl_2 exists (Wells, Sil Am J 146 25)

Solubility determinations show that NH_4Cl , 2PbCl_2 is the only double salt formed at 25° (Foote, Am Ch J 1907, 37 121)

NH_4Cl , $\text{PbCl}_2 + \frac{1}{3}\text{H}_2\text{O}$ (Wells, l c)

Ammonium lead tetrachloride

See Chloroplumbate, ammonium

Ammonium magnesium chloride, $\text{NH}_4\text{MgCl}_2 + 6\text{H}_2\text{O} = \text{NH}_4\text{Cl}$, $\text{MgCl}_2 + 6\text{H}_2\text{O}$

Deliquescent Very sol in H_2O

Sol in 6 pts cold H_2O (Fourcroy)

Solubility in $\text{NH}_4\text{Cl} + \text{Aq}$ at t°

t°	Per 1000 Mol H_2O	
	Mol NH_4Cl	Mol MgCl_2
3 5°	27 5	55 7
25 0	42 1	56 4
50 0	62 9	59 1

(Biltz, Z anorg 1911, 71 170)

$4\text{NH}_4\text{Cl}$, $5\text{MgCl}_2 + 33\text{H}_2\text{O}$ Sol in H_2O (Berthelot and André, A ch (6) 11 294)

Ammonium manganous chloride, NH_4Cl , $\text{MnCl}_2 + \frac{1}{2}\text{H}_2\text{O}$

Sol in $1\frac{1}{2}$ pts H_2O at ordinary temp (Hautz, A 66 280), does not exist (Saunders, Am Ch J 14 134)

$2\text{NH}_4\text{Cl}$, $\text{MnCl}_2 + \text{H}_2\text{O}$ Sol in H_2O (Rammeisberg), does not exist (Saunders)

$+2\text{H}_2\text{O}$ Easily sol in H_2O , but with decomp into NH_4Cl and MnCl_2 (Saunders)

Ammonium manganic chloride, $2\text{NH}_4\text{Cl}$, MnCl_3

Sol in H_2O , less sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Unstable (Neuman, M 1894, 15 490)

$+ \text{H}_2\text{O}$ Decomp by H_2O Sol in HCl apparently without decomp (Rice, Chem Soc 1898, 73 260)

Ammonium mercuric chloride, $2\text{NH}_4\text{Cl}$, $\text{HgCl}_2 + \text{H}_2\text{O}$ (sal alembroth)

Sol in 0.66 pt H_2O at 10° , and in nearly every proportion of hot H_2O

NH_4Cl , HgCl_2 Easily sol in H_2O

$+ \frac{1}{2}\text{H}_2\text{O}$ Easily sol in H_2O (Kane)

$2\text{NH}_4\text{Cl}$, $3\text{HgCl}_2 + 4\text{H}_2\text{O}$ Easily sol in H_2O (Holmes, C N 5 351)

NH_4Cl , 2HgCl_2 Very sol in H_2O (Rây, Chem Soc 1902, 81 648)

NH_4Cl , 5HgCl_2 (Stromholm, J pr 1902, (2) 66 441)

Ammonium mercuric sodium chloride, NH_4Cl , HgCl_2 , 4NaCl (?)

Sol in H_2O (Kossmann, A ch (3) 27 243)

Ammonium molybdenum chloride, $2\text{NH}_4\text{Cl}$, $\text{MoCl}_5 + \text{H}_2\text{O}$

Very sol in H_2O Nearly insol in alcohol and ether (Chilesotti, C C 1903 II, 652)

See also Ammonium chloromolybdenum chloride

Ammonium molybdenum chloride iodide

See Ammonium chloromolybdenum iodide

Ammonium molybdenyl chloride, $2\text{NH}_4\text{Cl}$, $\text{MoO}_2\text{Cl}_2 + 2\text{H}_2\text{O}$

(Weinland, Z anorg 1905, 44 98)

$2\text{NH}_4\text{Cl}$, MoOCl_3 Sol in H_2O , insol in H_2O sat with HCl (Klason, B 1901, 34 149)

Ammonium nickel chloride, NH_4Cl , $\text{NiCl}_2 + 6\text{H}_2\text{O}$

Deliquescent in moist air Easily sol in H_2O (Hautz)

$4\text{NH}_4\text{Cl}$, $\text{NiCl}_2 + 7\text{H}_2\text{O}$ (?)

Ammonium osmium tetrachloride

See Chlorosmate, ammonium

Ammonium osmium sesquichloride

See Chlorosmte, ammonium

Ammonium osmyl chloride, $(\text{NH}_4)_2\text{OsO}_2\text{Cl}_4$

Sol in H_2O Decomp by HCl (Wintrebert, A ch 1903, (7) 28 92)

Ammonium osmyl oxychloride,

$(\text{NH}_4)_2\text{OsO}_3\text{Cl}_2$

Very sl sol in H_2O Sol in $\text{KOH} + \text{Ag}$ with decomp (Wintrebert, A ch 1903, (7) 28 116)

Ammonium palladium chlorides

See Chloropalladate, ammonium and chloroammonium

Ammonium rhodium dichloride, $4\text{NH}_4\text{Cl}$, $\text{RhCl}_3 + 3\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O , but decomp slowly (Willm B 16 3033)

Does not exist (Leidé, A ch (6) 17 277)

Ammonium rhodium trichloride

See Chlororhodite, ammonium

Ammonium rhodium chloride ammonium nitrate, Rh_2Cl_6 , $6\text{NH}_4\text{Cl}$, $2\text{NH}_4\text{NO}_3$

See Chlororhodite nitrate, ammonium

Ammonium ruthenium trichloride

See Chlororuthenite, ammonium

Ammonium ruthenium tetrachloride

See Chlororuthenate, ammonium

Ammonium tellurium chloride

See Chlorotellurate, ammonium

Ammonium thallic chloride, $3\text{NH}_4\text{Cl}$, HCl_3

Easily sol in H_2O (Willm)

$+2\text{H}_2\text{O}$ Easily sol in H_2O and alcohol (Nickles, J Pharm (4) 1 28)

Ammonium thorium chloride, $8\text{NH}_4\text{Cl}$, $\text{ThCl}_4 + 8\text{H}_2\text{O}$

Sol in H_2O (Chydenius)

Ammonium tin (stannous) chloride (ammonium chlorostannite), NH_4Cl , $\text{SnCl}_2 + \text{H}_2\text{O}$

Decomp by H_2O Resembles K salt (Richardson, Am Ch J 14 93)

$2\text{NH}_4\text{Cl}$, $\text{SnCl}_2 + \text{H}_2\text{O}$ Sol in H_2O , it decomp by boiling (Rammelsberg)

Contains $2\text{H}_2\text{O}$ (Richardson)

$4\text{NH}_4\text{Cl}$, $\text{SnCl}_2 + 3\text{H}_2\text{O}$ Decomp by H_2O (Poggiale, C R 20 1182)

Does not exist (Richardson)

Ammonium tin (stannic) chloride

See Chlorostannate, ammonium

Ammonium titanium chloride, $2\text{NH}_4\text{Cl}$, $\text{TiCl}_4 + 2\text{H}_2\text{O}$

Ppt, decomp in moist air, sol in fuming HCl , insol in ether (Rosenheim, Z anorg 1901, 26 242)

Ammonium titanium chloride, $3\text{NH}_4\text{Cl}$, TiCl_4

Sol in H_2O

$6\text{NH}_4\text{Cl}$, TiCl_4 Sol in H_2O (Rose)

Ammonium tungsten chloride, $(\text{NH}_4)_3\text{W}_2\text{Cl}_7 = 3\text{NH}_4\text{Cl}$, 2WCl_6

Easily sol in H_2O Nearly insol in most organic solvents (Olsson, B 1913, 46 5 7)

Ammonium uranyl chloride

Very deliquescent, and sol in H_2O (Lilgott)

$2\text{NH}_4\text{Cl}$, $(\text{UO}_2)_2\text{Cl}_2 + 2\text{H}_2\text{O}$ Solution at 5° contains in 100 g 3.51 g, NH_4 , 40.67 g O_2 and 19.15 g Cl , hence there is considerable decomp (Rumbach, B 1904, 37 466)

Ammonium vanadium chloride, $2\text{NH}_4\text{Cl}$, $\text{VCl}_3 + \text{H}_2\text{O}$

Difficulty sol in H_2O and alcohol (Staer, B 1904, 37 4412)

Ammonium zinc chloride, NH_4Cl , $\text{ZnCl}_2 + 2\text{H}_2\text{O}$

Deliquescent Very sol in H_2O (Hautz, A 66 287)

$2\text{NH}_4\text{Cl}$, ZnCl_2 Sol in H_2O (Rammelsberg, Pogg 94 507)

$+ \text{H}_2\text{O}$ Deliquescent in moist air Sol in $\frac{1}{3}$ pt cold H_2O with absorption of heat Sol in 0.28 pt hot H_2O (Goltz-Bass, Z anorg 1901, 70 344), sol in $\frac{1}{2}$ pt cold H_2O (Hautz, A 66 287)

$3\text{NH}_4\text{Cl}$, ZnCl_2 Sol in H_2O (Mangin, C)

$+ \text{H}_2\text{O}$ (Berthelot, A ch (6) 11 294)

$4\text{NH}_4\text{Cl}$, ZnCl_2 (Deherun)

$6\text{NH}_4\text{Cl}$, $\text{ZnCl}_2 + \frac{2}{3}\text{H}_2\text{O}$ (Berthelot,)

Ammonium chloride zinc oxychloride, 2ZnCl_2 , $8\text{NH}_4\text{Cl}$, ZnO

Sol in a little H_2O , but decomp by excess (Andric)

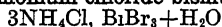
3ZnCl_2 , $10\text{NH}_4\text{Cl}$, ZnO As above (Andric, A ch (6) 3 88)

Ammonium chloride antimony fluoc de, NH_4Cl , SbF_3

Easily sol in H_2O (de Haen, B 21 90 R)

Ammonium chloride arsenic trioxide

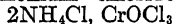
See Arsenite chloride, ammonium

Ammonium chloride bismuth bromide,

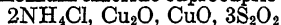
Deliquescent, decomp by H_2O (Murr, Chem Soc **31** 148)

$2\text{NH}_4\text{Cl}, \text{BiBr}_3 + 3\text{H}_2\text{O}$ Decomp by H_2O (Murr)

$5\text{NH}_4\text{Cl}, 2\text{BiBr}_3 + \text{H}_2\text{O}$ Decomp by H_2O (Murr)

Ammonium chloride chromic oxychloride,

Decomp in the air Sol in conc HCl without decomp (Weinland, B 1906, **39** 4045)

Ammonium chloride cuprocupric thiosulphate,

See Thiosulphate ammonium chloride, cuprocupric

Ammonium chloride lead iodide, $3\text{NH}_4\text{Cl}, \text{PbI}_2$

Decomp with H_2O (Behrens, Pogg **62** 252)

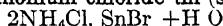
$4\text{NH}_4\text{Cl}, \text{PbI}_2 + 2\text{H}_2\text{O}$ Decomp with H_2O (Poggiale, C R **20** 1180)

Ammonium chloride mercuric bromide,

(Edhem-Bey, Dissert **1885**)

Ammonium chloride platinum sulphite

See Chloroplatosulphite, ammonium

Ammonium chloride tin (stannous) bromide,

Sol in H_2O (Rymann and Preis, A **223** 323)

Ammonium dichloroiodide, $\text{NH}_4\text{Cl I}$

Slowly decomp when exposed to dry air at ord temp. Vgry sol in H_2O (Chattaway, Chem Soc 1915 **107** 107)

Ammonium tetrachloroiodide, $\text{NH}_4\text{Cl}_4\text{I}$

Decomp in the air (Chattaway, Chem Soc 1915, **107** 107)

Ammonium lead chloroiodide, $\text{NH}_4\text{PbClI} + 2\text{H}_2\text{O}$ and $(\text{NH}_4)_2\text{PbCl}_2 + 2\text{H}_2\text{O}$

Sol in $\text{KOH} + \text{Aq}$ and in strong acids, decomp by H_2O (Ionizes Drwon, Bull Soc 1897, (5) **17** 318)

Ammonium fluoride, NH_4F

Abundantly sol in H_2O , sl sol in alcohol (Marignac, Ann Min (5) **15** 221)

Insol in liquid NH_3 (Ruff und Giesel, B 1903, **36** 820)

Almost insol in liquid NH_3 at 50° (Moissan, C R 1901, **133** 713)

Sol in methyl alcohol (Curara, Gazz ch 1896, **26** 119)

Ammonium hydrogen fluoride, $\text{NH}_4\text{F}, \text{HF}$

Deliquescent in moist air Sol in H_2O

Ammonium antimony fluoride, $2\text{NH}_4\text{F}, \text{SbF}_3$

Deliquescent, sol in 0.9 pt cold H_2O Insol in alcohol or ether (Flückinger, A **84** 248)

$\text{NH}_4\text{F}, 4\text{SbF}_3$ 3 pts sol in 2 pts H_2O (Raad and Hauser, B 1890, **23** R 125)

$\text{NH}_4\text{F}, \text{SbF}_3$ Easily sol in H_2O (Marignac, A **145** 239)

Ammonium bismuth fluoride, $2\text{NH}_4\text{F}, \text{BiF}_3$

Insol in H_2O Rather difficultly sol in acids (Helmholtz, Z anorg **3** 115)

Ammonium cadmium fluoride, $\text{NH}_4\text{F}, \text{CdF}_2$

Insol in H_2O Sol in acids on boiling (Helmholtz, Z anorg **3** 115)

Ammonium chromium fluoride, $3\text{NH}_4\text{F}, \text{CrF}_3$

Easily sol in H_2O Sl sol in $\text{NH}_4\text{F} + \text{Aq}$ (Petersen, J pr (2) **40** 52)

$2\text{NH}_4\text{F}, \text{CrF}_3 + \text{H}_2\text{O}$ (Wagner, B **19** 896)

Ammonium cobaltous fluoride, $2\text{NH}_4\text{F}, \text{CoF}_2 + 2\text{H}_2\text{O}$

Sl sol in H_2O (Wagner, B **19** 896)

Easily sol in H_2O (Helmholtz, Z anorg **3** 132)

Ammonium columbyl fluoride

See Fluoxycolumbate, ammonium

Ammonium columbium fluoride oxyfluoride, $3\text{NH}_4\text{F}, \text{CbF}_5, \text{CbOF}_3$

See Fluoxycolumbate columbium fluoride, ammonium

Ammonium copper fluoride, $2\text{NH}_4\text{F}, \text{CuF} + 2\text{H}_2\text{O}$

Insol in H_2O (Helmholtz, Z anorg **3** 115)

Nearly insol in H_2O but decomp thereby (Haas, Ch Z 1908, **32** 8)

Ammonium glucinum fluoride, $2\text{NH}_4\text{F}, \text{GlF}$

Sol in H_2O (Marignac, A ch (4) **30** 51)

Vgry sol in H_2O (Helmholtz, Z anorg **3** 130)

Ammonium iron (ferrous) fluoride, $2\text{NH}_4\text{F}, \text{FeF}$

(Wagner, B **19** 896)

$\text{NH}_4\text{F}, \text{FeF} + 2\text{H}_2\text{O}$ (W)

Ammonium iron (ferric) fluoride, $2\text{NH}_4\text{F}, \text{FeF}_3$

More sol in H_2O than the corresponding K compound Decomp by boiling (Nickles, J Pharm (4) **7** 15)

$3\text{NH}_4\text{F}, \text{FeF}_3$ Sl sol in H_2O (Marignac, A ch (3) **60** 306)

Easily sol in acids (Helmholtz, Z anorg **3** 124)

Ammonium manganic fluoride, $2\text{NH}_4\text{F}, \text{MnF}_4$

More sol than the K salt (Nickles, C R **65** 107)

True composition is $4\text{NH}_4\text{F}$, Mn_2F_6 (Christensen, J pr (2) 34 41)

See also Fluomanganate, ammonium

Ammonium manganyl fluoride

See Fluoxymanganate, ammonium

Ammonium molybdenum fluoride

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ (Berzelius)

See also Fluomolybdate, ammonium

Ammonium molybdenyl fluoride

See Fluoxymolybdate, ammonium

Ammonium nickel fluoride, $2\text{NH}_4\text{F}$, $\text{NiF}_2 + 2\text{H}_2\text{O}$

Sol in H_2O (Wagner, B 19 896)

Easily sol in H_2O (Helmholtz, Z anorg 3 143)

Ammonium scandium fluoride, $(\text{NH}_4)_3\text{ScF}_6$

Easily sol in H_2O Aqueous solution is not decomp by boiling Decomp by acids (R I Meyer, Z anorg 1914, 86 275)

Ammonium silicon fluoride

See Fluosilicate, ammonium

Ammonium silver fluoride, $2\text{NH}_4\text{F}$, $\text{AgF} +$

scopie Sol in H_2O , sol in conc

Sol in alcohol (Grützner, in 1900, 238 3)

F , $\text{AgF} + 4\text{H}_2\text{O}$ More deliquescent H_4F (Bohm, Dissert 1906)

Ammonium tantalum fluoride

See Fluotantalate, ammonium

Ammonium tantaly fluoride

See Fluoxytantalate, ammonium

Ammonium tellurium fluoride, NH_4F , TeF_4

Decomp by H_2O (Hogbom, Bull Soc (2) 35 60)

Ammonium tin (stannous) fluoride, $2\text{NH}_4\text{F}$, $\text{SnF}_2 + 2\text{H}_2\text{O}$

Sol in H_2O (Wagner, B 19 896)

Ammonium tin (stannic) fluoride, $2\text{NH}_4\text{F}$, SnF_4

See Fluostannate, ammonium

Ammonium titanium sesquifluoride

See Fluotitanate, ammonium

Ammonium titanyl fluoride

See Fluoxypertitanate, ammonium

Ammonium tungstyl fluoride

See Fluoxytungstate, ammonium

Ammonium uranyl fluoride

See Fluoxyuranate, ammonium

Ammonium vanadium sesquifluoride

See Fluovanadate, ammonium

Ammonium vanadyl fluoride

See Fluoxovanadate, ammonium

Ammonium zinc fluoride, $2\text{NH}_4\text{F}$, ZnF_2

Sol in H_2O (R Wagner)

+ $2\text{H}_2\text{O}$ Very sl sol in H_2O Easily s in dil acids (Helmholtz)

Ammonium zirconium fluoride

See Fluozirconate, ammonium

Ammonium fluoride manganic oxyfluorid
 $2\text{NH}_4\text{F}$, MnOF_2

Precipitate (Nicklès)

See also Fluoxymanganate, ammonium

Ammonium fluoride molybdenum trioxid
 $2\text{NH}_4\text{F}$, MoO_3

Decomp by H_2O (Mauro, Gazz ch 18 120)

Ammonium fluoride tungsten oxyfluoride

See Fluoxytungstate, ammonium

Ammonium fluoride tungsten oxyfluorid
ammonium tungstate, $4\text{NH}_4\text{F}$, WO_3
 $(\text{NH}_4)_2\text{WO}_4$

See Fluoxytungstate tungstate, ammonium

Ammonium fluoride vanadium oxyfluoride

See Fluoxovanadate, and fluoxyhypovanadate, ammonium

Ammonium hydroselenide, NH_4HSe

Sol in H_2O with decomp (Bineau, A c (2) 67 229)

Ammonium hydrosulphide, NH_4SH

Sol in H_2O and alcohol Solutions decomp on air

Ammonium hydroxide, NH_4OH

See Ammonia,

Ammonium imidosulphamide,

$(\text{S O}_4\text{N}_3\text{H}_4)\text{NH}_4$

(Hantzsch, B 1905, 38 1033)

Ammonium iodide, NH_4I

Very deliquescent Sol in 0.60 pt H_2O (Eder, Dingl 221 89)

Sp gr of aqueous solution of NH_4I at 1 containing—

10	20	30	40	50% NH_4I
1.0652	1.1397	1.2260	1.3260	1.4415

(Kohlrausch, W Ann 1879 1)

$\text{NH}_4\text{I} + \text{Aq}$ containing 12.51% NH_4I h sp gr $20^\circ/20^\circ = 1.0846$

$\text{NH}_4\text{I} + \text{Aq}$ containing 19.19% NH_4I h sp gr $20^\circ/20^\circ = 1.1359$

(Le Blanc and Rohland, Z phys Ch 189 19 279)

Very easily sol in liq NH_3 (Frankl Am Ch J 1898, 20 826)

Very sol in liq NH_3 at -50° (Moissan C R 1901, 133 713)

Sol in SOCl_2 (Walden, Z anorg 1900, 25 216)

Sol in liquid SO_2 (Walden, Z anorg 1902, 30 160)

Sol in 4 0 pts abs alcohol (Eder, lc)

" 210 " ether (Eder, lc)

" 20 " alcohol-ether (1 1) (Eder, lc)

Sol in acetone (Eidmann, C C 1899, II 1014), (Naumann, B 1904, 37 4328)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Ammonium diiodide, NH_4I_2

Sol in alcohol, ether, CS_2 , and $\text{KI} + \text{Aq}$, less sol in chloroform (Guthrie, Chem Soc (2) 1 239)

Ammonium triiodide, NH_4I_3

Sl deliquescent Sol in little H_2O , but decomp by much H_2O (Johnson, Chem Soc 33 397)

Ammonium antimony iodide, NH_4I , $\text{SbI}_3 + 2\text{H}_2\text{O}$

Decomp by H_2O (Nickles, C R 51 1097)

$3\text{NH}_4\text{I}$, $4\text{SbI}_3 + 9\text{H}_2\text{O}$ Decomp by H_2O , with separation of SbOI Sol in $\text{HC}_2\text{H}_3\text{O}_2$, HCl , and $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$ Decomp by CS_2 (Schaffer, Pogg 109 611)

$3\text{NH}_4\text{I}$, $\text{SbI}_3 + 3\text{H}_2\text{O}$ As above

$4\text{NH}_4\text{I}$, $\text{SbI}_3 + 3\text{H}_2\text{O}$ As above

Ammonium bismuth iodide, NH_4I , $\text{BiI}_3 + \text{H}_2\text{O}$

Deliquescent, decomp by H_2O (Nicklès, C R 51 1097)

$4\text{NH}_4\text{I}$, $\text{BiI}_3 + 3\text{H}_2\text{O}$ As above (Linau, Pogg 111 240)

$2\text{NH}_4\text{I}$, $\text{BiI}_3 + 2\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O , or MCl , MBr , or $\text{MI} + \text{Aq}$ (Nicklès, J pr (2) 39 116)

Ammonium cadmium iodide, $2\text{NH}_4\text{I}$, $\text{CdI}_2 + 2\text{H}_2\text{O}$

Deliquescent (Croft)

Sol at 15° in 55 pt H_2O , 0 70 pt abs alcohol, 8 9 pts ether (sp gr 0 729), and 18 pts alcohol-ether (1 1) (Eder, Dingt 221 89)

100 pts of the solution in H_2O contain 85 97 pts of the salt at $14 5^\circ$ (Rimbach, B 1905, 38 1563)

NH_4I , $\text{CdI}_2 + \frac{1}{2}\text{H}_2\text{O}$ Sol at 15° in 0 90 pt H_2O , 0 88 pt abs alcohol, and 2 4 pts ether (sp gr 0 729) (Eder, lc)

$+ \text{H}_2\text{O}$ (Grossmann, Z anorg 1902, 33 154)

Ammonium chloromolybdenum iodide, $2\text{NH}_4\text{I}$, $\text{Cl}_4\text{Mo}_3\text{I} + 2\text{H}_2\text{O}$

Decomp by H_2O Cryst from $\text{HI} + \text{Aq}$ (Blomstrand)

Ammonium cuprous iodide, $2\text{NH}_4\text{I}$, $\text{Cu}_2\text{I}_2 + \text{H}_2\text{O}$

Decomp on the air, or by H_2O , or alcohol (Saglier, C R 104 1440)

$+ \frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O with separation of Cu_2I_2 (Gossner, Zeit Kryst 1903, 38 501)

Ammonium cupric iodide ammonia, $2\text{NH}_4\text{I}$, CuI_2 , $2\text{NH}_3 + 2\text{H}_2\text{O}$

Insol in H_2O or alcohol, sl sol in $\text{NH}_4\text{OH} + \text{Aq}$

$+ 6\text{H}_2\text{O}$ Unstable (Saglier, C R 104 1440)

NH_4I , 2CuI , 3NH_3 (Fleurent, C R 1891, 113 1047)

Ammonium iridium diiodide, $2\text{NH}_4\text{I}$, IrI_2

Insol in cold or hot H_2O , and in alcohol Sol in warm dil acids (Oppler)

Ammonium iridium sesquiodide

See Iodiridite, ammonium

Ammonium iridium tetriiodide

See Iodiridate, ammonium

Ammonium lead iodide, NH_4I , $\text{PbI}_2 + 2\text{H}_2\text{O}$

Decomp by much H_2O (Wells, Sil Am J 146 25)

$4\text{NH}_4\text{I}$, $3\text{PbI}_2 + 6\text{H}_2\text{O}$ Sl sol in H_2O (Mosnier, C R 1895, 120 444)

Sol in H_2O with decomp Sol in strong $\text{KOH} + \text{Aq}$ and in strong acids (Fonze-Diacon, Bull Soc 1897, (3) 17 347)

Ammonium magnesium iodide, NH_4I , $\text{MgI}_2 + 6\text{H}_2\text{O}$

Very deliquescent (Ierch, J pr (2) 28 338)

Ammonium mercuric iodide, NH_4I , $\text{HgI}_2 + \text{H}_2\text{O}$

Decomp into its constituents by H_2O (Boullay, A ch (2) 34 345)

Sol without decomp in alcohol and ether NH_4I , 2HgI_2 Decomp by H_2O Sol in $\text{KI} + \text{Aq}$ Very sol in alcohol, ether and nitrobenzol (Low, Zeit Kryst, 51 138)

Ammonium silver iodide, $2\text{NH}_4\text{I}$, AgI

Deliquescent Decomp by H_2O (Poggialk)

Ammonium thallic iodide, NH_4I , ThI_3

Sol in H_2O (Nickles, J Pharm (4) 1 32)

Ammonium tin (stannous) iodide, NH_4I , SnI_2

Decomp by small amt H_2O but completely sol in a large amt (Boullay, A ch (2) 34 376)

$+ 1\frac{1}{2}\text{H}_2\text{O}$ (Personne)

Ammonium zinc iodide, $2\text{NH}_4\text{I}$, ZnI_2

Extremely deliquescent, and sol in H_2O (Rammelsberg, Pogg 43 665)

NH_4I , $\text{ZnI}_2 + 4\frac{1}{2}\text{H}_2\text{O}$ Hydroscoptic
(Ephraim, Z anorg 1910, 67 384)

Ammonium iodide arsenic trioxide

See Arsenite iodide, ammonium

Ammonium cobalt nitride

See Ammonium cobalt azoimide

Ammonium ruthenium dihydronitrosobromide, $\text{NO Ru}_3\text{H}_2(\text{NH}_3)_3\text{Br}_3 \cdot 2\text{HBr}$

Ppt (Brizard, A ch 1900, (7) 21 363)

Ammonium ruthenium nitroschloride,
 $3\text{NH}_4\text{Cl} \cdot 2\text{HCl} \cdot \text{NO Ru}_2\text{H}_2\text{Cl}_3$

Ppt (Brizard, A ch 1900, (7) 21 354)

Ammonium ruthenium dihydronitroschloride, $\text{NO Ru}_2\text{H}_2(\text{NH}_3)_3\text{Cl}_3 \cdot 2\text{HCl}$

Ppt (Brizard, A ch 1900, (7) 21 358)

Ammonium peroxide, $(\text{NH}_4)_2\text{O}_2$

M-pt -2° Sl sol in ether without
decomp (D'Ans, B 1913, 46 3076)

Sol in alcohol, insol in ether, decomp
slowly in aq solution (Melikoff, B 1897, 30
3145)

Ammonium hydrogen peroxide, $(\text{NH}_4)_2\text{O}_2$,
H O

ordinary temp (Melikoff, B

table, deliquesces at ordinary
cohol, insol in light petroleum
898, 31 152)

Ammonium selenide, $(\text{NH}_4)_2\text{Se}$

Sol in H_2O with decomp (Bineau, A ch
(2) 67 229)

Stable in the air Sol in H_2O , aq solution
decomp slowly (Lenher and Smith, J Am
Chem Soc 1898, 20 277)

Ammonium hydrogen selenide, NH_4HSe

Sol in H O (Fabre, C R 103 269)

Ammonium monosulphide, $(\text{NH}_4)_2\text{S}$

Decomp on air Sol in H_2O , but solution
decomposes rapidly

Very sol in liquid NH_3 (Franklin, Am Ch
J 1898, 20 826)

Ammonium disulphide, $(\text{NH}_4)_2\text{S}_2$

Sol in H_2O with decomp
Does not exist (Bloxam, Chem Soc
1895, 67 293)

Ammonium tetrasulphide, $(\text{NH}_4)_2\text{S}_4$

Easily sol in H_2O Conc solution is stable,
dil solution decomp on air Easily sol in
alcohol without decomp, but solution decomp
on the air more rapidly than the
aqueous solution (Fritzsch, J pr 32 313)

$+ \frac{1}{2}\text{H}_2\text{O}$ When dissolved in H_2O , it is at
once dissociated with deposition of S (Blox-
am, Chem Soc 1895, 67 303)

Ammonium pentasulphide, $(\text{NH}_4)_2\text{S}_5$

Decomp on air Sol in H_2O with separa-
tion of S Sol in alcohol without decomp,
but solution decomposes quickly on standing
(Fritzsch, J pr 32 313)

Rapidly decomp by H_2O with separation
of S (Bloxam, Chem Soc 1895, 67 298)

$+ \text{H}_2\text{O}$ Decomp by H_2O with separation
of S (Bloxam, Chem Soc 1895, 67 298)

Ammonium heptasulphide, $(\text{NH}_4)_2\text{S}_7$

More stable on air, and less easily decomp-
posed by H_2O than $(\text{NH}_4)_2\text{S}_5$

$+ 1\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O with separa-
tion of S Slowly attacked by dil $\text{HCl} + \text{Aq}$
(Bloxam, Chem Soc 1895, 67 307)

Tetrammonium heptasulphide, $(\text{NH}_4)_4\text{S}_7 + 4\text{H}_2\text{O}$

Sol in H_2O Solution can be kept for a
long time without depositing S (Bloxam,
Chem Soc 1895, 67 298)

Diammonium enneasulphide, $(\text{NH}_4)_2\text{S}_9 + \frac{1}{2}\text{H}_2\text{O}$

Decomposed by H_2O with separation of S
Not attacked by boiling dil $\text{HCl} + \text{Aq}$ on
account of formation of a hard crust of S
on the crystals (Bloxam, Chem Soc 1895,
67 306)

Tetrammonium enneasulphide, $(\text{NH}_4)_4\text{S}_9$

Solution in H_2O deposits crystals of
 $(\text{NH}_4)_2\text{S}_5$ on standing (Bloxam, Chem Soc
1895, 67 302)

$+ 3\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O with separa-
tion of S (Bloxam, Chem Soc 1895, 67
299)

Ammonium polysulphides

Conc $\text{NH}_3 + \text{Aq}$ dissolves H_2S to form
 $(\text{NH}_4)_2\text{S}_2 \cdot 2\text{NH}_4\text{SH}$ On dilution more H_2S is
absorbed to form $(\text{NH}_4)_4\text{S}_4 \cdot \text{NH}_4\text{SH}$, then
 $(\text{NH}_4)_2\text{S}_8 \cdot 8\text{NH}_4\text{SH}$, then $(\text{NH}_4)_2\text{S}_{18} \cdot 18\text{NH}_4\text{SH}$
and finally NH_4SH (Bloxam, ()
1895, 67 234)

Ammonium copper sulphide, $(\text{NH}_4)_2\text{S}_2 \cdot 2\text{CuS}_2 (?)$

Sol in warm H O, but decomp on standing
Warm $\text{KOH} + \text{Aq}$ acts similarly, sl sol in
 $\text{NH}_4\text{OH} + \text{Aq}$, $\text{Na CO}_3 + \text{Aq}$, or absolute al-
cohol Insol in ether Decomp by dil acids
(Priwoznik, B 6 1291)

Correct formula is NH_4CuS_4 Sl sol in
H O Decomp by conc and dil acids
Easily sol in NaOH Sl sol in alcohol
(Biltz, B 1907, 40 976)

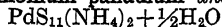
Ammonium gold polysulphide, $\text{AuS}_3 \cdot \text{NH}_4$

Ppt (Hofmann, B 1903, 36 3092, B
1904, 37 245)

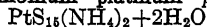
Ammonium iridium pentadecasulphide,

$\text{IrS}_{15}(\text{NH}_4)_3$

Ppt (Hofmann, B 1904, 37 247)

Ammonium palladium undecasulphide,

Ppt (Hofmann, B 1904, 37 248)

Ammonium platinum pentadecasulphide,

Can be washed with CS_2 without decomp
Sol in alcohol Insol in ether (Hofmann,
B 1903, 36 3091)

Ammonium stannic sulphide

See Sulphostannate, ammonium

Ammonium telluride, NH_4HTe

Easily sol in H_2O (Bineau, A ch (2) 67
229)

**Ammonium sulphide ammonia, $(\text{NH}_4)_2\text{S}$,
 2NH_3**

Very unstable (Bloxam, Chem Soc 1895,
67 294)

**Ammonium acisulphomelid, $(\text{NSO ONH}_4)_2$
(?)**

(Hantzsch and Stuer, B 1905, 38 1039)

Ammonplatindramine comps

See Platintriamine comps

Ammondisulphonic acid, $\text{NH}_2(\text{SO}_3\text{H})_2$

Known only in its salts (Claus, A 158
52 and 194)

Contains 2 at H less, and is identical with
midosulphonic acid $\text{NH}(\text{SO}_3\text{H})_2$, which see
(Raschig, A 241 161)

Ammontrisulphonic acid, $\text{NH}_2(\text{SO}_3\text{H})_3$

Known only in its salts (Claus, A 158
52 and 194)

Contains 2 at H less, and is nitrosulphonic
acid $\text{N}(\text{SO}_3\text{H})_3$, which see (Raschig, A 241
161)

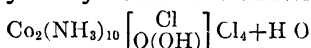
Ammontetrasulphonic acid, $\text{NH}(\text{SO}_3\text{H})_4$

Known only in its salts (Claus, A 158
52 and 194)

Does not exist, but was impure nitrosulphonic
acid, which see (Raschig, A 241
161)

Anhydroarseniotungstic acid, $\text{H}_3\text{AsW}_5\text{O}_{28}$

See under Arseniotungstic acid

Anhydrooxycobaltamine chloride,

Easily sol in H_2O , but decomposes after a
few minutes, can be recrystallized from dil
 $\text{HCl} + \text{Aq}$ Precipitated from sat H_2O solu-
tion by conc $\text{HCl} + \text{Aq}$, or alcohol (Vort-
mann, M Ch 6 404)

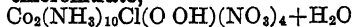
$\text{Co}_2(\text{NH}_3)_{10} \left(\begin{array}{c} \text{Cl} \\ \text{OH} \end{array} \right) \text{Cl}_4$ Sol in H_2O (Vort-
mann)

**Anhydrooxycobaltamine chloride mercuric
chloride, $\text{Co}_2(\text{NH}_3)_{10}(\text{ClO}_2\text{H})\text{Cl}_4, 3\text{HgCl}_2$**

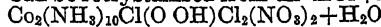
Can be recryst from very dil hot $\text{HCl} + \text{Aq}$

**— chloroplatinate, $\text{Co}_2(\text{NH}_3)_{10}(\text{ClO}_2\text{H})\text{Cl}_4$,
 2PtCl_4**

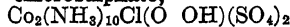
Can be recrystallized from H_2O containing
 HCl

— chloronitrate,

Can be recrystallized from dil $\text{HCl} + \text{Aq}$



More easily sol in H_2O than the preceding
comp

— chlorosulphate,**— dichromate, $[\text{Co}_2(\text{NH}_3)_{10}\text{O OH}]_2(\text{Cr}_2\text{O}_7)_5$
 $+ 8\text{H}_2\text{O}$**

Sl sol in H_2O

**— nitrate, $\text{Co}_2(\text{NH}_3)_{10}(\text{NO}_3)(\text{O OH})(\text{NO}_3)_4$
 $+ \text{H}_2\text{O}$**

Sl sol in pure H_2O with immediate decomp
Can be recrystallized from H_2O containing
 HNO_3

**— sulphate, $[\text{Co}_2(\text{NH}_3)_{10}\text{O OH}]_2(\text{SO}_4)_5$,
 $2\text{H}_2\text{SO}_4 + 2\text{H}_2\text{O}$**

Sl sol in cold H_2O When crystallized
from dil $\text{H}_2\text{SO}_4 + \text{Aq}$, is converted into—

$[\text{Co}_2(\text{NH}_3)_{10}\text{O OH}]_2(\text{SO}_4)_5, \text{H}_2\text{SO}_4 + 3\text{H}_2\text{O}$,
which by further recrystallization from very
dil $\text{H}_2\text{SO}_4 + \text{Aq}$ becomes—

$[\text{Co}_2(\text{NH}_3)_{10}\text{O OH}]_2(\text{SO}_4)_6 + 8\text{H}_2\text{O}$ Sl sol
in cold H_2O (Vortmann)

Anhydrophospholutedungstic acid,

See under Phosphotungstic acid

Antimonic Acid**Metantimonic acid, HSbO_3**

Very sl sol in H_2O , sol in conc $\text{HCl} + \text{Aq}$,
sl sol in dil $\text{HNO}_3 + \text{Aq}$, easily sol in tar-
taric acid + Aq , easily sol in hot KOH , or
 $\text{NaOH} + \text{Aq}$, completely insol in $\text{NH}_4\text{OH} +$
 Aq (Ficmy, A ch (3) 23 407)

Sl sol in H_2O Very sl sol in KOH and
 $\text{K}_2\text{CO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Insol
in $\text{HNO}_3 + \text{H}_2\text{SO}_4$ Slowly sol in cold, quickly
in hot $\text{HCl} + \text{Aq}$ Sl sol in tartaric and
oxalic acid and in $\text{KHC}_2\text{O}_4 + \text{Aq}$ (Senderens,
Bull Soc 1899, (3) 21 48)

Insol in acetone (Nunnn, B 1904, 37
4329)

Pyroantimonic acid, $\text{H}_4\text{Sb}_2\text{O}_7$

More sol in H_2O and acids than H_3SbO_4
Sol in cold NH_4OH , or $\text{KOH} + \text{Aq}$ (Ficmy)

Slowly sol in cold H_2O

5.88 g Sb_2O_5 in 1 l H_2O at 15°

8.55 " " " 1 l " " 25°

21.30 " " " 1 l " " 60°

(Delacroix, J Pharm 1897, 6 337-41)

Sl sol in H_2O Very sl sol in KOH and $K_2CO_3 + Aq$ Insol in $NH_4OH + Aq$, and in $HNO_3 + H_2SO_4$ Slowly sol in cold, quickly in hot $HCl + Aq$ Sl sol in tartaric acid, oxalic acid and $KHC_2O_4 + Aq$ (Senderens, Bull Soc 1899, (3) 21 48)

Orthoantimonic acid, H_3SbO_4

Sl sol in H_2O Insol in $NH_4OH + Aq$ Easily sol in $KOH + Aq$ (Fremy)

Does not exist (Raschig, B 18 2745)

Has, however, been prepared by Daubrawa (A 186 110), Conrad (C N 40 198), and Beilstein and Blaese (Bull Ac St Petersburg 33 97)

Very sol in H_2O (Delacroix, Bull Soc 1899 (3) 21 1049)

Very sl sol in H_2O , in KOH and $K_2CO_3 + Aq$ Slowly sol in cold, quickly in hot $HCl + Aq$ Insol in $NH_4OH + Aq$, and in $HNO_3 + H_2SO_4$ Sl sol in tartaric acid, oxalic acid and $KHC_2O_4 + Aq$ (Senderens, Bull Soc 1899, (3) 21 52)

$+ \frac{1}{2}H_2O$ (Beilstein and Blaese)

According to Beilstein and Blaese only one antimonic acid, H_3SbO_4 , exists

Tetraantimonic acid, $Sb_2O_5 + 4H_2O = H_4Sb_2O_8$

Slowly sol in cold H_2O

Solution sat at t° contains g Sb_2O_5 per litre—

t°	15°	25°	60°	70°
	5.88	8.3-8.75	21.30	53.89

in solution by heating to 100° or long in the cold to $Sb_2O_5 \cdot 3H_2O$

(Senderens, Bull Soc 1899, (3) 21 1049)

Insol in H_2O Very sl sol in KOH and $K_2CO_3 + Aq$ Slowly sol in cold, quickly in hot $HCl + Aq$ Insol in $NH_4OH + Aq$ Insol in $HNO_3 + H_2SO_4$ Sl sol in tartaric acid, oxalic acid and in $KHC_2O_4 + Aq$ (Senderens, Bull Soc 1899, (3) 21 51)

Hexantimonic acid, $Sb_2O_5 + 6H_2O = H_{12}Sb_2O_{11}$

Sol in H_2O to the extent of 22 g Sb_2O_5 per l but on standing becomes turbid and a white powder is pptd until finally only 3 g Sb_2O_5 are dissolved per l (Senderens, Bull Soc 1899, (3) 21 48-49)

Antimonates

α Antimonates From $HSbO_3$ Some of the K and NH_4 salts are sol in H_2O , the others are slightly sol or insol

β Pyroantimonates From $H_2Sb_2O_7$ As a class, insol in H_2O , but decomp thereby except in presence of large excess of alkali (Fremy, A ch (3) 12 499)

Probably do not exist (Beilstein and Blaese)

Aluminum antimonate, $Al_2O_3 \cdot 3Sb_2O_5$ (?)

Ppt Somewhat sol in excess of Al salts + Aq Insol in $K_2Sb_2O_7 + Aq$

$Al(SbO_3)_3 + 15H_2O = AlH_6(SbO_4)_3 + 12H_2O$

Ppt (Beilstein and Blaese, Bull Ac St Petersburg 33 101)

$Al(SbO_3)_3 + 7H_2O = AlH_6(SbO_4)_3 + 4H_2$

Ppt (B and B)

$Al_2O_3 \cdot Sb_2O_5 + 9H_2O$ Ppt (Ebel, B 2 3043)

Ammonium antimonate, $NH_4SbO_3 + 2H_2O$

Insol in H_2O

$+ 2\frac{1}{2}H_2C$ Insol in H_2O (Senderens, Bull Soc 1899, (3) 21 56)

$+ 6H_2O$ See $(NH_4)_2H_2Sb_2O_7 + 5H_2O$

Ammonium pyroantimonate, $(NH_4)_4Sb_2O_7$

Known only in solution

$(NH_4)_2H_2Sb_2O_7 + 5H_2O$

Sol in H_2O , but decomp by standing, boiling into insol salt Insol in alcchol (Fremy, J pr 45 215) Composition $NH_4SbO_3 + 6H_2O$, according to Raschig (J 18 2743)

Barium antimonate, $Ba(SbO_3)_2$

Ppt Scarcely sol in H_2O Slowly sol in $BaCl_2 + Aq$

$+ 2H_2O$ Somewhat sol in H_2O Easily sol in $HCl + Aq$ (Delacroix, Bull Soc 1899, (3) 21 1051)

$+ 5$, or $6H_2O$ Ppt

$BaSb_4O_{17} + 5H_2O$ Sol in conc HCl (Delacroix, Bull Soc 1899, (3) 21 1051)

$BaO \cdot 3Sb_2O_5 + 5H_2O$ Insol in H_2O In completely sol in HCl (Delacroix, l c)

$BaO \cdot 4Sb_2O_5 + 15H_2O$ (Delacroix, l c)

$9BaO \cdot 10Sb_2O_5 + 18H_2O$ Insol in HCl Aq (Delacroix, l c)

Bismuth antimonate, $BiSbO_4 + H_2O$

Ppt Insol in H_2O , sol in $HCl + Ac$ (Cavazzi, Gazz ch it 15 37)

$3Bi_2O_3 \cdot Sb_2O_5 + H_2O$ Insol in H_2O , so in $HCl + Aq$ (Cavazzi)

$2Bi_2O_3 \cdot Sb_2O_5$ As above (Cavazzi)

Cadmium antimonate, $Cd(SbO_3)_2 + 2H_2O$

Insol in H_2O (Senderens, Bull Soc 1899 (3) 21 56)

$+ 3\frac{1}{2}H_2O$ Very sol in H_2O Sol in $HCl + Aq$ (Ebel, Dissert 1890)

$+ 5H_2O$ Insol in H_2O (Senderens, l c)

$+ 6H_2O$ Ppt Insol in H_2O (Ebel, l c 22 3043)

Calcium antimonate, $Ca(SbO_3)_2$

Ppt

$+ 5H_2O$ Ppt (Heffter, Pogg 86 418)

$+ 6H_2O$ Insol in H_2O (Senderens, Bull Soc 1899, (3) 21 56)

$3CaO \cdot 2Sb_2O_5 + 6H_2O$ Min *Ullmannite*

Chromic antimonate, $Cr(SbO_3)_3 + 14H_2O$

Ppt (Beilstein and Blaese)

Cobaltous antimonate, $Co(SbO_3)_2 + 5H_2O$

Insol in H_2O Loses $3H_2O$ in the presence of H_2SO_4 and passes into $Co(SbO_3)_2 + 2H_2O$

also insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 55)

+ $6\text{H}_2\text{O}$ Ppt (Ebel, B **22** 3043)

+ $7\text{H}_2\text{O}$ Sl sol in H_2O Sl sol in boiling solutions of cobalt salts

+ $12\text{H}_2\text{O}$ Ppt (Heffter, Pogg **86** 448)

Cobaltous hydrogen antimonate, $\text{CoH}_4(\text{SbO}_4)_2 + \text{H}_2\text{O}$

(Gorgeul, Ann Phys Beibl 1897, **21** 198)

Cupric antimonate, $3\text{CuO}, 2\text{Sb}_2\text{O}_3$

Ppt (Beilstein and Blaese)

$\text{Cu}(\text{SbO}_3)_2$ Insol in H_2O , acids, or alkalies (Berzelius)

+ $2\text{H}_2\text{O}$ Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 55)

+ $5\text{H}_2\text{O}$ Ppt (Ebel, B **22** 3043)

Insol in H_2O (Senderens, *l c*)

$\text{CuO}, 2\text{Sb}_2\text{O}_3 + 9\text{H}_2\text{O}$ Insol in H_2O Sol in $\text{Sb}_2\text{O}_3, 4\text{H}_2\text{O} + \text{Aq}$ (Delacroix, Bull Soc 1899, (3) **21** 1054)

$2\text{CuO}, 3\text{Sb}_2\text{O}_3 + 10\text{H}_2\text{O}$ Insol in H_2O Sol in NH_4OH and in triantimonic acid + Aq (Delacroix, *l c*)

$\text{CuO}, 6\text{Sb}_2\text{O}_3 + 16\text{H}_2\text{O}$ (Delacroix, *l c*)

Cupric antimonate ammonia, $\text{Cu}(\text{SbO}_3)_2, 4\text{NH}_3 + 4\text{H}_2\text{O}$

Insol in H_2O and $\text{NH}_4\text{OH} + \text{Aq}$ (Schiff, A **123** 39)

$\text{CuSb}_2\text{N}_3\text{H}_{21}\text{O}_{12} = \text{Cu}(\text{ONH}_4)\text{OH},$

$2(\text{NH}_4\text{SbO}_3 + 2\text{H}_2\text{O})$ (Raschig, B **18** 2743)

$\text{Cu}(\text{SbO}_3)_2, 3\text{NH}_3 + 9\text{H}_2\text{O}$ (Delacroix, Bull Soc 1901, (3) **25** 289)

Glucinum antimonate, $\text{Gl}(\text{SbO}_3)_2 + 6\text{H}_2\text{O}$

Somewhat sol in hot H_2O Easily sol in warm HCl (Ebel, Dissert **1890**)

Iron (ferrous) antimonate

Sl sol in H_2O (Berzelius)

Iron (ferric) antimonate

Insol in H_2O (B)

$\text{Fe}_2\text{O}_3, \text{Sb}_2\text{O}_3 + 7\text{H}_2\text{O}$ Ppt (Ebel, B **22** 3043)

$\text{Fe}_2\text{O}_3, 2\text{Sb}_2\text{O}_3 + 11\text{H}_2\text{O}$ Ppt (Beilstein and Blaese)

$\text{Fe}(\text{SbO}_3)_3 + 6\text{H}_2\text{O}$ Ppt (B and B)

Lead antimonate, basic, $\text{Pb}_3(\text{SbO}_3)(\text{OH})_4 + 2\text{H}_2\text{O} = \text{Pb}_3(\text{SbO}_4) + 4\text{H}_2\text{O}$

Min *Bleinerite, Brindheimite*

$2\text{Pb}(\text{SbO}_3), \text{PbO} + 11\text{H}_2\text{O}$ Ppt (B and B)

Lead antimonate, $\text{Pb}(\text{SbO}_3)_2$

Insol in H_2O Incompletely decomp by acids (Berzelius)

Naples Yellow Insol in H_2O

+ $2\text{H}_2\text{O}$ Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 57)

+ $5\text{H}_2\text{O}$ Ppt (Ebel, B **22** 3043)

+ $6\text{H}_2\text{O}$ Ppt (Beilstein and Blaese)

+ $9\text{H}_2\text{O}$ Insol in H_2O (Senderens, *l c*)

Lead antimonate chloride, $\text{Pb}(\text{SbO}_3)_2, \text{PbCl}_2$

Min *Nadorite* Sol in HCl , HNO_3 , and tartaric acid + Aq

Lithium antimonate, LiSbO_3

Sl sol in cold, sol in hot H_2O , and crystallizes on cooling Much more sol than NaSbO_3

+ $3\text{H}_2\text{O}$ Ppt Sl sol in H_2O (Beilstein and Blaese)

Magnesium antimonate, $\text{Mg}(\text{SbO}_3)_2 + 12\text{H}_2\text{O}$

Sol in hot, less sol in cold H_2O (Heffter)

Sol in $\text{MgSO}_4 + \text{Aq}$, insol in $\text{KSbO}_3 + \text{Aq}$ (Berzelius)

Manganous antimonate, $\text{Mn}(\text{SbO}_3)_2$

Difficultly sol in H_2O

When heated, is sol only in strong acids

+ $2\text{H}_2\text{O}$ Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 56)

+ $5\text{H}_2\text{O}$ Ppt (Ebel, B **22** 3043)

+ $6\text{H}_2\text{O}$ Insol in H_2O (Senderens, *l c*)

+ $7\text{H}_2\text{O}$ Ppt (Beilstein and Blaese)

Mercurous antimonate

Insol in H_2O (Berzelius)

Mercuric antimonate, $\text{Hg}(\text{SbO}_3)_2$

Insol in H_2O , alkalies, and most acids

Sl attacked by boiling H_2SO_4 , and $\text{HCl} + \text{Aq}$

+ $2\text{H}_2\text{O}$ Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 55)

+ $5\text{H}_2\text{O}$ Insol in H_2O (Senderens)

+ $6\text{H}_2\text{O}$ Ppt (Beilstein and Blaese)

Nickel antimonate, $\text{Ni}(\text{SbO}_3)_2 + 2\text{H}_2\text{O}$

Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 54)

+ $5\text{H}_2\text{O}$ Insol in H_2O (Senderens)

+ $6\text{H}_2\text{O}$ Ppt Insol in H_2O (Heffter, Pogg **86** 446)

+ $12\text{H}_2\text{O}$ Sl sol in H_2O (Heffter)

Potassium antimonate, KSbO_3

Insol in H_2O Sol in warm $\text{KOH} + \text{Aq}$, but separates nearly completely on cooling By boiling with H_2O , or by standing for a long time with cold H_2O , it gradually dissolves as $2\text{KSbO}_3 + 5\text{H}_2\text{O}$, or $\text{K}_2\text{H}_2\text{Sb}_2\text{O}_7 + 4\text{H}_2\text{O}$ or $2\text{KH}_2\text{SbO}_4 + 3\text{H}_2\text{O}$

Insol in CS_2 (Arcowski, Z anorg **1894**, **6** 257)

+ H_2O Insol in H_2O (Senderens, Bull Soc 1899, (3) **21** 57)

+ $1\frac{1}{2}\text{H}_2\text{O}$ ($= 2\text{KSbO}_3 + 5\text{H}_2\text{O}$ of Trömy) Easily sol in H_2O , especially if warm Solution is pptd by $\text{NH}_4\text{Cl} + \text{Aq}$ (Trömy, A ch (3) **12** 499)

+ $2\frac{1}{2}\text{H}_2\text{O}$ 100 pts H_2O at 20° dissolve 2.81 pts anhydrous salt, sp gr of solution sat at $18^\circ = 1.0263$ Composition is given as $\text{K}_2\text{H}_2\text{Sb}_2\text{O}_7 + 4\text{H}_2\text{O}$ (König and Olschewsky, B **20** 3043)

+ $3\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Senderens, *l c*)

+4½H₂O Sol in H₂O (Delacroix, J Pharm 1897, (6) 6 533)
 2K₂O, 3Sb₂O₅+10H₂O Sl sol in H₂O (Delacroix, J Pharm 1897, 6 337)
 +10H₂O (Delacroix, *l c*)

Potassium pyroantimonate, K₄Sb₂O₇

Deliquescent, decomp by boiling with H₂O into K₂SbO₃+5H₂O, by cold H₂O into K₂H₃SbO₇+6H₂O (Fremy)

Does not exist (Knorre and Olschewsky)
 Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 829)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1904, 37 3601)

Potassium hydrogen pyroantimonate, K₂H₃SbO₇

Insol in acetone (Eidmann, C C 1899, II 1014)

+2½H₂O (Senderens, Bull Soc 1899, (3) 21 57)

+3½H₂O Very difficultly sol in hot or cold H₂O (Knorre and Olschewsky, B 18 2358)

+6H₂O Quite difficultly sol in cold H₂O
 Not precipitated by NH₄Cl+Ag₂ Aqueous solution gradually decomposes (Fremy)

+4H₂O See 2KSbO₃+5H₂O

Potassium antimonate sulphantimonate, K₂SbO₃, K₂SbS₄+5H₂O

Decomp on air, and with cold H₂O Sol in hot H₂O (Rammelsberg)

Silver antimonate

Insol in H₂O (Berzelius)
 AgSbO₃+3H₂O=AgH SbO₄+2H₂O 1 cc sol in NH₄OH+Ag, when freshly pptd (Beilstein and Blaise)

+1½H₂O Ppt (Ebel, B 22 3045)

Silver antimonate ammonia, AgH SbO₄, 2NH₃+H₂O

(Beilstein and Blaise)

Sodium antimonate, NaSbO₃

Sol in much H₂O but soon becomes decomposed into NaH SbO

+3½H₂O composition of NaH SbO +6H₂O, according to Beilstein and Blaise

1000 pts H₂O dissolve 0.31 pt NaSbO₃+3½H₂O at 12°

1000 pts alcohol of 15% dissolve 0.13 pt NaSbO₃+3½H₂O at 12°

1000 pts alcohol of 20% dissolve 0.07 pt NaSbO₃+3½H₂O at 12°

Somewhat more sol when freshly precipitated

Absolutely insol in glacial HC H₂O

Presence of NaOH or Na₂S dissolves solubility while NH₄OH or K salts increase it

slightly (Beilstein and Blaise, Bull Ac St Petersb 33 201)

+4½H₂O Sol in H₂O (Delacroix, Bull Soc 1899, (3) 21 1051)

2Na₂O, 3Sb₂O₅+10H₂O (Delacroix, *l c*)
 Na₂O, 3Sb₂O₅+11H₂O (Delacroix, *l c*)

Sodium pyroantimonate, Na₂H₂Sb₂O₇+6H₂O

Boiling H₂O dissolves 1/37 pt of this salt (Fremy) 1000 pts H₂O dissolve 2.5 pts salt (Ebel, B 22 3044) See also NaSbO₃+3½H₂O

+5H₂O (Knorre and Olschewsky)

Strontium antimonate, Sr(SbO₃)₂+6H₂O

Ppt Less sol in H₂O than SrSO₄ (Heffter, Pogg 86 418)

Thalious antimonate, TlSbO₃+2H₂O=TlH₃SbO₄+H₂O

Somewhat sol in H₂O, when freshly precipitated, insol when dried (Beilstein and Blaise)

Tin (stannous) antimonate, 2SnO, Sb₂O₅

Ppt (Lenssen, A 114 113)

Sn(SbO₃)₂+2H₂O Attacked with difficulty by acids or alkalis, most easily by hot conc H₂SO₄ (Schiff, A 120 55)

2SnO, 3Sb₂O₅+4H₂O

SnO, 2Sb₂O₅

Tin (stannic) antimonate

Insol in H₂O (Levol, A ch (3) 1 504)

Uranium antimonate, 5UO₂, 3Sb₂O₅+15H₂O

Ppt Sol in hot conc HCl+Ag, and in UCl₃+Ag (Rammelsberg)

Zinc antimonate, Zn(SbO₃)₂

Verv slightly sol in H₂O (Berzelius) sol in solutions of Zn salts

+2H₂O (Ebel, Dissert 1890)

Insol in H₂O (Senderens, Bull Soc 1899 (3) 21 57)

+3H₂O Not wholly insol in cold, moderately sol in hot H₂O (Ebel, Dissert 1890)

+6H₂O Insol in H₂O (Senderens)

Antimoniomolybdic acid

Ammonium antimoniomolybdate, 5(NH₄)O 4SbO 7MoO₄+12H₂O

Readily sol in hot H₂O (Gibbs, Am Ch J 7 392)

Antimoniotungstic acid, 3Sb₂O₅, 4WO₃+11H₂O

Sol in H₂O (Hallopeau, C R 1896, 123 1068)

Potassium antimoniotungstate, 3K₂O, 3Sb₂O₅, 4WO₃+4H₂O

Much more sol in hot than in cold H₂O
 Decomp by HCl, H₂SO₄ and HNO₃ (Hallopeau, C R 1896, 123 1066)

+16H₂O Much more easily sol in hot than cold H₂O Decomp by HCl, H₂SO₄, and HNO₃ (Hallepeau, *l c*)
 6K₂O, 4Sb₂O₃, 12WO₃+25H₂O
 Sl sol in H₂O (Gibbs, Am Ch J 7 392)

Antimoniuretted hydrogen

See Antimony hydride

Antimonosomolybdic acid

Ammonium antimonosomolybdate, 6(NH₄)₂O,
 3Sb₂O₃, 17MoC₃+21H₂O

Insol in cold H₂O (Gibbs, Am Ch J 7 313)

Antimonosophosphotungstic acid

Potassium antimonosophosphotungstate,
 12K₂O, 5Sb₂O₃, 6P₂O₅, 22WO₃+48H₂O,

Nearly insol in cold or warm H₂O (Gibbs, Am Ch J 7 392)

Antimonosotungstic acid

Ammonium antimonosotungstate

Sol in H₂O

Barium antimonosotungstate, 4BaO, 6Sb₂O₃,
 22WO₃+36H₂O

Precipitate, very sl sol in hot H₂O (Gibbs, Am Ch J 7 313)

Antimonous acid, HSbO₃

(Long, J Am Chem Soc 1895, 17 87)
 +1½H₂O Ppt (Schaffner, A 51 182)
 H₃SbO₃ Ppt (Clarke and Stallo, B 13 1793)

Does not exist (Guntz, C R 102 1472)

H₄Sb₂O₅ When freshly pptd, is sol in dil KOH, and NaOH+Aq Scarcely sol in NH₄OH+Aq, or in (NH₄)₂CO₃, or KHCO₃+Aq

Completely sol in K₂CO₃, and Na₂CO₃+Aq, especially if warm When recently pptd is sl sol in succinic acid+Aq

Calcium antimonite, (CaSb₂O₄) (?)

Min *Romelia* Insol in acids

Cobaltous antimonite (?)

Sl sol in H₂O (Berzelius)

Cuprous antimonite, (Cu₆(SbO₃)₄)

Insol in H₂O Sol in acids, most easily in conc HCl+Aq (Husmann and Stromeyer, Schw J 19 241)

Cupric antimonite (?)

Insol in H₂O (Berzelius)

CuSb₂O₅ Min *Ammodite*

CuSb₂O₄ Sol in HCl+Aq tutuic and citric acids (Harding, Z anorg 1899, 20 238)

Iron (ferrous) antimonite (?)

More sol in H₂O than the antimonate (Dumas)

Potassium antimonite, K₂O, 3Sb₂O₃

Easily decomp by cold H₂O Not decomp by KOH+Aq containing over 20 9% K₂O (Corimmbœuf, C R 115 1305)
 +3H₂O As above (C)

Potassium antimonite iodide, K₂O, 8Sb₂O₃,
 2KI

Insol and not decomp by cold or hot H₂O Not decomp by acids or alkalies Aqua regia decomp slowly Tartaric acid dissolves gradually (Gruhl, Dissert 1897)

Sodium antimonite, NaSbO₂+3H₂O

Difficultly sol in H₂O (Terreil, A ch (4) 7 380)

2Na₂O, 3Sb₂O₃+H₂O Decomp by H₂O, but not by NaOH+Aq containing 94 3 g NaOH per l (Corimmbœuf)

Na₂O, 2Sb₂O₃ Decomp by H₂O but not by NaOH+Aq containing 188 6 g NaOH per l (C)

Na₂O, 3Sb₂O₃ Decomp by H₂O, but not by NaOH+Aq containing 113 2 g NaOH per l (C)

+2H₂O=NaH₂(SbO)₃ (Terreil)

Antimony, Sb

Does not decomp H₂O Not attacked by HCl+Aq (Berzelius), slowly sol in conc HCl+Aq (Debray), slowly sol in conc warm HCl+Aq (Troost) Attacked by very conc HCl+Aq only when finely divided (Schutzenberger, Willm), very sl attacked by dil or conc acid (Guntz) Not attacked by boiling HCl+Aq (Gmelin) By careful experiments, pure Sb is absolutely insol in dil or conc, hot or cold HCl+Aq, except when in contact with oxygen (Ditte and Metzner, A ch (6) 29 889)

Insol in dil or cold conc, but sol in hot conc H₂SO₄ Oxidized but not dissolved by HNO₃+Aq Easily and completely sol in aqua regia

Very slowly attacked by pure HNO₃+Aq of 1 51-1 42 sp gr weaker acid has no marked action whether it contains NO₂ or not HCl+HNO₃ has no action if dil or at low temp, but when even very dil and KNO₃ is added, the action will begin (Millon, A ch (3) 6 101)

Not attacked in 10 months by 2% HNO₃+Aq Sb is not dissolved by HNO₃+Aq of any concentration a white powder being always left, which is sol in HNO₃+Aq or H₂O (Montemurri Gazz ch it 22 384)

Insol in alkalis+Aq

Somewhat sol in distilled H₂O More or less sol in solutions of acids, alkalis and salts and in alcohol and ether Only sl sol in a mixture of alcohol and ether (Ruff and Albert, B 1905 38 54)

Alkaline H₂O₂ converts Sb into antimonous acid, but neutral H₂O is without action (Clark, Chm Soc 1893, 63 886)

Insol in liquid NH₃ (Gore, Am Ch J 1898, 20 826)

ANTIMONY ARSENIDE

Easily attacked by pyrosulphurvl chloride (Feumann and Kochlin, B 16 479)
Sb is sol in a mixture of HNO₃ and tartaric acid or other polybasic acids (Czerwek, Z anal 1906, 45 507)

Not attacked by a mixture of alcohol and ether (Cohen, Z phys Ch 1904, 47 12)
½ cc oleic acid dissolves 0.0007 g Sb in 10 days (Gates, J phys Ch 1911, 15 143)

There are three modifications
1 Ordinary gray metallic
2 Black amorphous Unstable at ord mp By boiling with H₂O is changed to metallic Sb

3 Yellow Very unstable At -50° goes over rapidly into the ordinary black modification Sol in CS₂ at a little above -90° (Stock, B 1903, 37 898)

Unstable above -90° (Stock, B 1905, 38 337)

Antimony arsenide, Sb₂As
(Descamps, C R 86 1065)

Antimony tribromide, SbBr₃

Deliquescent, decomps by H₂O
Very sol in liquid NH₃ (Gore, Am Ch 1898, 20 826)
Very sol in warm liquid AsBr₃, forming a solution with sp gr = 3.685 at 47° (Retgers, Z anorg Ch 1903, 11 339)

Walden, Z anorg 1900, 25

1B1₃ (Isbekow, Z anorg 1913,

ly sol in PCl₃ and PBr₃ (Walden, Z 1900, 25 211)

Sol in alcohol and CS

Sol in ether forming two liquids (Hayes, J chem Soc 1902, 24 360)

Sol in acetone (Nannum, B 1904, 37 328)

Solubility of SbBr₃ in organic liquids
Data in parentheses indicate liquid equilibrium

Solvent	t°	Mols per 100	t°	Mols per 100	t°	Mols per 100
Benzene	-28°	0	-17°	17.1	-91°	7.3
	-30°	4.0	-15°	24.9	-90°	7.3
	-32°	8.7	-10°	30.7	-80°	84.1
	-13°	13.5	-5°	38.4	-70°	11.4
	-17°	17.5	0°	48.2	-62°	14.5
	0°	21.7	5°	58.1	-100°	100
Chlor benzene	-17°	0	0°	7.2	60°	37.4
	-30°	1.7	10°	12	70°	30.0
	-40°	2.2	20°	11.5	80°	66.6
	-20°	3.2	30°	15.4	90°	89.6
Brom benzene	-10°	4.3	40°	20.5	94°	100
	-10°	5.6	50°	28.1		
	-12°	9.2	60°	36.6		

Solubility of SbBr₃ in organic liquids—Co

Solvent	t°	Mols per 100	t°	Mols per 100	t°	Mols
Iod benzene	-28°	0	10°	26.3	70°	6.1
	-30°	4.0	20°	31.5	80°	78.1
	-32°	8.7	30°	37.3	90°	91.1
	-13°	13.5	40°	43.7	94°	100
	-17°	17.5	50°	50.7		
	0°	21.7	60°	58.5		
Paradi-chlor-benzene	54°	0	65°	29.5	85°	68.1
	51°	6.3	70°	37.0	90°	80.1
	48°	12.8	75°	45.6	94°	100
	55°	18.7	80°	56.2		
Paradi-brom-benzene	88°	0	65°	52.0	90°	9.3
	80°	6.8	70°	59.1	92°	9.1
	80°	18.0	75°	66.5	94°	100
	75°	29.5	80°	74.4		
	70°	41.5	85°	83.0		
Nitro benzene	6°	0	-5°	32.3	55°	5.1
	1°	8.6	5°	35.3	65°	6.1
	-4°	17.0	15°	38.8	75°	7.3
	-9°	24.0	25°	42.8	85°	8.1
	-15°	29.7	35°	47.4	90°	9.1
	(-17°)	(31.9)	45°	52.8	94°	100
Metadi-nitro-benzene	90°	0	55°	49.1	70°	7.3
	85°	8.1	50°	53.0	75°	7.1
	80°	16.2	47°	54.4	80°	8.7
	75°	24.2	50°	56.1	85°	8.3
	70°	31.8	55°	58.8	90°	9.2
	65°	38.5	60°	62.2	94°	100
	60°	44.3	65°	66.2		
Toluene	-93°	0	10°	28.8	70°	6.4
	-93°	0.3	20°	36.7	80°	7.4
	-70°	1.2	30°	47.3	85°	8.2
	-50°	2.6	(34°)	(54.0)	90°	9.6
	-30°	5.2	40°	51.5	94°	100
	-10°	13.3	50°	56.3		
Ethyl benzene	-93°	0	10°	9.8	60°	5.8
	-60°	0.4	20°	19.5	70°	6.4
	-40°	1.0	25°	28.6	80°	7.4
	-20°	2.3	29°	37.8	85°	8.1
	-10°	3.9	40°	44.6	90°	9.6
	0°	6.4	50°	51.6	94°	100
Propyl benzene	-80°	0.4	(-15°)	(33.3)	50°	4.3
	-60°	1.2	(-20°)	(23.3)	60°	5.5
	-40°	3.4	0°	25.8	70°	6.5
	-30°	5.3	10°	27.8	80°	7.5
	-20°	9.5	20°	30.1	90°	9.1
	-10°	17.2	30°	34.1	94°	100
Isomyl benzene	-70°	1.9	(-13°)	(21.9)	60°	4.8
	-50°	3.6	-10°	17.0	70°	4.3
	-30°	1.1	0°	18.2	80°	5.0
	-20°	7.1	10°	19.9	90°	6.0
	-10°	13.4	20°	22.1	94°	100
	-17°	16.4	30°	25.9		

(Menschutkin, Ann Inst Pol P le Ch 13)

Antimony bromide with MBr

See Bromantimonate, M

Also below

Antimony hydrogen bromide, SbH₃, HBr + 3H₂O

Very hygroscopic Decomps by H₂
(Weinland and Feige, B 1903, 36 256)

See Metabromantimonous acid

Antimony caesium bromide, $2\text{SbBr}_3, 3\text{CsBr} + 2\text{H}_2\text{O}$
Loses Br_2 in the air (Weinland, B 1903, 16 257)

Antimony calcium bromide, $\text{SbBr}_3, \text{CaBr}_2 + 8\text{H}_2\text{O}$
Easily decomp (Benedict, Proc Am Acad 1895, 30 9)

Antimony glucinum bromide, $3\text{SbBr}_3, 2\text{GlBr}_2 + 18\text{H}_2\text{O}$
Hydroscopic Easily decomp (Weinland, B 1903, 36 258)

Antimony magnesium bromide, $\text{SbBr}_3, \text{MgBr}_2 + 8\text{H}_2\text{O}$
As Ca salt (Benedict, Proc Am Acad 1895, 30 9)

Antimony potassium bromide, $10\text{SbBr}_3, 23\text{KBr} + 27\text{H}_2\text{O}$
(Herty, Am Ch J 1894, 16 496)

Antimony rubidium bromide, $2\text{SbBr}_3, 3\text{RbBr}$
Decomp by H_2O , can be recryst from dil $\text{HBr} + \text{Aq}$ (Wheeler, Z anorg 5 258)
 SbRb_2Br_3 Slowly loses Br_2 in the air
Decomp by H_2O (Weinland, B 1903, 36 259)

$10\text{SbBr}_3, 23\text{RbBr}$ (?) Cryst from conc $\text{HBr} + \text{Aq}$ (Wheeler)

The composition assigned to this salt by Wheeler (Z anorg 5 253) is incorrect
Ephraim, B 1903, 36 1817)

Antimony vanadium bromide, $\text{SbBr}_3, \text{VBr}_4 + 7\text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dil HCl and in tartaric acid (Weinland, B 1903, 36 260)

Antimony bromide potassium chloride, $\text{SbBr}_3, 3\text{KCl} + 1\frac{1}{2}\text{H}_2\text{O}$

Slowly deliquescent Very sol in H_2O
Sat solution contains 120.5 g to 100 cc H_2O , and has sp gr = 1.9

Decomp by much H_2O (Atkinson, Chem Soc 43 290)

Does not exist (Herty, Am Ch J 1894, 16 497)

See also Antimony chloride potassium bromide

Antimony bromofluoride, SbF_3Br

Decomp by H_2O (Ruff, B 1906, 39 4319)

Antimony trichloride, SbCl_3

Deliquescent Decomp by H_2O with precipitation of SbOCl This precipitation is prevented by tartaric, citric, or hydrochloric acid, or by conc solutions of chlorides of alkalis and alkaline earths

Solubility in H_2O
100 pts SbCl_3 sol in pts H_2O at t°

t°	Pts H O
0°	16 6
15°	12 3
20°	10 9
25°	10 1
30°	9 4
35°	8 7
40°	7 3
50°	5 2
60°	2 2

(Meerburg, Z anorg 1903, 33 299)

Solubility in $\text{HCl} + \text{Aq}$
100 mol H_2O dissolve mol SbCl_3 in presence of mol HCl at 20°

Mol HCl	Mol SbCl_3
0	72 1-72 8
2 4	73 0
6 5	67 5
8 4	67 6
8 6	66 5
9 8	65 0
12 2	65 3
29 6	54 5

(Meerburg, Z anorg 1903, 33 304)

Solubility in $\text{HCl} + \text{Aq}$

Solid phase	100 mol H_2O dissolve at 20°			
	1	2	3	4
	Mol SbCl_3	Mol HCl	Mol SbOCl	Mol HCl
SbOCl	8 7	7 2	9 8	6 9
	8 6	7 5	16 1	7 9
	19 6	8 0	21 7	7 4
	19 8	8 9	25 0	8 8
			28 0	8 6
$(\text{SbOCl})_x, (\text{SbCl}_3)_y$	37 5	8 7	32 0	7 9
	44 0	6 8	35 8	7 9
	63 7	6 2	59 5	6 4
	69 1	5 6	61 0	6 5
	66 1	4 6	62 7	4 4
	69 8	5 3		
SbCl_3 and $(\text{SbOCl})_x, (\text{SbCl}_3)_y$	69 3	4 3		
	68 3	3 6		

1 & 2 (Meerburg, Z anorg 1903, 33 302)
3 & 4 (Noodt, Z anorg 1903, 33 302)

Somewhat sol in liquid (CN) (Centnerszwer, Bull Soc 1901, (3) 28 405)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 826)

Easily sol in PCl_3 and PBr_3 (Walden, Z anorg 1900, 25 211)

Sol in S Cl_2 (Walden, Z anorg 1900, 25 217)

Easily sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Sol in alcohol without decomp Very sol in hot CS_2 , but solubility diminishes rapidly on cooling (Cooke, Proc Am Acad 13 72)

1 g SbCl_3 is sol in 0.186 g acetone at 18° Sp gr of sat solution $18^\circ/4^\circ = 2.216$ (Naumann, B 1904, 37 4332)

Sol in ethyl acetate (Naumann B 1904, 37 3601)

1 pt sol in 16.97 pts of ethyl acetate at 18° Sp gr of sat solution $18^\circ/4^\circ = 1.7968$ (Naumann, B 1910, 43 320)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methylal (Eidmann, C C 1899, II 1014)

Solubility of SbCl_3 in organic liquids
Data in parentheses indicate labile equilibrium

Solvent	t°	Mols per 100	t°	Mols per 100	t°	Mols per 100
Benzene	5.6°	0	50	27.2	75°	78.5
	4	2.6	60	34.7	70	83.3
	1	7.1	70	45.2	62	89.3
	10	10.1	75	53.1	67.5	94.2
	20	13.1	77.5	58.7	73	100
	30	16.8	79	66.6		
	40	21.4	77.5	73.4		
Chlor benzene	-45.2°	0	-10	14.4	30	47.1
	-47	2.2	0	19.4	40	56.2
	-40	3.6	0	28.1	50	66.6
	-30	6.0	(4)	(41.1)	60	78.7
	-20	9.0	10	32.5	70	94.3
	-15	11.6	20	35.7	73	100
Brom benzene	-31°	0	-5°	21.7	40	59.2
	-32.5	3.4	0	26.6	50	68.5
	(-30)	(6.4)	3	31.8	60	80.6
	-30	4.8	(6)	(41.9)	65	87.2
	-25	7.6	(7)	(50.0)	70	95.0
	-20	10.7	10	36.4	73	100
	-15	14.1	20	43.2		
	-10	17.8	30	50.8		
Iod benzene	-25.6	0	(-5)	(10.7)	25	53.9
	-30	2.4	-34	10.7	35	60.4
	(-30)	(11.7)	-2	16.4	45	67.5
	(-40)	(20.8)	-15	24.7	55	76.2
	(-45)	(27.2)	-5	39.1	65	87.4
	(-35)	(30.9)	(-3)	(47.2)	70	95.0
	(-25)	(33.9)	15	44.5	75	100
	(-15)	(37.5)	15	48.7		
Parachlor benzene	5°	0	0	29.5	60	66.5
	10	6.3	5	37.5	65	78.1
	15	11.5	10	46.4	70	91.1
	40	28.0	20	56.0	75	100
Toluene	55°	0	6°	45.1	65°	87.1
	55	9	60	53.8	70	95.2
	50	15.8	15	64.9	75	100
	45	23.5	20	72.5		
	40	31.7	30	79.8		
			40	87.5		
Nitro benzene	1°	0	-13	27.3	15	59.2
	2	7.0	-10	23.8	25	63.0
	-2	12.1	-7	35.2	35	67.6
	-4	16.5	-6	40.7	45	72.8
	-10	20.3	-4	50.0	55	79.0
	-14	23.5	6	52.8	65	87.2
	(-18)	(26.2)	10	63.0	70	92.7
	-15	28.2	20	73.5	75	100

Solvent	t°	Mols per 100	t°	Mols per 100	t°	Mols per 100
Metadi nitro benzene	90°	0	(-10°)	(57.7)	(0°)	78.1
	80	14.3	(10)	(62.4)	20	65.2
	70	25.3	(27.5)	(44.5)	30	68.2
	60	33.9	(28.5)	(50.0)	40	73.2
	40	45.6	27.5	55.0	50	78.5
	(20)	(53.6)	25	60.2	60	85.8
	(1)	(59.9)	(20)	(66.2)	70	95.2
	(-11)	(62.2)	(10)	(73.5)	73	100
Toluene	-93°	0	-10°	14.4	40°	59.3
	-94	0.5	0	22.1	42°	66.6
	-70	1.4	6	28.6	40	71.1
	-50	3.3	11	35.7	50	77.1
	-40	5.1	(-8)	(27.0)	60	83.8
	-30	7.2	20	40.5	70	94.7
	-20	10	30	47.6	73	100
Ethylbenzene	-93°	0	35°	36.4	(36.8)	(68.1)
	-50	0.6	39	50	(33)	(65.7)
	-30	1.1	37	57.7	40	70.3
	-10	3.6	35	61.8	50	77.3
	0	5.6	(33)	(65.7)	60	85.5
	10	9.4	(15)	(37.8)	65	90.3
	20	16.8	(25)	(47.5)	70	95.6
	30	27.2	37	66.6	73	100
Propyl benzene	(-70°)	(0.6)	-70°	0.2	8	53.2
	(-50)	(2.8)	-50	1.5	10	53.6
	(-40)	(5.2)	-40	3.0	20	58.9
	(-30)	(8.8)	-30	5.5	30	60.6
	(-20)	(14.8)	-20	9.7	40	65.5
	(-10)	(25.1)	-10	16.2	50	72
	(-5)	(32.4)	-5	20.5	60	81
Iso amyl benzene	(0)	(43.3)	0	26.2	65	86.8
	(1.5)	(50)	5	35.6	70	95.1
	(1)	(51.1)	7	41.6	73	100
	-80	3	(-45°)	(17.1)	0°	46.3
	-70	5.4	(-35)	(22.8)	10	48.8
	-60	8.4	-25	29.3	20	52.5
	-50	12.4	-15	36.6	30	57.3
Iso amyl benzene	-40	17.9	0	46.6	40	63.4
	(-30)	(27.3)	(0)	(52.3)	50	71.4
	(-25)	(34.4)	(0)	(60.3)	60	81.7
	(-22)	(40.7)	(7)	(66.6)	65	88
	(-20)	(50)	(-21)	(44.2)	70	95.5
	(-22)	(54)	(-10)	(44.9)	73	100

(Menschutkin, Ann Inst Pol P-le Gr 13 1)

Antimony hydrogen trichloride, $2\text{SbCl}_3 + 2\text{HCl}$

Deliquescent Decomps by H_2O
Molts in crystal H_2O at 16° (Engel C R 106 1797)

Antimony pentachloride, SbCl_5

Deliquesces to $\text{SbCl}_3 + \text{HCl}$ which can be crystallized out of a little H_2O . Decomps by more H_2O into SbOCl . Sol in a large amt of H_2O , if it is added all at one time. Capitation by H_2O is also hindered by presence of tartaric, or hydrochloric acid.

+ H_2O Deliquescent Sol in chloroform (Anschutz and Evans, A 239 285)

+ CHCl_3 Insol in chloroform (Anschutz and Evans)

Antimony pentachloride with MCl

See Chlorantimonate, M

See also below

Antimony hydrogen pentachloride, SbCl_5 , $\text{HCl} + 4\frac{1}{2}\text{H}_2\text{O}$

"Metachlorantimonic acid" according to Weinland and Schmid, (Z anorg 1905, 44 43)

Very easily sol in H_2O , alcohol, acetone and glacial acetic acid. Aqueous solution decomp on standing with separation of Sb_2O_3 but remains clear in presence of 10% HCl (Weinland and Schmid, Z anorg 1905, 44 43)

SbCl_5 , $5\text{HCl} + 10\text{H}_2\text{O}$ Not deliquescent. Decomp by H_2O . Melts in crystal H_2O at about 55° (Engel, C R 106 1797)

Antimony antimonyl chloride, SbCl_3 , SbOCl

More easily attacked by H_2O than SbOCl (Bemmelen, Z anorg 1903, 33 293)

Antimony antimonyl potassium chloride, SbCl_3 , SbOCl , 2KCl

Not deliquescent. Immediately decomp by hot or cold H_2O , sol in hot glacial $\text{HC}_2\text{H}_3\text{O}_2$, or in HCl , or tartaric acid + Aq

Insol in KCl + Aq, hot or cold alcohol, CS_2 , or ligroine (Benedikt, Proc Am Acad 29 217)

Antimony antimonyl rubidium chloride, SbCl_3 , SbOCl , 2RbCl

Sol in very dil HCl + Aq (Wells, Am J Sci 1897, (4) 3 463)

Antimony barium chloride, SbCl_3 , $\text{BaCl}_2 + \frac{3}{2}\text{H}_2\text{O}$

Decomp by H_2O

Antimony caesium chloride, SbCl_3 , 6CsCl

Decomp by H_2O . Cryst from dil HCl + Aq (Godeffroy, Arch Pharm (3) 12 47)

2SbCl_3 , 3CsCl Decomp by H_2O , sl sol in cold, easily in hot dil HCl + Aq. This is identical with the above salt (Saunders, Am Ch J 14 152)

SbCl_3 , 2CsCl Sol in boiling conc HCl + Aq without decomp (Setterberg, Oef Vet Akad 1882, 6 23)

SbCl_3 , CsCl Cryst from HCl + Aq without decomp. Decomp by H_2O (Setterberg, Oef Vet Akad 1882, 6 27)

Antimony calcium chloride, SbCl_3 , $\text{CaCl}_2 + 8\text{H}_2\text{O}$

Easily decomp (Benedikt, Proc Am Acad 1895, 30 9)

$\text{SbCl}_3 \cdot \text{CaSbCl}_3 \cdot \text{OH} + 9\text{H}_2\text{O}$ Deliquescent, sl sol in H_2O (Weinland, B 1901, 34 2635)

Antimony chromium chloride,

CrCl_3 , $3\text{SbCl}_3 + 13\text{H}_2\text{O}$ (Weinland) should be

$[\text{SbCl}_2]_3[\text{Cr}(\text{OH})_2]_3 + 7\text{H}_2\text{O}$, and CrCl_3 , $\text{SbCl}_3 + 10\text{H}_2\text{O}$ should be

$[\text{SbCl}_2]_3[\text{Cr}(\text{OH})_2]_3 + 6\text{H}_2\text{O}$ (Pfeiffer, Z anorg 1903, 36 349)

Antimony glucinum chloride, SbCl_3 , $\text{GlCl}_2 + 3\text{H}_2\text{O}$

Very hygroscopic. Decomp by H_2O . Very easily sol in HCl (Ephraim, B 1903, 36 1822)

+ $4\text{H}_2\text{O}$ Ppt. Decomp by H_2O . Sol in HCl (Ephraim, B 1903, 36 1822)

Antimony hydrazine chloride, SbCl_3 , $3\text{N}_2\text{H}_4\text{Cl}$

Sol in conc HCl + Aq, decomp by H_2O (Ferrattini, C A 1912, 1613)

Antimony lithium chloride, SbCl_3 , $2\text{LiCl} + 5\text{H}_2\text{O}$

Hygroscopic. Decomp by H_2O . Very easily sol in HCl (Ephraim, B 1903, 36 1821)

+ $6\text{H}_2\text{O}$ Decomp by H_2O , easily sol in HCl (Ephraim, B 1903, 36 1822)

Antimony magnesium chloride, SbCl_3 , $\text{MgCl}_2 + 5\text{H}_2\text{O}$

Hygroscopic. Decomp by H_2O . Can be cryst from HCl without decomp (Ephraim, B 1903, 36 1823)

2SbCl_3 , MgCl_2 Hygroscopic. Decomp by H_2O . Very sol in HCl (Ephraim)

$\text{SbCl}_3 \cdot \text{MgSbCl}_3 \cdot \text{MgOH} + 17\text{H}_2\text{O}$ Hydroscopic. Sol in H_2O with decomp (Weinland, B 1901, 34 2635)

Antimony nitrosyl chloride, SbCl_3 , NOCl

Very deliquescent, decomp by pure H_2O sol in H_2O containing tartaric acid (Weber, Pogg 123 347)

2SbCl_3 , 5NOCl Decomp by H_2O (Sudborough, Chem Soc 59 661)

Antimony phosphorus chloride, SbCl_3 , PCl_3

Deliquescent (Weber, Pogg 125 78)

Antimony phosphoryl chloride, SbCl_3 , POCl_3

Deliquescent (Weber)

Antimony platinum potassium chloride,

$(\text{Sb}, \text{Pt})\text{Cl}_6\text{K}$

Ppt (Weinland, B 1903, 38 1056)

Antimony potassium chloride, SbCl_3 , 2KCl

Sol in H_2O without decomp (Jaquelain, A ch (2) 66 125)

Not deliquescent. Immediately decomp by hot or cold H_2O . Sol in HCl , or tartaric acid + Aq (Benedikt, Proc Am Acad 29 219)

+ $2\text{H}_2\text{O}$ Very efflorescent

SbCl_3 , 3KCl Deliquescent. Decomp by hot H_2O (Poggiale)

+ $2\text{H}_2\text{O}$ (Romanis, C N 49 273)

Not obtained by Benedikt (l c)

10SbCl_3 , 23KCl True composition of above salts. Sol in H_2O (Herty Am Ch J 1894, 16 495)

SbCl_3 , 2KCl is the only true compound, all

others being isomorphous mixtures (Jordis, B 1903, **36** 2539)

2SbCl₃, 3KCl Deliquescent Decomp by H₂O (Bosek, Chem Soc 1895, **67** 516)

SbCl₃KSbCl₃KOH Hydroscopic Sol in H₂O with decomp (Weinland, B 1901, **34** 2635)

See also Antimony antimonyl potassium chloride

Antimony rubidium chloride, SbCl₃, RbCl

Decomp on air or with H₂O (Saunders, Am Ch J **14** 162)

2SbCl₃, RbCl + H₂O Decomp on air (Wheeler, Z anorg **5** 253)

SbCl₃, 6RbCl Decomp by H₂O (Godefroy, Arch Pharm (3) **9** 343)

Formula is 10SbCl₃, 23RbCl (?) (Saunders Am Ch J **14** 159)

10SbCl₃, 23RbCl (?) Decomp by H₂O, sol in HCl + Aq (Saunders)

Formula is 3SbCl₃, 7RbCl (Wells and Foote, Am J Sci 1897, (4) **3** 461)

Composition assigned to this salt by Saunders (Am Ch J **14** 155) is incorrect (Ephraim, B 1903, **36** 1817)

3SbCl₃, 5RbCl As above (Saunders)

Formula is 2SbCl₃, 3RbCl (Wheeler)

Rb₂SbCl₆ Ppt Decomp by H₂O (Weinland, B 1905, **38** 1083)

Rb₂SbCl₆, 2Rb₂SbCl₆ Ppt Decomp by H₂O (Weinland, B, 1901, **34** 2635)

Antimony selenium chloride, SbCl₃, SeCl₄

Deliquescent (Weber)

Antimony selenyl chloride, SbCl₃, SeOCl₂

Very deliquescent (Weber, Pogg **125** 325)

Antimony sodium chloride, SbCl₃, 3NaCl (?)

Decomp by much H₂O (Poggiale)

Antimony sulphur chloride, 2SbCl₃, 3SbCl₂

Decomp by H₂O

SbCl₃, SCl₄ Sol in dil HNO₃ + Aq

Mpt 125-126° in an atmos of chlorine Violently decomp by H₂O (Ruff, B 1904, **37** 4515)

Antimony thallium chloride, SbCl₃, 3TlCl

Ppt (Ephraim, Z anorg 1909, **61** 249)

SbCl₃, TlCl (Ephraim and Barteczko, Z anorg 1909, **61** 251)

2SbCl₃, 2TlCl, TlCl₃ Slowly decomp by cold H₂O (Ephraim and Barteczko, Z anorg 1909, **61** 253)

Antimony trichloride ammonia, SbCl₃, NH₃

Not very deliquescent Decomp by H₂O

Antimony pentachloride ammonia, SbCl₅, 6NH₃

Decomp by H₂O (Persoz)

Antimony pentachloride cyanhydric acid, SbCl₅, 3HCN

Deliquescent, decomp by H₂O (Kl n, A **74** 85)

Antimony pentachloride nitric oxide, SbCl₅, NO

Decomp by H₂O (Besson, C F **108** 1012)

Antimony pentachloride nitrogen peroxide, 3SbCl₅, 2NO₂

Decomp by H₂O (Besson)

Antimony pentachloride nitrogen sulphide, SbCl₅, N₄S₄

Easily decomp (Davis, Chem Soc 1906, **89** 1577)

Decomp by cold H₂O, HCl, H₂SO₄ and warm alcohol, also by boiling with KOH + Aq Almost insol in organic solvents (Wells, Z anorg 1908, **57** 283)

Antimony chloride potassium bromide, SbCl₃, 3KBr + 1½H₂O

Very deliquescent Decomp by much H₂O (Atkinson, Chem Soc **43** 289)

2SbCl₃, 3KBr + 2H₂O (Atkinson)

SbCl₃, KBr + H₂O (Atkinson)

Above are mixtures (Herty, Am Ch J **1894**, **16** 497)

See Antimony bromide potassium chloride

Antimony chlorofluoride, SbCl₃F₂

(Swarts, Z anorg 1896, **12** 71)

Antimony fluoriiodide, SbF₃I

Slowly decomp by H₂O (Ruff, B 1906, **39** 4321)

(SbF₃)₂I Sol in H₂O with pptn of I₂ (Ruff, B 1906, **39** 4321)

Antimony trifluoride, SbF₃

Deliquescent Sol in H₂O

Solubility in H₂O at t°

t°	100 g of the solution contain g SbF ₃	100 g H ₂ O contain g SbF ₃
0°	79.37	38.7
20	81.64	44.7
22.5	81.91	45.8
25	83.12	49.2
30	84.93	56.6

(Rosenheim, Z anorg 1909, **61** 18)

Solubility in HI + Aq at 0°

Normality of HI + Aq	100 g H ₂ O of the solution dissolve g SbF ₃	solu
2	474.9	
1	432.5	
0.5	404.0	

(Rosenheim, Z anorg 1909, **61** 19)

Solubility of SbF_3 in salts + Aq at 0°

Salt	Normality of salt solution	100 g H ₂ O of the salt solution dissolve g SbF ₃
KCl	1	461.8
	0.5	448.3
	0.25	431.9
	0.125	407.3
KBr	1	448.7
	0.5	450.0
	0.25	455.6
	0.125	417.2
KNO ₃	1	458.2
	0.5	451.9
	0.25	418.3
	0.125	401.4
½K ₂ SO ₄	1	419.9
	0.5	408.5
	0.25	406.6
½K ₂ C ₂ O ₄	1	465.7
	0.5	481.2
	0.25	451.3
	0.125	405.2
½(NH ₄) ₂ C ₂ O ₄	0.5	431.9
	0.25	442.3
	0.125	433.3
½K ₂ C ₄ H ₄ O ₆	1	461.4
	0.5	430.5
	0.25	430.8
	0.125	435.2

(Rosenheim, Z anorg 1909, 61 192)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 826)

Antimony pentafluoride, SbF_5

Sol in H_2O (Maignac, A 145 239)
 Very hygroscopic, bpt 155° Sol in H_2O with hissing (Ruff, B 1904, 37 678)
 $+2\text{H}_2\text{O}$ (Ruff, B 1904, 37 679)

Antimony pentafluoride diantimony trifluoride, $\text{Sb}_3\text{F}_{11} = 2\text{SbF}_3 \cdot \text{SbF}_5$

Hygroscopic, bpt 390° Easily sol in H_2O (Ruff, B 1904, 37 680)

Antimony pentafluoride pentantimony trifluoride, $\text{SbF}_5 \cdot 5\text{SbF}_3$

Bpt 384° (corr) (Ruff, B 1904, 37 681)

Antimony caesium fluoride,

$\text{CsF} \cdot 2\text{SbF}_3$
 $\text{CsF} \cdot 3\text{SbF}_3$
 $4\text{CsF} \cdot 7\text{SbF}_3$
 $\text{CsF} \cdot \text{SbF}_3$
 $2\text{CsF} \cdot \text{SbF}_3$
 (Wells, Am J Sci 1901, (4) 11 451)

Antimony lithium fluoride, $\text{SbF}_3 \cdot 2\text{LiF}$

Sol in more than 20 pts H_2O (Flückinger, Pogg 87 245)

$\text{SbF}_3 \cdot \text{LiF}$ Easily sol in H_2O (Stein, Chem Z 13 357)

Antimony potassium fluoride, $\text{SbF}_3 \cdot 2\text{KF}$

Sol in less than 2 pts boiling, and in 9 pts cold H_2O Insol in alcohol or ether

$\text{SbF}_3 \cdot \text{KF}$ More sol than $\text{SbF}_3 \cdot 2\text{KF}$ Sol in 2.8 pts H_2O (Flückinger, Pogg 87 245)

$\text{SbF}_3 \cdot \text{KF}$ Easily sol in H_2O

$\text{SbF}_3 \cdot 2\text{KF} + 2\text{H}_2\text{O}$ Easily sol in H_2O (Maignac, A 145 239)

Antimony sodium fluoride, $\text{SbF}_3 \cdot 3\text{NaF}$

Sol in 14 pts cold, and 4 pts boiling H_2O Sol in HF (Flückinger, Pogg 87 245)

$\text{SbF}_3 \cdot \text{NaF}$ 100 pts cold H_2O dissolve 93 pts 100 pts hot H_2O dissolve 166 pts (Stein, Wagners' J B 1887 1160)

$4\text{SbF}_3 \cdot \text{NaF}$ As NH_4 salt (Raad and Hauser, B 1890, 23 R 125)

$\text{SbF}_3 \cdot 2\text{NaF}$ Easily sol in H_2O (Maignac, A 145 329)

Antimony thallium fluoride, $\text{TlF} \cdot \text{SbF}_3$

Sol in H_2O without decomp (Ephraim, B 1909, 42 4458)

$\text{TlF} \cdot 2\text{SbF}_3$ Sol in H_2O without decomp (Ephraim)

$\text{TlF} \cdot 3\text{SbF}_3$ Sol in H_2O without decomp

Antimony trifluoride ammonia, SbF_3

Sl sol in liquid NH_3 (Ruff, B 1904, 4326)

Antimony trifluoride ammonium chloride $\text{SbF}_3 \cdot \text{NH}_4\text{Cl}$

Easily sol in H_2O (de Haen, B 21 901 R)

Antimony trifluoride ammonium sulphate, $\text{SbF}_3 \cdot (\text{NH}_4)_2\text{SO}_4$

More sol than K or Na salt 1 pt H_2O dissolves 1.4 pts at 24° and 15 pts at 100° (de Haen, B 21 902 R)

Antimony fluoride lithium chloride, $\text{SbF}_3 \cdot \text{LiCl}$

Sol in H_2O (Stein, Chem Z 13 357)

Antimony pentafluoride nitrosyl fluoride, $\text{SbF}_5 \cdot \text{NOF}$

Hygroscopic Decomp by H_2O Sol in liquid NH_3 with decomp Sl sol in NOCl , SiCl_4 , PCl_3 , AsCl_3 , SO_2Cl_2 and SOCl_2 (Ruff, Z anorg 1908, 58 434)

Antimony trifluoride potassium chloride, $\text{SbF}_3 \cdot \text{KCl}$

100 pts H_2O dissolve 51 pts at 24° , and 300 pts at 100° (de Haen, B 21 901 R)

- Antimony trifluoride potassium sulphate**, $\text{SbF}_3, \text{K}_2\text{SO}_4$
Sol in H_2O (de Haen)
 $2\text{SbF}_3, \text{K}_2\text{SO}_4$ Very sol in H_2O (Mayer, B 1894, 27 R 922)
- Antimony trifluoride sodium chloride**, $\text{SbF}_3, \text{NaCl}$
Easily sol in H_2O (de Haen, B 21 901 R)
- Antimony trifluoride sodium sulphate**, $\text{SbF}_3, \text{Na}_2\text{SO}_4$
Sol in H_2O (de Haen)
- Antimony fluoiodide**, SbF_2I
Mpt 80° , slowly decomp by H_2O (Ruff, B 1906, 39 4321)
 $(\text{SbF}_2)_2\text{I}$ Mpt $110-115^\circ$, decomp by H_2O (Ruff)
- Antimony fluosulphide**, SbF_2S
Very hygroscopic. Decomp by H_2O . Sol with decomp in alcohol. Sol in CCl_4 (Ruff, B 1906, 39 4322)
- Antimony gold**, AuSb
Insol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 72)
- Antimony hydride**, SbH_3
Scarcely sol in H_2O . 1000 ccm H_2O absorb 4.12 cc SbH_3 at 10.5° . Decomp by long contact with H_2O , also by conc H_2SO_4 or $\text{KOH} + \text{Aq}$ (Jones, Chem Soc 29 641)
- Antimony trihydroxide**, $\text{Sb}_2\text{O}_3, 2\text{H}_2\text{O} = \text{Sb}_2\text{O}_3(\text{OH})_4$
(Schaffner, A 51 182)
 $\text{Sb}(\text{OH})_3$ Ppt (Clarke and Stolla, B 13 1787)
Does not exist (Guntz, C R 102 1472)
See Antimonous acid and antimony trioxide
- Antimony triiodide**, SbI_3
Decomp by H_2O or 50% alcohol. Sol in $\text{HI} + \text{Aq}$, sol in boiling CS_2 and in boiling benzene, but separates out on cooling. Almost insol in $\text{C}_2\text{H}_5\text{Cl}$ (Cooke, Proc Am Acad (2) 5 72)
Easily sol in AsI_3 (Walden, Z anorg 1902, 29 574)
Sol in warm AsI_3 . Sp gr of a solution sat at 40° which solidifies at 37° , = 3.720. This dissolves further AsI_3 , whereby the mpt sinks to 31° and sp gr rises to 3.501. By mixing the latter solution with a solution of AsI_3 in CH_2I_2 , a liquid can be obtained with a sp gr of 3.702 at 20° (Retgers, Z phys Ch 1893, 11 340)
Sol in PCl_3 (Buckmann, Z anorg 1906, 51 110)
Sol in SOCl_2 (Walden, Z anorg 1900, 25 215)
Sol in SOCl_2 and S_2Cl_2 (Walden, Z anorg 1900, 25 216)
Sol in AsCl_3 (Walden, Z anorg 1901, 25 214)
Sol in SnCl_4 (Walden, Z anorg 1901, 25 218)
Sol in POCl_3 (Walden, Z anorg 1901, 25 212)
Easily sol in PCl_3 and PBr_3 (Walden, Z anorg 1900, 25 211)
Partly sol in, and partly decomp by alcohol or ether (M'Ivor, Chem Soc (2) 4 328)
Insol in oil of turpentine and CCl_4
100 pts methylene iodide dissolve 11.3 pts SbI_3 at 12° , sp gr of solution = 3.453 (Retgers, Z anorg 3 343)
Sol in C_6H_6 (Retgers, Z phys Ch 1 18, 11 334)
Sol in acetone (Naumann, B 1904 17 4328)
- Antimony pentaoxide**, Sb_2O_5
Very unstable (Pendleton, C N 48 7)
- Antimony barium iodide**, $\text{SbI}_3, \text{BaI}_2 + 9\text{H}_2\text{O}$
Decomp by H_2O . Sol in HCl , $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$. CS_2 dissolves out I_2 (Schaffer, Pogg 109 611)
- Antimony caesium iodide**, $2\text{SbI}_3, 3\text{CsI}$
Sl sol in $\text{HI} + \text{Aq}$. Exists in two distinct forms (Wells, Am J Sci 1901, (4) 11 5)
- Antimony potassium iodide**, $2\text{SbI}_3, 3\text{KI} + 3\text{H}_2\text{O}$
Decomp by H_2O . Sol in HCl , $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$. CS_2 dissolves out I_2 (Schaffer, Pogg 109 611)
 $\text{SbI}_3, 2\text{KI} + 2\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O (Nickles, J Pharm (3) 39 116)
- Antimony rubidium iodide**, $2\text{SbI}_3, 3\text{RbI}$
Decomp by H_2O (Wheeler, Z anorg 5 259)
- Antimony sodium iodide**, $2\text{SbI}_3, 3\text{NaI} + 12\text{H}_2\text{O}$
 $\text{As}_2\text{SbI}_3, 3\text{KI}$ (Schaffer, Pogg 109 1)
- Antimony thalious iodide**, $2\text{SbI}_3, 3\text{HI}$
Decomp by H_2O and by $\text{HCl} + \text{Aq}$, al by alcohol (F phram, Z anorg 1908, 58 14)
- Antimony nitride**, SbN
Decomp by heat (Ermundischer, B 10, 43 1471)
- Antimony trioxide**, Sb_2O_3
Very sl sol in H_2O . Sol in 8900-10000 pts H_2O at 100° , 55,000-61,100 pts at 15° (Schulze, J pr (2) 27 320)
Sol in $\text{HCl} + \text{Aq}$. Insol in $\text{HNO}_3 + \text{Aq}$ but not as insol as metastannic acid. Sol in old fuming HNO_3 or H_2SO_4 . Insol in dil but sol in conc alkalis, or alkali carbon s+

Aq Sol in cold NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$
Sol in 15 pts boiling SbCl_3 (Schneider, Pogg 108 407)

Sol in $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$, and not pptd from these solutions by H_2O . Easily sol in benzoic acid. Insol in pyrotartaric acid. Very sol in $\text{KHC}_4\text{H}_4\text{O}_6 + \text{Aq}$. Sol in glycerine.

Somewhat sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Köhler, Dingl 1885, 258 520)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 826)

Sol in lactic acid (Kretzschmar, Ch Z 1888, 12 943)

Sol in grape sugar solution to which $\text{Ca}(\text{OH})_2$ has been added (Vogel, B 1885, 18, R 38)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Sol in glycerine in presence of alkalis (Köhler, Dingl 1885, 258 520)

Exists in a sol colloidal modification (Spring, B 16 1142)

Min *Valentinite*, *Senarmontite*
+ H_2O See **Antimonous acid**

Antimony tetroxide, Sb_2O_4

Insol in H_2O . Slightly attacked by acids, hot conc $\text{HCl} + \text{Aq}$ acts only slightly (Fresenius)

Min *Cervantite*. Sl sol in $\text{HCl} + \text{Aq}$

Antimony pentoxide, Sb_2O_5

Insol in H_2O . Easily sol in $\text{HCl} + \text{Aq}$. Sl sol in conc $\text{KOH} + \text{Aq}$

"Antimonoxvd" is sol in glycerine in presence of alkalis

100 g glycerine, to which have been added 10 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 20.6 g at b-pt, 20 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 36.0 g at b-pt, 40 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 68.5 g at b-pt, 80 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 93.0 g at b-pt, 120 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 119.2 g at b-pt (Köhler, Dingl 258 520)

See also **Antimonic acid**

Antimony nitrogen pentoxide, 2SbO_5 , N_2O_5

Not decomp by H_2O (Thomas, C R 1895, 120 1116)

Antimony oxybromide

See **Antimonyl bromide**

Antimony oxychloride

See **Antimonyl chloride**

Antimony oxyfluoride

See **Antimonyl fluoride**

Antimony oxysulphide, $\text{Sb}_2\text{O}_3\text{S}$

Min *Antimony blends* (*kermesite*)

Insol in H_2O or dil acids, except $\text{HCl} + \text{Aq}$ (Schneider, Pogg 110 147)

Antimony palladium, Sb_2Pd

Sl sol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 69)

Antimony platinum, Sb Pt

Insol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 67)

Antimony phosphide, SbP

Insol in benzene, ether, or CS_2 (M'Ivor, B 6 1362)

Antimony selenide, SbSe

(Chrétien, C R 1906, 142 1341)

Sb_2Se_4 (Chrétien, *lc*)

Sb_2Se_3 (Chrétien, *lc*)

Sb_2Se_3 Sol in $\text{KOH} + \text{Aq}$ (Hofacker, A 107 6)

Sb_2Se_3 (Hofacker)

Antimony selenide, with M selenide

See **Selenoantimonates, M**

Antimony trisulphide, Sb S_3 (*Kermes*)

Insol in H_2O and dil acids

1 l H_2O dissolves 5.2×10^{-5} mols pptd Sb_2S_3 at 18° (Weigel, Z phys Ch 1907, 58 294)

Decomp by conc HNO_3 or H_2SO_4 . Sol in conc $\text{HCl} + \text{Aq}$. Easily sol in dil KOH , NaOH , $(\text{NH}_4)_2\text{S}$, and $\text{K}_2\text{S} + \text{Aq}$. Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$, very sl sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, insol in $\text{KSH} + \text{Aq}$ (Fresenius)

Sol in a mixture of 50 pts H_2O and 18 pts HCl (sp gr 1.16) even when completely sat with H_2S (Lung and Carson, J Soc Chem Ind 1902, 21 1018)

Sl sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Guerout, C R 1872, 75 1276)

Cryst Sb S_3 is only sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (1 pt in about 2000 pts NH_4OH)

Pptd amorphous Sb_2S_3 is appreciably more sol (1 pt in 600 pts NH_4OH) (Guerout, J pr 1843, 29 83)

Sl sol in hot 2% $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ still less sol in cold (Matene, C C 1906, II 557)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$

Sol in 14-15 pts pure SbCl_3 (Schneider, Pogg 108 407)

Slowly sol in $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$

Sol in boiling $\text{Na}_2\text{SbS}_4 + \text{Aq}$

Sol in hot citric, tartaric and oxalic acids. Sl sol in malic, benzoic, picric and pyrogallic acids. Insol in formic and acetic acids. Especially easily sol in citric and oxalic acids with addition of KNO_3 , KNO or KClO_3 (Bolton, C N 1878, 37 86 and 99)

Sol in ethylamine sulphhydrate + Aq

Min *Stibnite*. Sol in cold citric acid + Aq (Bolton, C N 37 11)

Soluble modification. Sb S_3 may be obtained in a colloidal state in aqueous solution containing 1 pt Sb S_3 to 200 pts H_2O . This can be boiled without decomp, but Sb S_3 is pptd by acids and salts.

- Antimony trifluoride potassium sulphate**, $\text{SbF}_3, \text{K}_2\text{SO}_4$
Sol in H_2O (de Haen)
 $2\text{SbF}_3, \text{K}_2\text{SO}_4$ Very sol in H_2O (Mayer, B 1894, 27 R 922)
- Antimony trifluoride sodium chloride**, $\text{SbF}_3, \text{NaCl}$
Easily sol in H_2O (de Haen, B 21 901 R)
- Antimony trifluoride sodium sulphate**, $\text{SbF}_3, \text{Na}_2\text{SO}_4$
Sol in H_2O (de Haen)
- Antimony fluoiodide**, SbF_2I
Mpt 80° , slowly decomp by H_2O (Ruff, B 1906, 39 4321)
 $(\text{SbF}_2)_2\text{I}$ Mpt $110-115^\circ$, decomp by H_2O (Ruff)
- Antimony fuosulphide**, SbF_2S
Very hygroscopic. Decomp by H_2O . Sol with decomp in alcohol. Sol in CCl_4 (Ruff, B 1906, 39 4372)
- Antimony gold**, Au_3Sb
Insol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 72)
- Antimony hydride**, SbH_3
Scarcely sol in H_2O . 1000 ccm H_2O absorb 4.12 cc SbH_3 at 10.5° . Decomp by long contact with H_2O , also by conc H_2SO_4 or $\text{KOH} + \text{Aq}$ (Jones, Chem Soc 29 641)
- Antimony trihydroxide**, $\text{Sb}(\text{OH})_3 \cdot 2\text{H}_2\text{O}$
 $\text{Sb}(\text{OH})_3$ (Schaffner, A 51 182)
 $\text{Sb}(\text{OH})_3$ Ppt (Clarke and Stolla, B 13 1787)
Does not exist (Gauntz, C R 102 1472)
See Antimonous acid and antimony trioxide
- Antimony triiodide**, SbI_3
Decomp by H_2O or SO_2 ; alcohol. Sol in $\text{HI} + \text{Aq}$ sol in boiling CS_2 and in boiling benzene but separates out on cooling. Almost insol in CHCl_3 (Coolidge, Proc Am Acad (2) 5 72)
Easily sol in AsI_3 (Walden, Z anorg 1902 29 574)
Sol in warm AsI_3 . Sp gr of a solution sat at 40° which solidifies at $37-37.2^\circ$. This dissolves further AsI_3 whereby the mpt sinks to 31° and sp gr rises to 3.801. By mixing the latter solution with a solution of AsI_3 in CHCl_3 a liquid can be obtained with a sp gr of 3.702 at 20° (Retgers, Z phys Chem 1899, 11 40)
Sol in PCl_5 (Pechmann, Z anorg 1906 51 110)
Sol in SOCl_2 (Walden, Z anorg 1900
- Sol in SOCl_2 and S_2Cl_2 (Walden, Z anorg 1900, 25 216)
Sol in AsCl_3 (Walden, Z anorg 900, 25 214)
Sol in SnCl_4 (Walden, Z anorg 1900, 25 218)
Sol in POCl_3 (Walden, Z anorg 1900, 25 212)
Easily sol in PCl_5 and PBr_5 (Walden, Z anorg 1900, 25 211)
Partly sol in, and partly decomp by alcohol or ether (M'IVOR, Chem Soc 1911 14 328)
Insol in oil of turpentine and CCl_4 . 100 pts methylene iodide dissolve 1 pt SbI_3 at 12° , sp gr of solution = 3.453 (Retgers, Z anorg 3 343)
Sol in C_6H_6 (Retgers, Z phys Chem 1893, 11 334)
Sol in acetone (Naumann, B 1904, 37 4328)
- Antimony pentaoxide**, Sb_2O_5
Very unstable (Pendleton, C N 1907 97)
- Antimony barium iodide**, $\text{SbI}_3, \text{BaI}_2 + \text{H}_2\text{O}$
Decomp by H_2O . Sol in HCl , H_2SO_4 , or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$. CS_2 dissolves only SbI_3 (Schaffer, Pogg 109 611)
- Antimony caesium iodide**, $2\text{SbI}_3, 3\text{CsI}$
Sl sol in $\text{HI} + \text{Aq}$. Exists in two distinct forms (Wells, Am J Sci 1901, (4) 455)
- Antimony potassium iodide**, $2\text{SbI}_3, 3\text{KI} + 3\text{H}_2\text{O}$
Decomp by H_2O . Sol in HCl , H_2SO_4 , or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$. CS_2 dissolves only SbI_3 (Schaffer, Pogg 109 611)
 $\text{SbI}_3, 2\text{KI} + 2\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O (Nickles, J Pharm (3) 39 116)
- Antimony rubidium iodide**, $2\text{SbI}_3, 3\text{RbI}$
Decomp by H_2O (Whacker, Z anorg 5 259)
- Antimony sodium iodide**, $2\text{SbI}_3, 3\text{NaI} + 12\text{H}_2\text{O}$
 $\text{As}_2\text{SbI}_6, 3\text{KI}$ (Schaffer, Pogg 109 611)
- Antimony thallos iodide**, $2\text{SbI}_3, 3\text{I}$
Decomp by H_2O and by $\text{HCl} + \text{Ac}$ also by alcohol (Iphigium, Z anorg 1908, 8 354)
- Antimony nitride**, SbN
Decomp by heat (Frunz Fischer, B 1910, 43 1471)
- Antimony trioxide**, Sb_2O_3
Very sl sol in H_2O . Sol in 89-10,000 pts H_2O at 100° , 55,000-61,100 pts at 15° (Schulze, J pr (2) 27 320)
Sol in $\text{HCl} + \text{Aq}$. Insol in HNO_3 . Aq, but not as insol as metastannic acid. Sl in cold fuming HNO_3 , or H_2SO_4 . Insol in dil, but sol in conc alkalis, or alkali carbonates +

Aq Sol in cold NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$
Sol in 15 pts boiling SbCl_3 (Schneider, Pogg 108 407)

Sol in $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$, and not pptd from these solutions by H_2O Easily sol in benzoic acid Insol in pyrotartaric acid Very sol in $\text{KHC}_4\text{H}_4\text{O}_6 + \text{Aq}$ Sol in glycerine

Somewhat sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Kohler, Dngl 1885, 258 520)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 826)

Sol in lactic acid (Kretschmar, Ch Z 1888, 12 943)

Sol in grape sugar solution to which $\text{Ca}(\text{OH})_2$ has been added (Vogel, B 1885, 18, R 38)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Sol in glycerine in presence of alkalis (Kohler, Dngl 1885, 258 520)

Exists in a sol colloidal modification (Spring, B 16 1142)

Min *Valentinite*, *Senarmontite*
 $+ \text{H}_2\text{O}$ See Antimonous acid

Antimony tetroxide, Sb_2O_4

Insol in H_2O Slightly attacked by acids, hot conc $\text{HCl} + \text{Aq}$ acts only slightly (Fresenius)

Min *Cervantite* Sl sol in $\text{HCl} + \text{Aq}$

Antimony pentoxide, Sb_2O_5

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$ Sl sol in conc $\text{KOH} + \text{Aq}$

"Antimonoxvd" is sol in glycerine in presence of alkalis

100 g glycerine, to which have been added 10 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 20.6 g at b-pt, 20 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 36.0 g at b-pt, 40 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 68.5 g at b-pt 80 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 93.0 g at b-pt, 120 g $\text{NaOH} + \text{Aq}$ (1 1), dissolve 119.2 g at b-pt (Kohler, Dngl 258 520)

See also Antimonic acid

Antimony nitrogen pentoxide, $2\text{Sb}_2\text{O}_5, \text{N}_2\text{O}_5$

Not decomp by H_2O (Thomas, C R 1895, 120 1116)

Antimony oxybromide

See Antimonyl bromide

Antimony oxychloride

See Antimonyl chloride

Antimony oxyfluoride

See Antimonyl fluoride

Antimony oxysulphide, Sb_2OS_2

Min *Antimony blende* (*kermesite*)

Insol in H_2O or dil acids, except $\text{HCl} + \text{Aq}$ (Schneider, Pogg 110 147)

Antimony palladium, Sb_2Pd

Sl sol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 69)

Antimony platinum, Sb_2Pt

Insol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 67)

Antimony phosphide, SbP

Insol in benzene, ether, or CS_2 (M'Ivor, B 6 1362)

Antimony selenide, SbSe

(Chrétien, C R 1906, 142 1341)

Sb_2Se_3 (Chrétien, *lc*)

Sb_2Se_5 (Chrétien, *lc*)

Sb_2Se_3 Sol in $\text{KOH} + \text{Aq}$ (Hofacker, A 107 6)

Sb_2Se_5 (Hofacker)

Antimony selenide, with M selenide

See Selenoantimonates, M

Antimony trisulphide, Sb_2S_3 (*Kermes*)

Insol in H_2O and dil acids

1 l H_2O dissolves 5.2×10^{-6} mols pptd Sb_2S_3 at 18° (Weigel, Z phys Ch 1907, 58 294)

Decomp by conc HNO_3 or H_2SO_4 Sol in conc $\text{HCl} + \text{Aq}$ Easily sol in dil KOH , NaOH , $(\text{NH}_4)_2\text{S}$, and $\text{K}_2\text{S} + \text{Aq}$ Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ very sl sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, insol in $\text{KSH} + \text{Aq}$ (Fresenius)

Sol in a mixture of 50 pts H_2O and 18 pts HCl (sp gr 1.16) even when completely sat with H_2S (Lang and Carson, J Soc Chem Ind 1902, 21 1018)

Sl sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Guerout, C R 1872, 75 1276)

Cryst Sb_2S_3 is only sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (1 pt in about 2000 pts NH_3)

Pptd amorphous Sb_2S_3 is appreciably more sol (1 pt in 600 pts NH_3) (Garot, J pr 1843, 29 83)

Sl sol in hot 2% $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ still less sol in cold (Materne, C C 1906, II 557)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$

Sol in 14-15 pts pure SbCl_3 (Schneider, Pogg 108 407)

Slowly sol in $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$

Sol in boiling $\text{Na}_2\text{SbS}_4 + \text{Aq}$

Sol in hot citric, tartaric and oxalic acids Sl sol in malic, benzoic, picric and pyrogallic acids Insol in formic and acetic acids Especially easily sol in citric and oxalic acids with addition of KNO_3 , KNO or KClO_3 (Bolton, C N 1878, 37 86 and 99)

Sol in ethylamine sulphydiate + Aq

Min *Stibnite* Sol in cold citric acid + Aq (Bolton, C N 37 14)

Soluble modification Sb_2S_3 may be obtained in a colloidal state in aqueous solution containing 1 pt Sb_2S_3 to 200 pts H_2O This can be boiled without decomp, but Sb_2S_3 is pptd by acids and salts

Table of maximum dilution of solutions of acids and salts which cause pptn of Sb_2S_3

HCl	1	270
H_2SO_4	1	140
$\text{H}_2\text{C}_2\text{O}_4$	1	45
K_2SO_4	1	65
$(\text{NH}_4)_2\text{SO}_4$	1	130
MgSO_4	1	1720
MnSO_4	1	2060
NaCl	1	135
BaCl_2	1	2050
MgCl_2	1	5800
CoCl_2	1	2500
KNO_3	1	75
Fe_2Cl_6	1	2500
$\text{Ba}(\text{NO}_3)_2$	1	1250
$\text{K}_2\text{Al}(\text{SO}_4)_4$	1	35,000
$(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_4$	1	800
$\text{K}_2\text{Cr}_2(\text{SO}_4)_4$	1	40,000
$\text{KSB}(\text{OC}_2\text{H}_4\text{O})_6$	1	18

(Schulze, J pr (2) 27 320)

Antimony trisulphide with M.S

See Sulphantimonites, M

Antimony pentasulphide, Sb_2S_5

Insol in H_2O , or H_2O containing H_2S Sol in conc $\text{HCl} + \text{Aq}$ Completely sol in $\text{NH}_4\text{OH} + \text{Aq}$, traces dissolve in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ sol in KOH , or $\text{NaOH} + \text{Aq}$, or sulphides + Aq Sol in 50 pts cold $\text{OH} + \text{Aq}$ (Geiger) in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ in cold, but sol in hot alkali carbonates + Aq (Berzelius)

Insol in $\text{Na}_2\text{SbS}_4 + \text{Aq}$

When boiled with alcohol, ether, CS_2 , oil of turpentine, etc, portion of the S is dissolved out (Berzelius)

CS_2 dissolves about 5% of the sulphur (Rammelsberg)

Antimony pentasulphide with M S

See Sulphantimonates, M

Antimony sulphochloride, SbSCl_3

Decomp by moist air in H_2O (Clotz, A ch (3) 30 374)

SbSCl_3 Easily attacked by acids insol in CS_2 (Ouvrard, C R 116 1516)

SbSCl_3 (Ouvrard)

$2\text{SbSCl}_3, 3\text{SbSCl}_3$ Decomp by dil $\text{HCl} + \text{Aq}$ (Schneider)

$\text{SbSCl}_3 7\text{SbSCl}_3$ Deliquescent decomp by H_2O (Schneider Pogg 108 407)

Antimony sulphofluoride, SbSI_3

See Antimony fluosulphide

Antimony sulphiodide, SbSI

Not attacked by H_2O and decomp only by conc acids Insol in CS_2 (Schneider, Pogg 110 147)

SbSI_3 (Henry and Garot)

SbSI_3 Sol in dry CS_2 Very easily decomp (Ouvrard, C R 117 108)

Antimony sulphur dioxide, SbSO_2

Ppt (Faktor, C C 1900, I 1211)

Antimony telluride, SbTe

Insol in H_2O

Sb_2Te_3 Insol in H_2O (Oppenheim, J pr 71 277)

Antimonyl bromide, SbOBr

Insol in CS_2 (Cooke, Proc Am Acad 1 104)

Sl sol in liquid NH_3 (Gore, Am Ch 1898, 20 826)

$\text{Sb}_2\text{O}_3\text{Br}_2$ (M'Ivor, C N 29 179)

$10\text{Sb}_2\text{O}_3\text{Br}_2, \text{SbBr}_3$

Antimonyl chloride

From $\text{SbCl}_3, \text{SbOCl}$ Insol in H_2O D comp by boiling with H_2O , sol in $\text{HCl} + \text{A}$ Insol in alcohol or ether, sol in $\text{CS}_2, \text{CHCl}_3$ or C_6H_6 (Sabanajew, Zeit Ch 1871 204) Insol in liquid NH_3 (Gore, Am Ch 1898, 20 826)

Insol in acetone (Naumann B 1904, 3 4329)

$\text{Sb}_2\text{O}_3\text{Cl}_2$ Algaroth powder Decomp in H_2O Sol in $\text{HCl} + \text{Aq}$ (Cooke, Proc Am Acad 13 1), tartaric acid + Aq (Schaff A 152 135)

$\text{Sb}_2\text{O}_3\text{Cl}_2$ (Cooke)

$\text{Sb}_2\text{OCl}_{12}$

$\text{Sb}_2\text{O}_{10}\text{Cl}_{23}$

From $\text{SbCl}_5, \text{SbOCl}_3$ Deliquescent D composed by H_2O Sol in H_2O (Daubraw A 184 118)

Docs not exist (Anschutz and Evans, 239 285)

$\text{Sb}_2\text{OCl}_{12}$ Deliquescent Insol in Cl_2 , easily sol in tartaric acid + Aq (Willhar, C N 24 224)

$\text{Sb}_2\text{O}_4\text{Cl}_7$ (Williams)

SbO_2Cl Decomp by hot H_2O into HSbO_3

Antimonyl fluoride

From $\text{SbI}_3, \text{Sb}_2\text{O}_3\text{F}_6$ Not deliquesce (Fluckiger, Pogg 87 249)

Antimonyl caesium fluoride, $\text{SbF}_4\text{OH}, \text{CsF}$

(Wells, Am J Sci 1901, (4) 11 456)

Antimonyl sodium fluoride, $\text{SbOF}_3, \text{NaF}$

(H)

Deliquescent Easily sol in H_2O (Mann, A 145 239)

Antimonyl iodide, $\text{Sb}_2\text{O}_3\text{I}_2$

Difficultly sol in solution of tartaric acid or turtrites Decomp by HCl, HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ Easily sol in alkalis, or $(\text{NH}_4)_2\text{S} + \text{Aq}$

SbOI Insol in CS_2 (Cooke, Proc Am Acad (2) 5 72)

Antimonyl sulphide

See Antimony oxysulphide

Argon, A

100 cc H₂O dissolve 4.05 cc argon at 13.9°
 Critical t — 121.6° under 50.6 atmos Bpt —
 186.9° Sp gr 19.9 (Rayleigh, C N 1895,
 71 51-62, 299-302, C C 1895 467)

Coefficient of absorption in H₂O at 12° =
 0.0394, at 13.9° = 0.0405 (Ramsay, Phil
 Trans 1895, 186 A 225)

Absorption by H O at t°

t°	Coefficient of absorption
0°	0.0561
10	0.0438
20	0.0379
30	0.0348
40	0.0338
50	0.0343

(Antropoff, Roy Soc Proc 1910, 83 A 480)

Absorption of argon by H₂O at t° and 760 mm pressure

t°	Coefficient of absorption
0°	0.05780
1	0.05612
5	0.05080
10	0.04525
15	0.04099
20	0.03790
25	0.03470
30	0.03256
35	0.03053
40	0.02865
45	0.02731
50	0.02567

(Estreicher, Z phys Ch 1899, 31 184)

1 l H₂O at 38° absorbs 25.7 cc A
 1 l blood absorbs 25.3 cc A (Regnard
 and Schloesing, C R 1897, 124 303)

Not absorbed by members of the fatty
 series of organic compounds, with members
 of the aromatic series absorption was ob-
 served varying from 8% of the volume em-
 ployed for benzene to 1% for aniline (Berthelot,
 C R 1899, 129 71)

Arsenamides, As(NH₂)₃

Insol in liquid NH₃ Decomp by H₂O
 (Hugot, C R 1904, 139 55)

Arsenic, As

Unaltered by pure H₂O Insol in HCl +
 Aq if air is excluded, but sl sol in presence of
 air Not attacked by dil H₂SO₄ + Aq Oxid-
 ized by conc H₂SO₄, HNO₃, or aqua regia
 Not attacked at 20° by HNO₃, conc or dil,
 or containing NO₂, nor by HNO₃ + HCl, as
 long as they do not act on each other, but if
 treated with the above mixture in extremely
 dilute state, and a few drops of KNO₂ + Aq

are added, the As is attacked at once (Mil-
 lon, A ch (3) 6 101)

Sol in sea water, 0.009 mg per liter off
 Brittany, 0.01 to 0.09 mg per liter near
 Azores (Gautier, C R 1903, 137 232)

Insol in liquid NH₃ (Franklin, Am Ch
 J 1898, 20 827)

Insol in liquid NH₃ (Hugot, A ch 1900,
 (7) 21 31)

Insol in NaOH, KOH, or NH₄OH + Aq
 Sol in S₂Br₂ (Hannay, Chem Soc (2) 11
 823)

Insol in alcohol and ether

Sol in certain fatty oils

Insol in methylene iodide (Retgers, Z
 anorg 3 343)

½ ccm oleic acid dissolves 0.0032 g As in
 6 days (Gates, J phys Ch 1911, 15 143)

Yellow modification Very unstable (Mc-
 Leod, C N 1894, 70 139)

Fairly stable in liquid air (Thomson,
 Chem Soc 1906, 90 (2) 745)

100 ccm CS₂ dissolve at

46° 20° 12° 0° -15° -60°
 11 8 6 4 2 0-2 5 1 0 g As

Less sol in benzene and ethyl acetate
 (Erdmann, Z anorg 1902, 32 448)

Arsenic acid See page 59

Arsenic bromide AsBr₃

Decomp by

about 3 pts boil

presence of HBr

17 261)

Sol in CS

Sol in AlBr₃ (Isbekow, Z anorg 1913,
 84 26)

Easily sol in PCl₃ and PB₃ (Walden,
 Z anorg 1900, 25 211)

Sol in S₂Cl₂ (Walden, Z anorg 1900,
 25 217)

Arsenic caesium bromide, 2AsBr₃, 3CsBr

Decomp by H₂O, can be recryst from
 conc HBr + Aq (Wheeler, Z anorg 4 451)

Arsenic rubidium bromide, 2AsBr₃, 3RbCl

As the corresponding Cs comp

Arsenic bromide ammonia, AsBr₃, 3NH₃

Decomp by H₂O (Besson, C R 110
 1258)

Arsenic bromide copper, 2AsBr₃, 7Cu

Stable toward hot H₂O Decomp by KOH
 (Hilpert and Herrman, B 1913, 46 2224)

Arsenic bromide silver, AsBr₃, 3Ag

Scarcely decomp by cold H₂O (Hilpert
 and Herrmann)

Arsenic chloride, AsCl₃

Miscible with little H₂O, and with alcohol,
 ether, and volatile oils Decomp by much
 H₂O, or by boiling (Gmelin)

Miscible with oil of turpentine, and with olive oil. Somewhat sol in $\text{HCl} + \text{Aq}$.

Easily sol in PCl_5 and PBr_5 (Walden, Z anorg 1900, 25 211).

Sol in liquid CN (Centnerszwer, J russ phys Ges 1901, 33 545).

Sol in S_2Cl_2 (Walden, Z anorg 1900, 25 217).

Arsenic pentachloride, AsCl_5

Fumes in the air with evolution of hydrogen chloride. Readily sol in CS_2 , and absolute ether cooled to -30° (Baskerville, J Am Chem Soc 1902, 24 1070).

Arsenic caesium chloride, $2\text{AsCl}_3, 3\text{CsCl}$

Decomp by H_2O . 100 pts $\text{HCl} + \text{Aq}$ (12 sp gr) dissolve 0.429 pt salt (Wheeler, Z anorg 4 451).

Arsenic iridium phosphorus chloride

See Iridium phosphorus chloride arsenic chloride

Arsenic rubidium chloride, $2\text{AsCl}_3, 3\text{RbCl}$

Decomp by H_2O . 100 pts $\text{HCl} + \text{Aq}$ (sp gr 1.2) dissolve 2.935 pts salt (Wheeler, Z anorg 4 451).

Arsenic chloride, $2\text{AsCl}_3, 3\text{SCl}_2$

by H_2O (Rose)
Compound is a mixture (Nilson, 1)

Arsenic chloride ammonia, $2\text{AsCl}_3, 7\text{NH}_3$

Decomp by cold H_2O , with evolution of NH_3 . From the solution crystallizes $\text{As}_4\text{Cl}_6 \cdot \text{N}_2\text{H}_{10}\text{O}_8$.

Sol in alcohol without decomp (Rose, Pogg 52 62).

Composition is $\text{AsCl}_3, 4\text{NH}_3$ (Besson, C R 110 1258).

Arsenic chloride copper, $2\text{AsCl}_3, 7\text{Cu}$

Somewhat decomp by H_2O . Decomp by KOH , or hot HCl (Hilpert and Herrmann, B 1913, 46 2224).

Arsenic chloride silver, $2\text{AsCl}_3, 7\text{Ag}$

H_2O , NH_4OH and KOH split off Ag (Hilpert and Herrmann).

Arsenic trifluoride, AsF_3

Sol in H_2O with evolution of heat and decomposition (Berzelius).

Easily sol in benzene (Moissan, C R 99 574).

Miscible with alcohol and ether (Meyer, C N 30 169).

Arsenic pentafluoride, AsF_5

Sol in H_2O , alkalis + Aq and liquid AsF_5 with evolution of heat. Absorbed by ether, alcohol and benzene with evolution of heat (Ruff, B 1906, 39 67).

Arsenic potassium fluoride, AsF_5, KF $\frac{1}{2}\text{H}_2\text{O}$

$\text{AsF}_5, 2\text{KF} + \text{H}_2\text{O}$

$\text{AsF}_5, \text{AsOF}_3, 4\text{KF} + 3\text{H}_2\text{O}$ (Maignac, 145 237).

Arsenic fluoride ammonia, $2\text{AsF}_3, 5\text{NH}_3$

Easily decomp by H_2O (Besson, C R 110 1258).

Arsenic pentafluoride nitrosyl fluoride, $\text{AsF}_5 \text{NOF}$

Decomp by H_2O , fuming HCl , $\text{NaOH} + \text{A}$, dry ether and dry alcohol with evolution. NO. Sol in conc HNO_3 , hot conc H_2SO_4 , boiling NOCl and AsF_3 . Insol in CCl_4 and CS_2 (Ruff, Z anorg 1908, 58 327).

Arsenic trifluoride sulphur tetrachloride, $2\text{AsF}_3, \text{SCl}_4$

Very hygroscopic. Decomp by H_2O and NaOH . Decomp by thionyl chloride, CCl_4 , CS_2 , abs alcohol and ether. Decomp by ligron, benzene and toluene (Ruff, B 1907, 37 4520).

Arsenic hydride, AsH_3

Sl sol in H_2O and alkali hydrates + A , with subsequent decomposition. H_2O absorbs $\frac{1}{5}$ vol AsH_3 . Decomp by conc acid. Absorbed rapidly by oil of turpentine, slightly by fixed oils, and not at all by alcohol, ether or $\text{KOH} + \text{Aq}$ (Gmelin).

Insol in $\text{KOH} + \text{Alcohol}$ (Meissner). Not more sol in alkaline solutions than in pure H_2O (Berzelius).

AsH_3 Solid. Insol in H_2O , alcohol, ether, and CS_2 (Wiederhold, Pogg 118 615).

Insol in H_2O , sol in methylene iodide, xylene, or in conc $\text{KOH} + \text{Aq}$ (Retgers, Z anorg 4 403).

Arsenic hydride boron bromide, $\text{AsH}_3, \text{BI}_3$

Easily decomp. Decomp by H_2O . Insol in C (Stock, B 1901, 34 949).

Arsenic diiodide, AsI_3

Decomp by H_2O or alkalis, easily sol in alcohol, ether, chloroform or carbon disulphide (Bunbriger and Phillip, B 14 261).

Not attacked by cold conc H_2SO_4 or by cold fuming HNO_3 . The latter oxidizes on warming. Decomp by pyridine. Sol in boiling acetic anhydride (Hewitt and Wainman, Chem Soc 1907, 91 962).

Arsenic triiodide, AsI_3

Sol in 5-12 pts boiling H_2O , and solution if boiled down deposits pure AsI_3 , but if left to cool slowly, deposits crystals of As_2O_3 and AsOI .

Sl sol in $\text{HCl} + \text{Aq}$.

Sol in POCl_3 , PCl_5 and PBr_5 (Walden, Z anorg 1900, 25 212).

Sol in PCl_3 (Beckmann, Z anorg 1906, 51 110)

Sol in SOCl_2 , S_2Cl_2 and SO_2Cl_2 (Walden, Z anorg 1900, 25 216)

Sol in SnCl_4 (Walden, l c)

Easily sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Sol in AsCl_3 (Walden, Z anorg 1900, 25 214)

Sol in alcohol without decomp

Sol in ether, benzene, chloroform, and CS_2
100 pts methylene iodide dissolve 17.4 pts AsI_3 at 12° (Retgers, Z anorg 3 343)

Arsenic pentaiodide, AsI_5

More or less sol in H_2O , alcohol, CHCl_3 , ether and CS_2 (Sloan, C N 1882, 46 194)

Arsenic caesium iodide, 2AsI_3 , 3CsI

Decomp by H_2O , sol in conc $\text{HI} + \text{Aq}$ (Wheeler, Z anorg 4 451)

Arsenic rubidium iodide, 2AsI_3 , 3RbI

As the corresponding Cs comp

Arsenic sulphur iodide

See Arsenic sulphoxidide

Arsenic triiodide ammonia, 2AsI_3 , 9NH_3

Insol in benzene (Bamberger and Phillip, B 14 2643)

AsI_3 , 4NH_3 (Besson, C R 110 1258)

Arsenic nitride, AsN

Easily decomp into As and N (Hugot, C R 1904, 139 56)

Decomp by heat (Franz Fischer, B 1910, 43 1471)

Arsenic suboxide, As_2O (?)

Insol in H_2O , decomp by dil acids or $\text{NH}_4\text{OH} + \text{Aq}$

Does not exist (Geuther, A 240 208)

Arsenic trioxide, As_2O_3

"White arsenic" exists in two modifications α and β —crystalline, octahedral, opaque, porcelainous, etc., β As_2O_3 —amorphous, vitreous, "arsenic glass"

The data on the solubility of As_2O_3 are very conflicting, the reasons being that (1) the solubility of the two modifications is different, (2) that the length of time necessary to effect solution differs in the two modifications, and (3) that there is a tendency of the amorphous As_2O_3 to go over into the crystalline state during the process of solution α As_2O_3 is also not easily moistened, especially when in a pulverulent condition, which is not the case with the β modification (Winkler, J pr (2) 31 247)

The older data are very unreliable, but possess a certain historical interest

1 pt As_2O_3 is sol in 10.5 pts (Wenzel) 11.34 pts (Fischer) 11.86 pts in $\frac{1}{2}$ hour (Klaproth) 12.2 pts (Bucholz) 15.0 pts (Brandt Bergman) 16.0 pts (Vogel) 24 pts (Lametherie) 40 pts (Porner) 64 pts

(Baumé) 80 pts (Navier) 200 pts (Aschof and Nasse 1812) 640 pts (Hagen 1796) boiling H_2O

1 pt As_2O_3 is sol in 7.72 pts H_2O if α or 9.33 pts if β (Gumbort) in 24 pts H_2O if α or 21 pts if β (Taylor)

Sol in 53.3 pts H_2O at 18.75° (Abl)

Sol in 30 pts H_2O (Nussebrook)

After the solution in H_2O at 100° has been left standing at ordinary temperatures—

1 pt As_2O_3 remains dissolved in 16 pts H_2O at 16° and 20 pts H_2O at 7° (Bucholz) in 33 pts H_2O at 7° (Klaproth) in 38.45 pts H_2O after 3 days 55 pts H_2O after 8 days 64.50 pts H_2O after 2.3 weeks at 10° (Fischer) in 33.52 pts if α As_2O_3 was used 55.06 pts if β As_2O_3 was used (Gumbort) in 38 pts if α As_2O_3 after 6 months 53.71 pts if β As_2O_3 after 48 hours (Taylor)

When an excess of pulverized As_2O_3 is left to digest for several days with cold H_2O —

1 pt dissolves in 50 pts (Bucholz) in 66 pts (Fischer) in 80 pts at 15° (Bergman) in 80 pts if α , and 103 pts if β (Gumbort) 96 pts at 10° (Speiman) 96 pts at 35.5° (Hahneemann) 320 pts H_2O at 20° (Aschof and Nasse 1812)

H_2O at 15.6° or below dissolves less than $\frac{1}{4}\%$ As_2O_3 (Dalton)

To dissolve 1 pt As_2O_3 in 12 pts H_2O it is necessary to boil an excess of As_2O_3 with H_2O if 1 pt As_2O_3 is boiled with 12 pts H_2O considerable remains undissolved and even with 1 pt As_2O_3 to 50–60 pts H_2O long continued boiling is necessary to effect solution. If a clear solution saturated by long boiling with an excess of As_2O_3 is poured off and evaporated continuously to $\frac{1}{2}$ its original bulk no As_2O_3 separates out and the solution contains 1 pt As_2O_3 to 6 pts H_2O (Fischer)

100 pts aqueous solution of β As_2O_3 sat at 15° contain 0.96 pt As_2O_3 and 9.68 pts when sat at 100° (Gumbort)

If 1 pt pulverized As_2O_3 be digested 10 days at 19 – 25° in 5–10 pts H_2O the solution contains 1 pt As_2O_3 to 50 pts H_2O . A solution of same strength is obtained in 25 days by digesting 1 pt As_2O_3 in 40 pts H_2O . If 1 pt As_2O_3 be immersed in 80 pts H_2O the resulting solution contains 1 pt As_2O_3 to 90 pts H_2O

160 pts H_2O 1 pt As_2O_3 to 180 pts H_2O if 1 pt As_2O_3 to 280 pts H_2O and ev H_2O 1 pt As_2O_3 to 1200 pts H_2O and ev pt As_2O_3 is digested at ordinary temper several days with 16 000–100 000 pts H_2O a portion remains undissolved. Pulverized α As_2O_3 was set aside with H_2O in closed bottles for 18 years when 1 pt As_2O_3 was present in 1000 pts H_2O a perfect solution was obtained when 1 pt As_2O_3 in 100 pts H_2O . α As_2O_3 was undissolved when 1 pt As_2O_3 in 35 pts H_2O 0.35% As_2O_3 was undissolved so that the solution contained 1 pt As_2O_3 to 54 pts H_2O (Gmelin)

Porcelainous modification (α As_2O_3) is much more sol in H_2O than the vitreous (β As_2O_3) 100 pts H_2O at ordinary temperature dissolve 0.96 pt β As_2O_3 and 1.25 pts α As_2O_3 100 pts boiling H_2O dissolve 9.68 pts β As_2O_3 and 11.47 pts α As_2O_3 and when the temperature of this solution has fallen to 15° the solution from β As_2O_3 retains 1.78 pts and that from α As_2O_3 retains 2.9 pts (Berzelius [citing Gumbort])

β As_2O_3 dissolves more quickly and abundantly than α As_2O_3 . The same amount H_2O which will take up 36–38 pts β As_2O_3 at 12 – 13° will dissolve only 12–14 pts α As_2O_3 , or 100 pts H_2O dissolve 4 pts β As_2O_3 and 12–13 pts α As_2O_3 . By long boiling with H_2O , α As_2O_3 is converted into β As_2O_3 , and thus requires the solubility of the latter, so that 100 pts boiling H_2O can take up 11 pts α As_2O_3 . But at low temperature β As_2O_3 is converted into α As_2O_3 when in contact with H_2O , so that the solution becomes weaker after a while, and retains only the proportion of As_2O_3 corresponding to the solubility of α As_2O_3 . Communion which hastens the rate of solubility of α As_2O_3 , without increasing the amount dissolved diminishes the solubility of β As_2O_3 , as this is converted into α As_2O_3 .

by the friction or contact with H_2O As_2O_3 , which has been rendered opaque by NH_4OH , and that which has been crystallized from an aqueous solution, are equally sol in H_2O (Bussy, C R 24 774, A 64 286)

100 pts H_2O dissolve 1 707 pts $\beta\text{As}_2\text{O}_3$ in $2\frac{1}{2}$ years, 100 pts boiling H_2O dissolve 11 46 pts $\beta\text{As}_2\text{O}_3$ in 3 hours, and 11 86 pts in 12 hours, 10 14 pts $\alpha\text{As}_2\text{O}_3$ in 3 hours, and 10 18 pts in 12 hours (Rose, Ann Phys (1) 36 494)

A cold sat solution which stood over excess of As_2O_3 for 10 months at $10-20^\circ$ contains 1 2% As_2O_3 , hot sat solution a few days after saturation contains 2 25-2 50% As_2O_3 . If trace of HCl is present, the solution contains 3 8% As_2O_3 . Hot sat solution of porcelain mod. of As_2O_3 contains 4 days after saturation 2 4% As_2O_3 at 24° , after 82 days at 14° , 1 5%, after 4 months at 12° , 1 3% As_2O_3 (Bacalogo, J pr 83 111)

According to later experiments, 1 pt $\alpha\text{As}_2\text{O}_3$ dissolves in 355 pts H_2O in 1 day at 15° , while 1 pt $\beta\text{As}_2\text{O}_3$ dissolves in 108 pts H_2O under the same conditions. 1 pt $\alpha\text{As}_2\text{O}_3$ dissolves in 46 pts H_2O , if solution is prepared at 100° , and allowed to stand 24 hours at 15° , while 1 pt $\beta\text{As}_2\text{O}_3$ dissolves in 30 pts H_2O under the same conditions (Buchner, N Rep Pharm 22 265)

100 pts H_2O dissolve pts $\alpha\text{As}_2\text{O}_3$ and $\beta\text{As}_2\text{O}_3$ at ordinary temperature

Time	$\alpha\text{As}_2\text{O}_3$	$\beta\text{As}_2\text{O}_3$
1 hour	0 023	1 589
3 hours	0 088	2 356
6 hours	0 353	3 666
12 hours	0 364	3 361
24 hours	0 956	5 306
2 days	1 627	2 629
4 days	1 814	2 429
1 week	1 673	1 763
3 weeks	1 776	1 713
$2\frac{1}{4}$ years	1 712	1 707

In the solution of $\beta\text{As}_2\text{O}_3$, octahedral crystals were deposited on the sides of the vessel after 12 hours, which continued to increase. There was no such deposit in the case of $\alpha\text{As}_2\text{O}_3$.

From the maxima in the above table, 100 pts H_2O can dissolve 3 7 pts $\beta\text{As}_2\text{O}_3$ and 1 7 pts $\alpha\text{As}_2\text{O}_3$ at ordinary temperature

100 pts boiling H_2O dissolve 11 46 pts $\beta\text{As}_2\text{O}_3$ and 10 140 pts $\alpha\text{As}_2\text{O}_3$ in 3 hours, 11 86 pts $\beta\text{As}_2\text{O}_3$ and 10 176 pts $\alpha\text{As}_2\text{O}_3$ in 12 hours (Cl Winkler, J pr (2) 31 247)

100 pts H_2O dissolve 1 75 pts. of a third modification (hexagonal crystalline) at ordinary temperature, and 2 75 pts at 100° (Claudet, Chem Soc (2) 6 179)

$\beta\text{As}_2\text{O}_3$ dissolves more rapidly in $\text{HCl}+\text{Aq}$ than $\alpha\text{As}_2\text{O}_3$ (Schultz-Sellac, B 4 109)

While 100 ccm H_2O dissolve 0 8507 $\beta\text{As}_2\text{O}_3$ at 18.5° , 100 ccm H_2O contain 1 3195 g HCl dissolve 1 1513 g $\beta\text{As}_2\text{O}_3$, containing 6 09 g HCl , 1 2724 g $\beta\text{As}_2\text{O}_3$ (Chodounsky, Listy Chemické, 13 114)

100 ccm H_2O dissolve 1 495 g As_2O_3 at 15° (Wood, Chem Soc 1908, 93 412)

Solubility of crystalline As_2O_3 in H_2O

1 l of the sat solution contains at
 2° 15° 25° 39.8° bpt
 12 006 16 566 20 384 29 302 60 + g As_2O_3 (Bruner, Z anorg 1903, 37 456)

Much more easily sol in many acids than in H_2O . Easily sol in fuming H_2SO_4 (Schultz-Sellac)

100 pts dilute H_2SO_4 + Aq of various strengths dissolve at t°

t°	Pts $\beta\text{As}_2\text{O}_3$	t°	Pts $\beta\text{As}_2\text{O}_3$	Ratios amts dissolved 80° is
80°	1 0195	18.5°	0 5422	1 88
	1 3664		0 7203	1 89
	1 1933		0 6522	1 84

(Chodounsky, l c)

Decomp by HNO_3 or aqua regia into As Sol in H_3PO_4 + Aq (Bergman)

More sol in $\text{HCl}+\text{Aq}$ than in H_2SO_4 , HNO_3 + Aq, and still less in H_2CO_3 + Aq Solubility in $\text{HCl}+\text{Aq}$

Conc of $\text{HCl}+\text{Aq}$	Grams of As_2O_3 per 100 of solution
0 46N	1 52
0 98N	1 41
2 03N	1 17
3 13N	1 11
3 81N	1 13
5 32N	2 20
6 50N	5 11
7 85N	12 28
9 17N	18 16

As the concentration of the acid increases, the solubility of the oxide decreases, a minimum being reached when the concentration of the solvent is about 3 2N. Beyond this point, an increase in the concentration of the solvent leads to a corresponding increase in the solubility (Wood, Chem Soc 1908, 93 412)

Insol in liquid CO (Buchner, Z ph Ch 1906, 54 674)

Easily sol in cold HClO_4 + Aq (Bergman)

When pulverized, it dissolves in hot $\text{HCl}+\text{Aq}$, but separates out on cooling

Easily sol in hot benzoic acid + Aq Sol in tartaric acid + Aq

Easily sol in alkali hydrates, or carbonates + Aq

Easily sol in NH_4 arsenite + Aq at $70-80^\circ$, crystallizing out on cooling (Berzelius)

Sol in hot $\text{K}_2\text{C}_2\text{O}_4$ + Aq

Sol in AsCl_3 (Penney and Wallace)

More sol in $\text{Na}_2\text{B}_4\text{O}_7$ + Aq than in H_2O

Very sl sol in absolute alcohol (Vogel)

Sol in 80 pts highly rectified spirit (Wenzel)

When 1 pt powdered As_2O_3 is digested 30 days in 10-40 pts alcohol a solution is formed containing 1 pt As_2O_3 to 60 pts alcohol when 1 pt As_2O_3 is digested with 60-150 pts alcohol a solution is formed containing 1 pt As_2O_3 to 124-140 pts alcohol (Fischer)

Sol in 70-80 pts alcohol (Thompson.)

Alcohol dissolves 0.446 pt $\beta\text{As}_2\text{O}_3$ (Rose, A. Phys. (1) 52 455)

100 pts alcohol dissolve pts, As_2O_3

Vol % of alcohol	$\alpha\text{As}_2\text{O}_3$ at 15°	$\alpha\text{As}_2\text{O}_3$ at b pt of alcohol	$\beta\text{As}_2\text{O}_3$ at 15°
56	1 680	4 895	0 504
79	1 430	4 551	0 540
84			0 565
86	0 715	3 197	
88			0 717
100	0 025	3 402	1 060

(Girardin, J. Pharm. (3) 46 269)

100 pts absolute alcohol dissolve 0.446 pt $\beta\text{As}_2\text{O}_3$ in $2\frac{1}{4}$ years (Winkler, J. pr. (2) 31 347)

Nearly insol in ether

100 pts ether dissolve 0.454 pt $\beta\text{As}_2\text{O}_3$ (Winkler)

Ether extracts 1 mg As_2O_3 from sat As_2O_3 + Aq for every 15 cc ether used, less is extracted when the solution is acidified with HCl , and almost none if acidified with H_2SO_4 or $\text{H}_2\text{C}_2\text{O}_4$ (Selmi, B. 13 206)

$\alpha\text{As}_2\text{O}_3$ is sol in 50 pts boiling nitrobenzol $\beta\text{As}_2\text{O}_3$ is insol in boiling nitrobenzol (Auerbach, Z. 1903, 37 353)

$\beta\text{As}_2\text{O}_3$ is insol in oil of turpentine, but $\alpha\text{As}_2\text{O}_3$ is sol therein $\alpha\text{As}_2\text{O}_3$ is very sl sol in benzene or petroleum ether, but more sol in methyl alcohol, ethyl alcohol, ether, or chloroform (Selmi)

100 pts C_2H_5 dissolve 0.001 pt $\beta\text{As}_2\text{O}_3$ in $2\frac{1}{4}$ years (Winkler)

Sl sol in the fatty oils

1000 pts castor-oil dissolve 1.33 pts As_2O_3 at ordinary temperature, and 9 pts at boiling temperature 1000 pts other oils dissolve 0.6-0.8 pt As_2O_3 in the cold, and about 1.7 pts on boiling (Berzelius)

Insol in chinoline or niline (Hoffmann, A. ch. (3) 9 113, 169)

Modestly sol in chinolin (Beckmann and Gubel, Z. anorg. 1906, 51 236)

Insol in acetone (Naumann, B. 1904, 37 4329), (Edim. ann. C. C. 1899, II 1014)

Sol in amyl alcohol and is divided between it and H_2O in the constant ratio of 1 : 5.47 at 25° (Auerbach, Z. anorg. 1903, 37 376)

Min. *Arsenolite*

Arsenic trioxide pentoxide, $3\text{As}_2\text{O}_3$, $2\text{As}_2\text{O}_5$ + $3\text{H}_2\text{O}$

Decomp by H_2O (Joly, C. R. 100 1221) $2\text{As}_2\text{O}_3$, As_2O_5 + H_2O Decomp by H_2O (Joly)

As_2O_3 , As_2O_5 + H_2O (Joly)

Arsenic tetroxide, As_2O_4

Sl sol in H_2O from which it is partially pptd by alcohol. More easily sol in alkali carbonates or HCl + Aq. Most easily sol in NaOH or KOH + Aq (Herbst, Dissert 1894)

Arsenic pentoxide, As_2O_5

Deliquescent in moist air, slowly sol in H_2O , forming H_3AsO_4 , which see. Easily sol in alcohol, much more sol in alcohol than As_2O_3 . Very sl sol in the fatty oils, 100 pts of oil dissolving 0.2 pt As_2O_5 in the cold, and 1 pt with partial decomp on boiling (Berzelius)

1000 pts boiling poppy-oil dissolve 27 pts As_2O_5 , 1000 pts boiling castor-oil dissolve 34 pts As_2O_5 (Hempel and Grundner)

+ $4\text{H}_2\text{O}$ Solubility in H_2O at t°

t°	Pts H_3AsO_4 in 100 pts solution	t°	Pts H_3AsO_4 in 100 pts solution
-55°	69 9	-5°	80 0
-50	70 9	0	81 0
-45	71 9	+5	82 1
-40	72 9	10	83 3
-35	73 9	15	84 7
-30	74 9	20	86 3
-25	75 9	25	88 0
-20	76 9	30	90 1
-15	77 9	35	92 8
-10	78 9		

(Menzies and Potter, J. Am. Chem. Soc. 1912, 34 1464)

+ $\frac{5}{3}\text{H}_2\text{O}$ Solubility in H_2O at t°

t°	Pts H_3AsO_4 in 100 pts of solution
+ 10°	88 1
20	89 1
30	89 8
40	90 5
50	91 2
60	91 9
70	92 6
80	93 2
90	93 8
100	94 1
110	95 0
120	95 6
130	96 2
140	96 8

(Menzies and Potter, J. Am. Chem. Soc. 1912, 34 1464)

$\text{As}_2\text{O}_3 + 4\text{H}_2\text{O}$ and $3\text{As}_2\text{O}_3 + 5\text{H}_2\text{O}$ are the only hydrates that can be isolated (Menzies and Potter)

See also Arsenic Acid

Arsenic trioxide, with alkali haloid

See Arsenite, alkali haloid

Arsenic sulphur trioxide, $\text{As}_2\text{O}_3, \text{SO}_3$

Deliquescent, decomp by H_2O (Adie, Chem Soc 55 157)

$\text{As}_2\text{O}_3, 2\text{SO}_3$ As above (Adie)

$\text{As}_2\text{O}_3, 3\text{SO}_3$ (Weber, B 19 3186)

$\text{As}_2\text{O}_3, 4\text{SO}_3$ As above (Adie)

$\text{As}_2\text{O}_3, 6\text{SO}_3$ (Weber)

$\text{As}_2\text{O}_3, 8\text{SO}_3$ As above (Adie)

Arsenic oxychloride, etc

See Arsenyl chloride, etc

Arsenic phosphide, AsP

Decomp by H_2O Not attacked by cold H_2SO_4 or HCl , and only sl sol therein on warming Easily decomp by $\text{HNO}_3, \text{KOH}, \text{NaOH}, \text{BaO}_2\text{H}_2 + \text{Aq}$ Insol in alcohol, ether, chloroform, sl sol in CS_2

PAs_2O_2 Product of action of H_2O on above compound, which it resembles (Janowsky, B 6 216)

Arsenic monoselenide, As_2Se

Insol in most organic and inorganic solvents Sol very slowly in conc HCl and H_2SO_4 Sol in boiling alkali hydroxides + Aq (Szarvasy, B 1897, 30 1245)

Arsenic triselenide, As_2S_3

Partially sol in $\text{KOH} + \text{Aq}$ if boiled with it for a long time (Uelsmann, A 116 123)

Arsenic pentaselenide, As_2Se_5

Insol in most solvents, as conc HCl Sol in alkali hydrates and sulpho-hydrates + Aq (Szarvasy, B 1895, 28 2655-2656)

Insol in H_2O , in dil acids and in conc HCl Sl sol in warm $\text{HNO}_3 + \text{Aq}$ Oxidized by cold fuming HNO_3 Sol in alkalis and in hot alkali carbonates + Aq Insol in alcohol, ether, CS_2 , etc (Claver Z inorg 1895, 10 129)

Arsenic selenosulphide

See Arsenic sulphoselenide

Arsenic sulphide, As_2S_3

Ppt Insol in NH_4OH or in colorless $(\text{NH}_4)_2\text{S} + \text{Aq}$ Sol in yellow $\text{NH}_4\text{SH} + \text{Aq}$ (Scott, Chem Soc 1900, 77 652)

Arsenic disulphide, As_2S_2

Min Realgar Difficultly sol in alkali sulphides + Aq Partly dissolved by $\text{KOH} + \text{Aq}$ with decomposition Sol at 150° in a sealed tube in $\text{NaHCO}_3 + \text{Aq}$, and crystallizes out on cooling (Scharmont A ch (3) 32 158)

Arsenic trisulphide, As_2S_3

Insol in H_2O when prepared in the dry wa but when prepared moist is very liable to into the colloidal modification mention below Insol in H_2O containing $\text{H}_2\text{S}, \text{HNO}_3, \text{HCl}, \text{H}_2\text{C}_2\text{O}_4, \text{HC}_2\text{H}_3\text{O}_3, \text{H}_2\text{C}_4\text{H}_4(\text{CO}_2), \text{NH}_4\text{Cl}, \text{KNO}_3, (\text{NH}_4)_2\text{SO}_4, \text{MgSC}(\text{Bontigny})$

Insol in H_2O Traces are dissolved in $\text{H}_2\text{S} + \text{Aq}$ Sl decomp by boiling with H_2S or long contact with cold H_2O (Fresenius 1 l H_2O dissolves 2.1×10^{-6} mols ppt As_2S_3 at 18° (Weigel, Z phys Ch 1907, 8 294)

Insol in dil acids Insol in cold, at scarcely attacked by hot conc $\text{HCl} + \text{Aq}$

Easily decomp by HNO_3 or aqua regia Easily sol in cold $\text{KOH}, \text{NaOH},$ or $\text{NH}_4\text{O} + \text{Aq}$, also in alkali carbonates, or sulphates Aq

Sol in hot $\text{KHSO}_3 + \text{Aq}$

Sol in citric acid, and alkali citrates + A (Spiller)

Slowly sol in cold 2% $\text{Na}_2\text{B}_4\text{O}_7 + \text{A}$ Easily sol on heating (Materne, C C 190 II 557)

Insol in CS_2

Min Orpiment

As_2S_3 may also be obtained in a colloid form, sol in H_2O Sat solution contains 34.46% As_2S_3 , it is decomp by standing, but may be boiled without decomposition position, most acids and many salts ppt As_2S_3 (Schulze, J pr (2) 25 431)

The following solutions cause pptn As_2S_3 in a solution of the colloidal modification, when added in the given state of dilution —

$\text{HCl} + \text{Aq}$	1	555
$\text{HNO}_3 + \text{Aq}$	1	276
$\text{H}_2\text{SO}_4 + \text{Aq}$	1	255
$\text{H}_2\text{SO}_3 + \text{Aq}$	1	138
$\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$	1	65
$\text{H}_3\text{PO}_4 + \text{Aq}$	1	26
$\text{HC H}_3\text{O} + \text{Aq}$	1	0 18
$\text{K SO}_4 + \text{Aq}$	1	76
$\text{Na SO}_4 + \text{Aq}$	1	129
$(\text{NH}_4) \text{SO}_4 + \text{Aq}$	1	188
$\text{CaSO}_4 + \text{Aq}$	1	2780
$\text{MgSO}_4 + \text{Aq}$	1	26 30
$\text{ZnSO}_4 + \text{Aq}$	1	55 30
$\text{MnSO}_4 + \text{Aq}$	1	2860
$\text{NiSO}_4 + \text{Aq}$	1	5440
$\text{Fe SO}_4 + \text{Aq}$	1	2 880
$\text{Al (SO}_4)_3 + \text{Aq}$	1	52600
$\text{Al}_2\text{SO}_4 + \text{Aq}$	1	799
$\text{KCl} + \text{Aq}$	1	1 57
$\text{KBr} + \text{Aq}$	1	10 5
$\text{KI} + \text{Aq}$	1	55
$\text{LiI} + \text{Aq}$	1	127
$\text{NaCl} + \text{Aq}$	1	212
$\text{NH}_4\text{Cl} + \text{Aq}$	1	207
$\text{BaCl}_2 + \text{Aq}$	1	2860
$\text{CaCl} + \text{Aq}$	1	4370
$\text{MgCl} + \text{Aq}$	1	10000

FeCl ₃ +Aq	1	50000
AlCl ₃ +Aq	1	83000
CrCl ₃ +Aq	1	20000
KNO ₃ +Aq	1	84
NaNO ₃ +Aq	1	117
NH ₄ NO ₃ +Aq	1	138
Ba(NO ₃) ₂ +Aq	1	2080
KClO ₃ +Aq	1	88
CaH ₂ (CO ₃) ₂ +Aq	1	3120
K ₂ C ₂ H ₄ O ₆ +Aq	1	85
K ₂ C ₂ O ₄ +Aq	1	81
NaC ₂ H ₃ O ₂ +Aq	1	78
Urea+Aq	1	25
(NH ₄) ₂ Fe(SO ₄) ₂ +Aq	1	1160
K ₂ Al ₂ (SO ₄) ₄ +Aq	1	50000
K ₂ Fe ₂ (SO ₄) ₄ +Aq	1	55500
K ₂ Cr ₂ (SO ₄) ₄ +Aq	1	25000
K ₄ Fe(CN) ₆ +Aq	1	67
K ₃ Fe(CN) ₆ +Aq	1	81

Cold conc solutions of boric, arsenious, tartaric, benzoic, and salicylic acids, also cane sugar, or chloral hydrate cause no pptn. Absolute alcohol and glycerine may also be mixed with the solutions without causing pptn (Schulze, J pr (2) 25 442)

+6H₂O, decomp completely into As₂S₃ under a pressure of 6000 to 7000 atmos (Spring, Z anorg 1895, 10 186)

Arsenic pentasulphide, As₂S₅

Insol in H₂O. Sol in NH₄OH, KOH, NaOH+Aq, and solutions of alkali sulphides and carbonates. Sol in BaO H₂ and CaO₂H₂+Aq

Sol in citric acid, and alkali citrates+Aq (Spiller)

Alcohol dissolves out S on boiling (Berzelius)

Sol in alkali arsenates+Aq (Nilson, J pr (2) 14 155)

+H₂O (Nilson, l c)

Arsenic trisulphide, with M S

See Sulpharsenites, M

Arsenic pentasulphide, with M S

See Sulpharsenates, M

Arsenic sulphobromide, AsS Br₃ = AsSBr + 3Br

Decomp by H₂O (Hummel, Chem Soc 33 254)

Arsenic sulphochloride, As S Cl

Slowly decomp by boiling H₂O. Sol in hot AsCl₃ without decomp (Ouvrard, C R 116 1516)

AsS Cl. Decomp by H₂O. Sol in NH₄OH, and alkali carbonates+Aq (Ouvrard)

AsS Cl. Slowly decomp by boiling H₂O. Sol in alkali carbonates and in NH₄OH+Aq (Ouvrard, C R 1893, 116 1517)

Arsenic sulphoiodide, AsSI

Insol in alcohol, chloroform or carbon disulphide (Schneider, J pr (2) 23 456)

Formula is probably As₂S₃, AsI₃

Slowly attacked by HCl+Aq, somewhat more easily by HNO₃+Aq. Easily sol in KOH, or NH₄OH+Aq (Schneider, J pr (2) 34 505)

2AsI₃, SI₆. Decomp on air (Schneider, J pr (2) 36 509)

As₂S₅I₃. Less sol in CS₂ than AsI₃ (Ouvrard, C R 117 107)

As-SI₄ (Ouvrard)

See also Arsenyl sulphoiodide

Arsenic sulphoselenide, As₂SeS₂

Easily sol in cold NH₄SH+Aq. Nearly completely sol in (NH₄)₂CO₃+Aq (v Gerichten, B 7 29)

As₂SSe₂. More difficultly sol than the preceding comp in NH₄SH+Aq (v Gerichten)

As₂Se₂S₃. Sp gr = 6.402 at ca 750°

Insol in most solvents. Easily sol in alkali hydroxides and sulphides+Aq (Szarvasky, B 1895, 28 2661)

As Se₂S₂. Sp gr = 11.35 at 550-600°

Insol in most solvents. Easily sol in alkali hydroxides and sulphides+Aq (Szarvasky, B 1895, 28 2659)

Arsenic telluride, As₂Te₂

Sol in HNO₃ and HNO₃+HCl+Aq (Oppenheim, J pr 71 266)

As₂Te₂. As above (Oppenheim)

Arsenic acid, anhydrous, As₂O₅

See Arsenic pentoxide

Metaarsenic acid, HAsO₃

Slowly sol in cold, quite easily sol in hot H₂O, with considerable evolution of I and conversion into H₃AsO₄ (Kopp, A (3) 48 196)

Orthoarsenic acid, H₃AsO₄

Sol in H₂O, with absorption of heat

1 pt As₂O₅ dissolves in 0.405 pt H₂O at 12.5°, or 100 pts H₂O dissolve 244.81 pts As₂O₅ at 12.5° (Vogel)

Sol in 0.5 pt H₂O (Lhéard)

Sol in 6 pts cold H₂O, and more quickly in 2 pts hot H₂O (Bucholz)

100 pts H₂O at 15.56° dissolve 150 pts As₂O₅ (Ure's Dict)

H₃AsO₄+Aq sat at 15° contains 15% As₂O₅

Sp gr of H₃AsO₄+Aq at 15° a = sp gr of 1% is As₂O₅ b = sp gr if % is H₃AsO₄

c	a	b	%	a	b
5	1.042	1.0337	45	1.540	1.3973
10	1.055	1.0690	50	1.635	1.4617
15	1.154	1.1061	55	1.742	1.5320
20	1.187	1.1457	60		1.6086
25	1.245	1.1882	65		1.6919
30	1.306	1.242	70		1.7827
35	1.378	1.2540	75		
40	1.453	1.3382			

(Schiff, A 113 183, calculated by Gerlach, Z anal 27 303)

Sp gr of $\text{H}_3\text{AsO}_4 + \text{Aq}$ at 15° $a = \text{sp gr if } \%$
is As_2O_5 , $b = \text{sp gr if } \%$ is H_3AsO_4

$\%$	a	b	$\%$	a	b
1	1 008	1 006	47	1 564	1 412
2	1 016	1 013	48	1 582	1 425
3	1 023	1 019	49	1 601	1 437
4	1 031	1 026	50	1 620	1 450
5	1 039	1 032	51	1 642	1 464
6	1 048	1 039	52	1 663	1 478
7	1 057	1 046	53	1 685	1 491
8	1 065	1 052	54	1 706	1 505
9	1 074	1 059	55	1 728	1 519
10	1 083	1 066	56	1 752	1 534
11	1 092	1 073	57	1 777	1 549
12	1 102	1 081	58	1 801	1 564
13	1 111	1 088	59	1 825	1 579
14	1 121	1 096	60	1 850	1 594
15	1 130	1 103	61	1 880	1 610
16	1 140	1 111	62	1 910	1 626
17	1 150	1 119	63	1 940	1 643
18	1 160	1 126	64	1 970	1 659
19	1 170	1 134	65	2 000	1 675
20	1 180	1 142	66	2 030	1 693
21	1 191	1 150	67	2 060	1 712
22	1 203	1 158	68	2 090	1 730
23	1 214	1 167	69	2 120	1 749
24	1 226	1 175	70	2 150	1 767
25	1 237	1 183	71		1 788
26	1 249	1 192	72		1 809
27	1 261	1 201	73		1 830
28	1 274	1 210	74		1 851
29	1 286	1 219	75		1 872
30	1 298	1 228	76		1 897
31	1 312	1 238	77		1 921
32	1 325	1 248	78		1 946
33	1 339	1 257	79		1 970
34	1 352	1 267	80		1 995
35	1 366	1 277	81		2 020
36	1 381	1 288	82		2 045
37	1 396	1 299	83		2 070
38	1 411	1 309	84		2 095
39	1 426	1 320	85		2 120
40	1 441	1 331	86		2 146
41	1 458	1 342	87		2 178
42	1 475	1 353	88		2 207
43	1 492	1 366	89		2 236
44	1 509	1 376	90		2 265
45	1 526	1 387	91		2 295
46	1 545	1 400			

(Kopp, calculated by Gerlach, *Z* and 27
316.)

See also Arsenic pentoxide

Triarsenic acid, $\text{H}_4\text{As}_2\text{O}_7$

Very deliquescent easily sol in H_2O with evolution of much heat and conversion into H_3AsO_4 .

Arsenates

Arsenates of the alkali metals and acid arsenates of the alkaline-earth metals are sol in H_2O . Neutral and basic arsenates are easily sol in mineral acids including H_3AsO_4 .

less sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$. The neutral alkaline-earth arsenates are less sol in $\text{H}_2\text{O} + \text{Aq}$ than in H_2O , but more sol in $\text{N}_2\text{H}_4 + \text{Aq}$ (Field). The alkali arsenates are sol in hot glycerine (Lefèvre, *C R* 108 158).

Aluminum arsenate, $\text{Al}_2(\text{AsO}_4)_3$.

Ppt Insol in H_2O , difficultly sol in acids (Coloniano, *C R* 103 273).

Insol in acetone (Naumann, *B* 14, 37 4328).

$2\text{Al}_2\text{O}_3, 3\text{As}_2\text{O}_5$ Nearly unattacked by boiling H_2O , sol in dil acids (Lefèvre, *A ch* (6) 27 5).

Aluminum potassium arsenate, $2\text{Al}_2\text{O}_3 \cdot 3\text{K}_2\text{O} \cdot 3\text{As}_2\text{O}_5$

(Lefèvre)

Aluminum sodium arsenate, $2\text{Al}_2\text{O}_3 \cdot 3\text{Na}_2\text{O} \cdot 3\text{As}_2\text{O}_5$

(Lefèvre)

Ammonium arsenate, $(\text{NH}_4)_3\text{AsO}_4 + 3\text{H}_2\text{O}$

Difficultly sol in H_2O . Less sol than $(\text{NH}_4)_2\text{HAsO}_4$ (Mitscherlich).

Insol in liquid NH_3 (Franklin, *A ch* 1898, 20 826).

Ammonium hydrogen arsenate,

$(\text{NH}_4)\text{HAsO}_4$

Effloresces, giving off NH_3 , more sol in H_2O than $(\text{NH}_4)_3\text{AsO}_4$ (Sukowsky, *J pr* 104 129).

Insol in acetone (Fildum, *C C* 1899, II 1014).

Ammonium dihydrogen arsenate,

$\text{NH}_4\text{H}_2\text{AsO}_4$

Not efflorescent. Very sol in H_2O .

Ammonium barium arsenate, $\text{NH}_4\text{Ba}(\text{AsO}_4)_2 + 2\text{H}_2\text{O}$

Sol by 10 days contact in 191 pts H_2O , in 18,832 pts of a mixture of 1 pt $\text{NH}_4\text{OH} + \text{Aq}$ and 3 pts H_2O in 227 pts of a solution of 1 pt NH_4Cl in 10 pts H_2O and 2169 pts of a solution of 1 pt NH_4Cl in 60 pts $\text{NH}_4\text{OH} + \text{Aq}$ and 60 pts H_2O (Lefèvre, *A ch* 1892, (6) 27 13).

$(\text{NH}_4)\text{BaH}(\text{AsO}_4)_2$ Efflorescent. Insol in H_2O ; easily sol in dil $\text{HNO}_3 + \text{Aq}$ (Baumann, *Arch Pharm* 36 36).

Ammonium calcium arsenate, $\text{NH}_4\text{Ca}(\text{AsO}_4)_2 + \text{H}_2\text{O}$

1000 pts pure H_2O dissolve 0.20 this salt, 1000 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (containing 50 pts NH_4Cl) dissolve 1.15 pts this salt (0 pts $\text{H}_2\text{O} + 100$ pts NH_4OH (sp gr = 0.88)) dissolve 0.01 pt this salt (Field, *Chem* 11 6).

Soluble by 10 days' contact in 2167 pts H_2O at 15° , in 381 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (17), in

43478 pts $\text{NH}_4\text{OH} + \text{Aq}$ (1 3), in 10570 pts $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH} + \text{Aq}$ (1 10 60) (Lefèvre, A ch 1892, (6) 27 13)
 $+ 6\text{H}_2\text{O}$ Sol in hot, very sl sol in cold H_2O , sl sol in NH_4Cl , and $\text{NH}_4\text{OH} + \text{Aq}$ (Wach, Schw J 12 285)
 $+ 7\text{H}_2\text{O}$ (Bloxam, C N 54 163)
 $(\text{NH}_4)_2\text{CaH}_2(\text{AsO}_4)_4$, Efflorescent Insol in H_2O , easily sol in dil $\text{HNO}_3 + \text{Aq}$ (Bauermann, Arch Pharm 36 36)
 $(\text{NH}_4)_2\text{Ca}_2\text{H}_2(\text{AsO}_4)_3 + 3\text{H}_2\text{O}$
 $(\text{NH}_4)_2\text{Ca}_2\text{H}_2(\text{AsO}_4)_3 + 3\text{H}_2\text{O}$ (Bloxam, C N 54 163)

Ammonium glucinum arsenate, $\text{NH}_4\text{GlAsO}_4 + 4\frac{1}{2}\text{H}_2\text{O}$

More stable than the corresponding potassium salt (Bleyer, Z anorg 1912, 75 291)

Ammonium iron (ferric) dihydrogen arsenate, $\text{NH}_4\text{H}_2\text{AsO}_4$, FeAsO_4

Hydrolyzed by H_2O
 Sol in cold conc HCl , hot HNO_3 , hot dil H_2SO_4 , and in hot arsenic acid + Aq containing 75% arsenic pentoxide

Sol in hot conc $\text{NH}_4\text{OH} + \text{Aq}$ Completely hydrolyzed by caustic alkalis

Insol in conc $\text{NH}_4\text{Cl} + \text{Aq}$ and in 50% acetic acid (Curtman, J Am Chem Soc 1910, 32 628)

Ammonium magnesium arsenate, $\text{NH}_4\text{MgAsO}_4$

Sl sol in H_2O Sol in acids
 Anhydrous salt is sol in 2784 pts H_2O at 15° , in 15,904 pts $\text{NH}_4\text{OH} + \text{Aq}$ (1 3) (0 96 sp gr), in 1386 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1 70), in 886 7 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1 7), in 3014 pts NH_4Cl (1 pt) + NH_4OH (0 96 sp gr) (10 pts) + Aq (60 pts), in 32,827 pts magnesia mixture (Fresenius, Z anal 3 206)

Anhydrous salt is sol in 4389 pts $\text{NH}_4\text{NO}_3 + \text{Aq}$ (1 50), in 2561 5 pts $\text{KCl} + \text{Aq}$ (1 165), in 1422 pts ammoniacal solution of 3 5 g tartaric acid in 250 cc H_2O , in 933 5 pts ammoniacal solution of 2 5 g citric acid in 250 cc H_2O (Puller, Z anal 10 62)
 $+ \frac{1}{2}\text{H}_2\text{O}$

Sol in 2656 pts H_2O at 15° , in 15,038 pts $\text{NH}_4\text{OH} + \text{Aq}$ (1 3) (0 96 sp gr), in 844 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1 7), in 1315 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1 70), in 2871 pts NH_4Cl (1 pt) + NH_4OH (0 96 sp gr) (10 pts) + Aq (60 pts) (Fresenius)

1000 pts pure H_2O dissolve 0 14 pt salt, 1000 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (containing 100 pts NH_4Cl) dissolve 0 95 pt salt, 900 pts $\text{H}_2\text{O} + 100$ pts NH_4OH (sp gr 0 880) dissolve 0 07 pt salt (Field, Chem Soc 11 6)

$+ 6\text{H}_2\text{O}$ Sl efflorescent Sl sol in H_2O
 Very sl sol in $\text{NH}_4\text{OH} + \text{Aq}$

Solubility of $\text{NH}_4\text{MgAsO}_4 + 6\text{H}_2\text{O}$ in H_2O and NH_4 salts + Aq
 Grams salt dissolved in 100 g solvent

t°	H_2O	5% $\text{NH}_4\text{NO}_3 + \text{Aq}$	5% $\text{NH}_4\text{Cl} + \text{Aq}$	NH_4OH 1 pt $\text{NH}_4\text{OH} + \text{Aq}$ (0 96) + 4 pts H_2O	4% $\text{NH}_4\text{OH} + \text{Aq} + 5\%$ $\text{NH}_4\text{Cl} + \text{Aq}$	4% NH_4OH $\text{Aq} + 10\%$ $\text{NH}_4\text{Cl} + \text{Aq}$
0°	0 03388	0 09216	0 08397	0 00874		
20	0 02066	0 11358	0 12284	0 00958	0 01331	0 03165
30		0 11758	0 11264			
40	0 02746	0 13936	0 19016	0 01173		
50	0 02261	0 18945	0 18889	0 01005		
60	0 02103	0 21115	0 21952	0 00902	0 04691	0 05353
70	0 01564	0 18880	0 22092	0 00949		
80	0 02364	0 18945	0 23144	0 00912		

(Wenger, Dissert 1911)

Ammonium manganous arsenate, $\text{NH}_4\text{MnAsO}_4 + 6\text{H}_2\text{O}$

Nearly insol in cold H_2O , easily sol in dil acids, insol in alcohol (Otto, J pr 2 414)

Ammonium sodium arsenate, $\text{NH}_4\text{NaHAsO}_4 + 4\text{H}_2\text{O}$

Sol in H_2O (Ullmann, Zeit f ges Nat 23 347)

Ammonium sodium hydrogen arsenate, $(\text{NH}_4)_2\text{NaH}_2(\text{AsO}_4)_4 + 6\text{H}_2\text{O}$

Sol in H_2O (Fulhol and Sanderens, C R 94 649)

Ammonium strontium arsenate, $\text{NH}_4_2\text{SrAsO}_4 + \frac{1}{2}\text{H}_2\text{O}$

Sol by 10 days' contact in 3229 pts H_2O , in 11,586 pts dil $\text{NH}_4\text{OH} + \text{Aq}$, in 199 pts

of a mixture of 1 pt NH_4Cl in 7 pts H_2O , and in 1519 pts of a solution of 1 pt NH_4Cl in 10 pts $\text{NH}_4\text{OH} + \text{Aq}$ and 60 pts H_2O (Lefèvre, A ch 1892, (6) 27 13)

Ammonium uranyl arsenate, $\text{NH}_4(\text{UO}_2)_2\text{AsO}_4 + x\text{H}_2\text{O}$

Insol in H_2O , HCl , H_3O , and saline solutions as $\text{NH}_4\text{Cl} + \text{Aq}$ sol in mineral acids (Puller, Z anal 10 72)

Ammonium vanadium arsenate, $\text{NH}_4(\text{VO})_2\text{AsO}_4$, and $(\text{NH}_4)_2\text{HAsO}_4 + 2(\text{VO})\text{HAsO}_4$

See Arseniovanadate, ammonium

Ammonium arsenate tellurate

See Arsenotellurate, ammonium

Antimony arsenate (?)

Insol in H_2O , insol in acids after ignition, but when fresh is sol in conc boiling HCl + Aq, and sl sol in HNO_3 + Aq (Dumas)

Barium arsenate, $Ba_3(AsO_4)_2$

1000 pts pure H_2O dissolve 0.55 pt $Ba_3(AsO_4)_2$, 1000 pts NH_4Cl + Aq (containing 50 pts NH_4Cl) dissolve 1.95 pts $Ba_3(AsO_4)_2$, 900 pts H_2O + 100 pts NH_4OH + Aq (sp gr = 0.88) dissolve 0.03 pt $Ba_3(AsO_4)_2$ (Field, Chem Soc 11 6)

Sol in cold HNO_3 , and HCl + Aq (Berzelius), $H_2C_2H_4O_6$, and $HC_2H_3O_2$ + Aq (Anthon)

Solubility in H_2O is not increased by presence of NH_4 , Na, or K salts (Laugier)

Not pptd in presence of Na citrate (Spiller)
+ $1\frac{1}{2}H_2O$ (Salkowsky, J pr 104 129)

Barium hydrogen arsenate, $BaHAsO_4 + 1\frac{1}{2}H_2O$

Very sl sol in H_2O , but decomp thereby into $Ba_3(AsO_4)_2$ and $BaH_4(AsO_4)$ (Berzelius)

Sl sol in cold acids
+ H_2O Sl sol in either $BaCl_2$ + Aq or $NaHAsO_4$ + Aq (Maumené, J B 1864 237)

Barium tetrahydrogen arsenate, $BaH_4(AsO_4)_2 + 2H_2O$

Easily sol in H_2O (Settemberg, Berz J B 26 206)

Difficultly sol in little, but decomp by much H_2O . Easily sol in HCl + Aq less easily in HCl + H_2O + Aq (Hornum, Dissert, 1879)

Barium arsenate, acid, $Ba(O_2)As_2O_5 + 4H_2O$

Very sl sol in H_2O (Mitscherlich)

Barium pyroarsenate, $Ba_2As_2O_7$

Insol in H_2O but decomp thereby into $BaHAsO_4$ + H_2O (Lefèvre C R 108 1038)

Barium potassium arsenate, $KBaAsO_4$

Sl decomp by cold H_2O . Rapidly sol in dil acids (Lefèvre Arch (6) 27 1)

Barium sodium arsenate, $NaBaAsO_4 + 9H_2O$

(Joly, C R 1887 104 1702)

Barium arsenate chloride, $Ba_2(AsO_4)_2 \cdot PbCl_2$

Insol in H_2O sol in dil HNO_3 + Aq (Schubert C R 65 172)

Bismuth arsenate, basic, $Bi_2(AsO_4)_3 \cdot 3Bi_2O_3$

Insol in H_2O . Sol in mineral acids (Cavazzi Gazz chit 14 289)

$Bi_2O_3 \cdot 2As_2O_5 + 5H_2O$ Min *Rhauit*
Easily sol in HCl + Aq sl sol in HNO_3 + Aq

Bismuth arsenate, $Bi_2(AsO_4)_3 + \frac{1}{2}H_2O$

Insol in H_2O Insol in HNO_3 -Aq in presence of H_2AsO_4 , or alkali arsenates + Aq, sol in HCl + Aq (Salkowsky, J pr 104 129)

Not wholly insol in HNO_3 + Aq (Schneider, J pr (2) 20 418)

Very sol in H_2AsO_4 + Aq (Dumas)

Insol in $Bi(NO_3)_3$ + Aq (Dumas)

Sol in $Bi(NO_3)_3$ + Aq (Salkowsky)

Insol in conc $Bi(NO_3)_3$ + Aq containing a small quantity of HNO_3 (Schneider)

Bismuth copper arsenate, $Bi_2Cu_{20}As_{10}O_{76}$

$= Bi_2O_3, 20CuO, 5As_2O_5 + 22H_2O$
Min *Mixite* Decomp by dil H_2O into insol $Bi_2(AsO_4)_3$, and $Cu_3(AsO_4)_2$, which goes into solution (Dana)

Bismuth uranyl arsenate, $Bi_2(AsO_4)_3 \cdot 8Bi_2O_3 \cdot H_2O$

Min *Walpurgite*

Cadmium arsenate, $Cd_3(AsO_4)_2$

Ppt (Salkowsky, J pr 104 129)
 $2CdO, As_2O_5$ (Lefèvre, C R 11 405)
 $5CdO, 2As_2O_5 + 5H_2O$ Ppt (Salkowsky)

Cadmium pyroarsenate, $Cd_2As_2O_7$

(de Schulten)

Cadmium hydrogen arsenate, $CdHAsO_4 + H_2O$

Decomp by H_2O (Demel, B 12 1279)
 $CdH_4(AsO_4)_2 + 2H_2O$ Decomp by excess of H_2O (de Schulten, Bull Soc (1) 473)

Cadmium potassium arsenate, $2CdO, K_2O, As_2O_5$

(Lefèvre C R 110 405)

Cadmium sodium arsenate, CdO, Na_2O, As_2O_5

Slowly sol in dil acids (Lefèvre C R 110 405)

$2CdO, 4Na_2O, 3As_2O_5$ (Lefèvre)

Cadmium arsenate bromide, $Cd_3(AsO_4)_2 \cdot 3CdBr_2$

Sol in very dil HNO_3 + Aq (de Schulten Bull Soc (5) 1 472)

Cadmium arsenate chloride, $Cd_3(AsO_4)_2 \cdot 3CdCl_2$

Sol in very dil HNO_3 + Aq (de Schulten)

Cæsium arsenate, $Cs_2O \cdot 2As_2O_5 + 10H_2O$

Ppt (Lippmann Z anorg 1910 55 246)

Calcium arsenate, $Ca_3(AsO_4)_2 + 3H_2O$

Ppt Insol in H_2O sol in H_2SO_4 + Aq (Kotschoubey, J pr 49 182)

Calcium pyroarsenate, $Ca_2As_2O_7$

Slowly decomp by cold H_2O into $CaHAsO_4 + \frac{1}{2}H_2O$ (Lefèvre)

Calcium hydrogen arsenate, $\text{CaHAsO}_4 + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O (Debray, A ch (3) 61 419)
 + H_2O Min *Hardingerite* Easily sol in acids
 + $2\frac{1}{2}\text{H}_2\text{O}$ Min *Pharmacohite* Easily sol in acids
 + $3\text{H}_2\text{O}$ Insol in H_2O , sol in HCl , HNO_3 , or $\text{H}_3\text{AsO}_4 + \text{Aq}$, also in $(\text{NH}_4)_2\text{SO}_4$, NH_4NO_3 , $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$, and $\text{NH}_4\text{Cl} + \text{Aq}$ (Pfaff)

Calcium tetrahydrogen arsenate,

$\text{CaH}_4(\text{AsO}_4)_2$
 Sol in H_2O (Graham)
 + H_2O Sl sol in H_2O Decomp by much hot H_2O into H_3AsO_4 and $\text{Ca}_3(\text{AsO}_4)_2$ (Hormann, Dissert 1879)

Calcium iron (ferric) arsenate, 6CaO , $4\text{Fe}_2\text{O}_3$, $5\text{As}_2\text{O}_5 + 15\text{H}_2\text{O}$ (?)

Min *Arseniosiderite* Sol in acids

Calcium magnesium arsenate, $\text{Ca}_5\text{H}_2(\text{AsO}_4)_4$, $\text{Mg}_5\text{H}_2(\text{AsO}_4)_4 + 10\text{H}_2\text{O}$

Min *Picropharmacohite* Easily sol in acids
 $\text{Ca}_3(\text{AsO}_4)_2$, $\text{Mg}_3(\text{AsO}_4)_2$ Sol in $\text{HNO}_3 + \text{Aq}$ (Kuhn)

Min *Berzelzite* Sol in $\text{HNO}_3 + \text{Aq}$
 $\text{Ca}_5\text{Mg}_5\text{H}_{14}(\text{AsO}_4)_{14} + 49\text{H}_2\text{O}$ Min *Wapplerite*

Calcium potassium arsenate, CaKAsO_4

(Lefèvre, A ch (6) 27 5)

Calcium sodium arsenate, CaNaAsO_4

(Lefèvre, A ch (6) 27 1)
 4CaO , $2\text{Na}_2\text{O}$, $3\text{As}_2\text{O}_5$ Not attacked by boiling H_2O , easily sol in dil acids (Lefèvre)

Calcium uranyl arsenate, $\text{Ca}(\text{UO}_2)_2(\text{AsO}_4)_2 + 5\text{H}_2\text{O}$

Min *Uranospinite*

Calcium vanadium arsenate, CaHAsO_4 , $2(\text{VO})_2\text{HAsO}_4 + 8\text{H}_2\text{O}$

See *Arseniovanadate*, calcium

Calcium arsenate chloride, $\text{Ca}_3(\text{AsO}_4)_2$, CaCl_2

Insol in H_2O , sol in dil $\text{HNO}_3 + \text{Aq}$ (Lechutier C R 65 172)
 $3\text{Ca}(\text{AsO}_4)_2$, CaCl_2 As above (Lechutier)

Cerous arsenate, CeHAsO_4

Insol in H_2O Sol in arsenic acid + Aq (Berzelius)

Ceric hydrogen arsenate, $\text{Ce}(\text{HAsO}_4)_4 + 6\text{H}_2\text{O}$

Ppt Insol in H_2O and dil acids (Barbier, B 1910, 43 2216)

Ceric dihydrogen arsenate, $\text{Ce}(\text{HAsO}_4)_4 + 4\text{H}_2\text{O}$

Sol in conc HNO_3 (Barbier l c)

Chromic arsenate, $2\text{Cr}_2\text{O}_3$, $3\text{As}_2\text{O}_5$

Insol in H_2O and conc boiling acids (Lefèvre, A ch (6) 27 5)

Chromic potassium arsenate, $2\text{Cr}_2\text{O}_3$, $3\text{K}_2\text{O}$, $3\text{As}_2\text{O}_5$

(Lefèvre)

Chromic sodium arsenate, $2\text{Cr}_2\text{O}_3$, $3\text{Na}_2\text{O}$, $3\text{As}_2\text{O}_5$

(Lefèvre)

Cobaltous arsenate, basic, 4CoO , As_2O_5

Easily sol in acids (Gentele, J B 1851 359)

$\text{Co}(\text{CoOH})\text{AsO}_4$ Insol in H_2O , difficultly sol in acids (Coloriano)

Cobaltous arsenate, $\text{Co}_3(\text{AsO}_4)_2 + 8\text{H}_2\text{O}$

Ppt Insol even in boiling H_2O , easily sol in HNO_3 , HCl , and $\text{NH}_4\text{OH} + \text{Aq}$, sol in $\text{H}_3\text{AsO}_4 + \text{Aq}$ (Proust), sol in dil $\text{FeSO}_4 + \text{Aq}$ (Karsten, Pogg 60 266)

Min *Cobalt bloom*, *Erythrite* Easily sol in acids

5CoO , $2\text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$ Insol in H_2O , difficultly sol in acids (Coloriano, C R 103 273)

2CoO , As_2O_5 Sl attacked by boiling H_2O , easily sol in dil acids (Lefèvre)

Cobaltous hydrogen arsenate $\text{CoH}(\text{AsO}_4)$

Sol in

Cobaltous potassium arsenate, CoKAs

(Lefèvre)

Cobaltous sodium arsenate, CoNaAsO_4

(Lefèvre)

4CoO , $2\text{Na}_2\text{O}$, $3\text{As}_2\text{O}_5$ (Lefèvre)

Cobaltous vanadium arsenate,

$\text{Co}(\text{VO}_2)_2\text{H}(\text{AsO}_4)_2 + 8\text{H}_2\text{O}$

See *Arseniovanadate*, cobaltous

Cobaltous arsenate ammonia, $\text{Co}_3(\text{AsO}_4)_2$, $\text{NH}_3 + 7\text{H}_2\text{O}$

(Ducru, A ch 1901, (7) 22 185)

$\text{Co}_3(\text{AsO}_4)_2$, $2\text{NH}_3 + 6\text{H}_2\text{O}$ (Ducru, l c)

$\text{Co}_3(\text{AsO}_4)_2$, $3\text{NH}_3 + 5\text{H}_2\text{O}$ (Ducru, l c)

Cuprous arsenate, 2CuO , As_2O_5

(Hampe, Dissert 1874)

4CuO , As_2O_5 (Hampe, l c)

Cuprous pyroarsenate, $\text{Cu}_4\text{As}_2\text{O}_7$

Ppt Sol in NH_4OH or $\text{KOH} + \text{Aq}$ (Reichard, B 1898, 31 2166)

Cupric arsenate, basic, CuO , $\text{As}_2\text{O}_5 + 12\text{H}_2\text{O}$

Min *Chalcophyllite* Easily sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$

6CuO , $\text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$ Min *Aphanesite*, *Choclasite* Sol in acids and ammonia

5CuO , $\text{As}_2\text{O}_5 + 2\text{H}_2\text{O}$ Min *Erimite* Sol in $\text{HNO}_3 + \text{Aq}$

+5H₂O Min *Cornwallite* Sol in acids, and NH₄OH+Aq
 +9H₂O Min *Tyrolite*
 4CuO, As₂O₅+H₂O Insol in H₂O (Debray, A ch (3) 61 423)
 Min *Olavenite* Sol in acids, and NH₄OH+Aq, decomp by hot KOH+Aq
 +7H₂O Min *Euchronite* Sol in HNO₃+Aq
 +4½H₂O (Hirsch, C C 1891, I 15)

Cupric arsenate, Cu₃(AsO₄)₂

Insol in H₂O Easily sol in HCl+Aq, sl sol in other acids, sol in NH₄OH+Aq (Coloriano, C R 103 273)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)
 Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 827)
 +4H₂O Decomp by hot H₂O (Debray)
 +5H₂O Min *Trichalcite* Easily sol in cold HCl+Aq

Cupric arsenate, acid, 5CuO, 2As₂O₅

Sol in H₂SO₃+Aq (Vogel)
 +3H₂O (Salkowsky)
 +8, 9½, and 12½H₂O (Hirsch)
 CuHAsO₄+H₂O Insol in H₂O (Coloriano)
 +1½H₂O Insol in H₂O (Debray, A ch (3) 61 419)
 8CuO, 3As₂O₅+12H₂O (Hirsch)

Cupric lead arsenate, 3CuO, PbO, As₂O₅+2H₂O

Min *Bayldonite* Nearly insol in HNO₃+Aq

Cupric potassium arsenate, CuKAsO₄

Slowly sol in NH₄OH+Aq, easily sol in acids (Lefevre, A ch (6) 27 5)
 8CuO, K₂O, As₂O₅ Easily sol in dil acids (Lefevre)

Cupric sodium arsenate, CuNaAsO₄

(Lefevre)
 3CuO, Na₂O, 2As₂O₅ Very sol in dil acids (Lefevre)
 2Cu(AsO₄), NaHAsO₄+5H₂O Ppt (Hirsch, C C 1891, I 15)
 6Cu₃(AsO₄)₂, 2NaH₂AsO₄, Na₂HAsO₄+13½H₂O, or 16H₂O Ppt (Hirsch)
 3Cu₃(AsO₄)₂, Na₂HAsO₄+9½H₂O Ppt (Hirsch)
 4Cu₃(AsO₄)₂, NaHAsO₄+11H₂O Ppt (Hirsch)

Cupric uranyl arsenate, Cu(UO₂)(AsO₄)₂+8H₂O

(Werthier, A 68 312)
 Min *Zeunerite*

Cupric vanadium arsenate,

Cu(VO)₂H(AsO₄)₂+3H₂O

See Arseniovanadate, cupric

Cupric arsenate ammonia, (3NH₃+4H₂O

Insol in cold or hot H₂O (Daour, J pr 37 485)
 2CuO, As₂O₅, 4NH₃+3H₂O I comp by H₂O (Schiff, A 123 42)

Cupric arsenate calcium carbonate, 5CuO, As₂O₅, CaCO₃+4H₂O, or 9H₂O

Min *Tyrolite* Easily sol in acids, and NH₄OH+Aq

Cupric arsenate sodium chloride, 2Cu₃(AsO₄)₂, NaCl+7½H₂O

Decomp by hot H₂O (Hirsch, Dissert 1891)

3Cu₃(AsO₄)₂, 2NaCl+13½H₂O +17½H₂O (Hirsch, l c)
 5Cu₃(AsO₄)₂, 3NaCl+23H₂O (Hirsch)

Didymium arsenate, D₁₂H₈(AsO₄)₄

Ppt Insol in H₂O, sl sol in weak acids (Marignac, A ch (3) 38 164)
 5D₁₂(AsO₄)₂, As₂O₅+3H₂O P

Glucinum arsenate, Gl₃(AsO₄)₃

Insol in H₂O, sol in H₃AsO₄+Aq (Berzelius)

Glucinum hydrogen arsenate, GlHAsO₄

Obtained in impure state by heating As₂O₅ with Gl(OH)₃ in a sealed tube at 220° (Bleyer, Z anorg 1912, 75 287)

Glucinum tetrahydrogen arsenate, GlH₄(AsO₄)₂

Very hygroscopic (Bleyer, Z anorg 1912, 75 287)

Glucinum potassium arsenate, KGlAsO₄, ½GlO+5H₂O

Unstable Amorphous Easily hydrolyzed, giving more basic salts (Bleyer, Z anorg 1912, 75 289)

Glucinum sodium arsenate, NaGlAsO₄, ½GlO+6H₂O

Unstable Easily hydrolyzed (Bleyer, Z anorg 1912, 75 290)

Iron (ferrous) arsenate, Fe₃(AsO₄)₂+6H₂O (?)

Ppt Sl sol in NH₄OH+Aq Insol in (NH₄)₃AsO₄+Aq or other NH salts+Aq (Wittstein)
 +8H₂O Min *Symplectite* Sol in HCl+Aq

Iron (ferric) arsenate, basic, 16FeO₃, As₂O₅+24H₂O

Insol in NH₄OH+Aq (Berzelius)
 2FeO₃, As₂O₅+12H₂O Insol in NH₄OH+Aq
 3Fe₂O₃, 2As₂O₅
 3Fe₂(AsO₄)₂, Fe₂O₆H₆+12H₂O Min *Pharmacosiderite* Easily sol in acids, decomp by KOH+Aq

Iron (ferric) arsenate, $\text{Fe}_2\text{O}_3, \text{As}_2\text{O}_5$

Ppt Insol in H_2O Decomp by hot H_2O
Sol in HCl , H_2SO_4 , and HNO_3 (Metzke, Z anorg 1898, 19 473)

+ $4\text{H}_2\text{O}$ Min *Scorodite* Easily sol in $\text{HCl} + \text{Aq}$, insol in $\text{HNO}_3 + \text{Aq}$
+ $8\text{H}_2\text{O}$ Insol in H_2O When freshly pptd, sol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in HCl , or $\text{HNO}_3 + \text{Aq}$ Insol in $\text{HC}_2\text{H}_3\text{O}_2$, or NH_4 salts + Aq (Wittstein)

Sol in warm $\text{H}_2\text{SO}_3 + \text{Aq}$ or $(\text{NH}_4)_2\text{SO}_3 + \text{Aq}$ (Berthier, A ch (3) 7 79)

Iron (ferric) arsenate, acid, $\text{Fe}_2\text{O}_3, 3\text{As}_2\text{O}_5$

+ $16\text{H}_2\text{O}$
Ppt, sl sol in acids with a yellow color, and in $\text{NH}_4\text{OH} + \text{Aq}$ with a red color (Metzke, Z anorg 1898, 19 476)

$2\text{Fe}_2\text{O}_3, 3\text{As}_2\text{O}_5 + 12\text{H}_2\text{O}$ Insol in H_2O or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$

Sol in mineral acids

Sol only in conc $\text{H}_2\text{AsO}_4 + \text{Aq}$

Sol in $(\text{NH}_4)_3\text{AsO}_4$, and other NH_4 salts + Aq (Wittstein)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$
+ $22\frac{1}{2}\text{H}_2\text{O}$ Ppt Sl sol in acids with a yellow color, and in $\text{NH}_4\text{OH} + \text{Aq}$ with a red color (Metzke, Z anorg 1898, 19 475)

Iron (ferroferric) arsenate, $6\text{FeO}, 3\text{Fe}_2\text{O}_3, 4\text{As}_2\text{O}_5 + 32\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$ (Wittstein, J B 1866 243)

Iron (ferric) lead arsenate, $5\text{Fe}_2(\text{AsO}_4)_2, \text{Pb}_3(\text{AsO}_4)_2$

Min *Carmine Spar Carminite* Sol in acids, $\text{KOH} + \text{Aq}$ dissolves out As_2O_5 (Sandberger)

Iron (ferric) potassium arsenate, $2\text{Fe}_2\text{O}_3, 3\text{K}_2\text{O}, 3\text{As}_2\text{O}_5$

Not attacked by boiling H_2O , easily sol in dil acids (Lefèvre)

$\text{Fe}_2\text{O}_3, \text{K}_2\text{O}, 2\text{As}_2\text{O}_5$ (Lefèvre)

Iron (ferric) sodium arsenate, $\text{Fe}_2\text{O}_3, \text{Na}_2\text{O}, 2\text{As}_2\text{O}_5$

(Lefèvre)
 $2\text{Fe}_2\text{O}_3, 3\text{Na}_2\text{O}, 3\text{As}_2\text{O}_5$ (Lefèvre)

Lanthanum arsenate, $\text{La}_2\text{H}_3(\text{AsO}_4)_3$

(Fierichs and Smith)
Doubtful (Cleve, B 11 910)

Lead arsenate, basic, $15\text{PbO}, 2\text{As}_2\text{O}_5$ (?)

Ppt (Stromholm Z anorg 1904, 38 446)

Lead arsenate, $\text{Pb}_3(\text{AsO}_4)_2$

Insol in H_2O , NH_4OH , or NH_4 salts + Aq (Wittstein)

Sol in 2703 5 pts $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ containing 38 94% $\text{HC}_2\text{H}_3\text{O}_2$ (Bertrand, Monit Scient (3) 10 477)

Sol in sat $\text{NaCl} + \text{Aq}$ (Becquerel, C R 20 1523)

Not pptd in presence of Na citrate (Spiller)

Lead pyroarsenate, $\text{Pb}_2\text{As}_2\text{O}_7$

Insol in H_2O or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in HCl , or $\text{HNO}_3 + \text{Aq}$ (Rose)

Decomp by cold H_2O (Lefèvre)

+ $\text{H}_2\text{O} = \text{PbHAsO}_4$ Ppt (Salkowsky, J pr 104 109)

Lead potassium arsenate, PbKAsO_4

(Lefèvre, A ch (6) 27 5)

Lead sodium arsenate, PbNaAsO_4

(Lefèvre)

$4\text{PbO}, 2\text{Na}_2\text{O}, 3\text{As}_2\text{O}_5$ Superficially decomp by cold H_2O (Lefèvre)

Lead arsenate chloride, $3\text{Pb}_3(\text{AsO}_4)_2, \text{PbCl}_2$

Sol in dil $\text{HNO}_3 + \text{Aq}$ (Lechartier)

Min *Mimetite* Sol in HNO_3 , and $\text{KOH} + \text{Aq}$

Lithium arsenate, Li_3AsO_4

Ppt Sol in dil acids and in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (de Schulten, Bull Soc (3) 1 479)

$\text{LiH}_2\text{AsO}_4 + \frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O into H_3AsO_4 and Li_3AsO_4 (Rammelsberg, Pogg 128 311)

Magnesium arsenate, $\text{Mg}_3(\text{AsO}_4)_2$

Ppt

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ $7\text{H}_2\text{O}$, + $8\text{H}_2\text{O}$, + $10\text{H}_2\text{O}$, and + $22\text{H}_2\text{O}$ (Grühl, Dissert 1897)

+ $8\text{H}_2\text{O}$ Min *Hörnseite* Insol in H_2O , easily sol in acids

Magnesium hydrogen arsenate, MgHAsO_4

+ $\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (de Schulten, C R 100 263)

+ $5\text{H}_2\text{O}$ (Schiefer)

+ $6\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O 1000 pts boiling H_2O dissolve 1 5 pts (Thompson)

Sol in $\text{HNO}_3 + \text{Aq}$ before ignition, but insol in acids after ignition (Graham, A 29 29)

+ $7\text{H}_2\text{O}$ Min *Roesslerite* Sol in $\text{HCl} + \text{Aq}$

Magnesium tetrahydrogen arsenate, $\text{MgH}_4(\text{AsO}_4)_2$

Very deliquescent, sol in H_2O (Schiefer)

Magnesium potassium arsenate, MgKAsO_4

Insol in, but decomp by cold H_2O (Rose)

Easily sol in dil acids (Lefèvre)

+ $7\text{H}_2\text{O}$ (Kinkelin, Dissert, 1893)

$4\text{MgO}, 2\text{K}_2\text{O}, 3\text{As}_2\text{O}_5$ Not attacked by boiling H_2O , slowly sol in dil acids (Lefèvre)

Magnesium potassium hydrogen arsenate, $\text{KMgH}(\text{AsO}_4)_2 + x\text{H}_2\text{O}$

Decomp by H_2O (Kinkelin, Dissert 1893)

$Mg_3KH_3(AsO_4)_2 + 5H_2O$ (Chevron and Drouxhe, J B 1888, 523)

Magnesium potassium sodium arsenate,
 $Mg_3KNa(AsO_4)_2 + 10H_2O$
 (Kinkelin, Dissert 1883)

Magnesium sodium arsenate, Mg_2NaAsO_4
 Insol in H_2O Very sl sol in dil acids
 (Lefèvre)
 $4MgO, 2Na_2O, 3As_2O_5$ (Lefèvre)

Magnesium vanadium arsenate,
 $MgH_2(VO_3)_2(AsO_4)_2 + 9H_2O$ and
 $MgHAsO_4, 2(VO_3)_2H_2AsO_4 + 9H_2O$
See Arseniovanadate, magnesium

Magnesium arsenate chloride, $Mg_3(AsO_4)_2$,
 $MgCl_2$
 Insol in H_2O , sol in dil $HNO_3 + Aq$
 (Lechartier, C R 65 172)

Magnesium arsenate fluoride, $Mg_3(AsO_4)_2$,
 MgF_2
 Insol in H_2O , sol in dil $HNO_3 + Aq$
 (Lechartier)

Manganous arsenate, basic, $6MnO, As_2O_5 + 3H_2O$ (?)

Min *Chondroarsenate* Easily and completely sol in dil HCl, and $HNO_3 + Aq$

Manganous arsenate, $Mn_3(AsO_4)_2 + H_2O$
 Insol in H_2O , sl sol in acids (Coloriano, C R 103 273)
 $5MnO, 2As_2O_5 + 5H_2O$ Insol in H_2O
 (Coloriano)

$2MnO, As_2O_5$ Sl decomp by cold H_2O , but rapidly on heating (Lefèvre)
 $MnHAsO_4 + H_2O$ Decomp by boiling H_2O into $5MnO, 2As_2O_5 + 5H_2O$ Sol in HNO_3, H_2SO_4 , or $H_3AsO_4 + Aq$

Manganous tetrahydrogen arsenate,
 $MnH_4(AsO_4)$
 Deliquescent Easily sol in H_2O (Schiefer)

Manganous potassium arsenate, $MnKAsO_4$
 (Lefèvre, A ch (6) 27 5)

Manganous sodium arsenate, $MnNaAsO_4$
 Very sol in dil acids (Lefèvre)
 $2MnO, 4Na_2O, 3As_2O_5$ Not attacked by boiling H_2O , very sol in dil acids (Lefèvre)

Manganous arsenate chloride, $Mn_3(AsO_4)_2$,
 $MnCl$
 Insol in H_2O , sol in dil $HNO_3 + Aq$
 (Lechartier, A 58 259)

Manganic arsenate, $Mn_2(AsO_4)_2 + 2H_2O$
 Insol in H_2O , sol in acids

Mercurous arsenate, $(Hg_2)_3(AsO_4)_2$
 Insol in H_2O , difficultly sol in acids
 (Coloriano, C R 103 273) Ppt (Haack, C C 1890, II 736)

$Hg(AsO_3)_2$ Insol in $H_2O, HC_2H_3O_2$, alcohol
 Decomp by cold $HCl + Aq$ Sl sol in cold $HNO_3 + Aq$, from which it is precipitated by NH_4OH as Hg_2HASO_4 (Simon Pogg 41 424)

Mercurous hydrogen arsenate, Hg_2HASO_4

Insol in $H_2O, HC_2H_3O_2$, or $NH_4OH + Aq$
 Decomp by cold $HCl + Aq$, sol in cold $HNO_3 + Aq$ without decomp, very sl sol with decomp in $NH_4NO_3 + Aq$ (Simon, Pogg 424)

Mercuric arsenate, $Hg_3(AsO_4)_2$

Ppt Sol in H_3AsO_4 or $HNO_3 + Aq$ (Bergemann) Very sl sol in H_2O Easily sol in $HCl + Aq$ Sl sol in $HNO_3 + Aq$ Insol in $H_3AsO_4 + Aq$ (Haack, C C 1890, II 73)

Mercurous silver arsenate, Hg_2AgAsO_4

Sol in hot conc HNO_3 (Jacobsen, B I Soc 1909, (4) 5 948)

Mercurous arsenate nitrate, $Hg_3AsO_4, HgNO_3 + H_2O$

Insol in H_2O or $HC_2H_3O_2$, sol in $HNO_3 + Aq$ (Simon, Pogg 41 424)
 $3Hg_3AsO_4, 2HgNO_3, 2Hg_2O$ Ppt (Haack)

Molybdenum arsenate

Ppt

Nickel arsenate, basic, $5NiO, As_2O_5$

Min — (Bergemann)
 $Ni(NiOH)AsO_4$ Difficultly attacked by acids or alkalis (Coloriano, Bull Soc 2) 45 241)
 $5NiO, 2As_2O_5 + 3H_2O$ As above

Nickel arsenate, $Ni_3(AsO_4)_2$

Min — (Bergemann)
 $+ xH_2O$ Insol in H_2O Sol in H_3AsO_4 , and conc mineral acids Easily sol in $NH_4OH + Aq$
 $+ 2H_2O$ Insol in H_2O , difficultly sol in acids (Coloriano, Bull Soc 45 241)
 $+ 8H_2O$ Min *Nickel-bloom, Annabergite*
 Easily sol in acids
 $NiHAsO_4 + H_2O$ Sol in H_2O Difficultly attacked by acids (Coloriano, C R 103 274)

Nickel potassium arsenate, $12NiO, 3K_2O, 5As_2O_5$

(Lefèvre)
 $2NiO, K_2O, As_2O_5$ Rapidly sol in dil acids (Lefèvre)

Nickel sodium arsenate, $NiNaAsO_4$

Very slowly sol in dil acids (Lefèvre)
 $4NiO, 2Na_2O, 3As_2O_5$ (Lefèvre)

Nickel arsenate ammonia,

$Ni_3(AsO_4)_2, 2NH_3 + 7H_2O$
 $Ni_3(AsO_4)_2, 2NH_3 + 6H_2O$
 $Ni_3(AsO_4)_2, 3NH_3 + 5H_2O$ (Ducru, I 1900, 131 703)

Palladium arsenate (?)

Ppt

Platinum arsenate (?)Ppt Sol in $\text{HNO}_3 + \text{Aq}$ **Potassium arsenate, K_3AsO_4** Deliquescent Very sol in H_2O (Graham, Pogg 32 47)

Insol in ethyl acetate (Naumann, B 1904, 37 3601)

Potassium hydrogen arsenate, K_2HAsO_4 Sol in H_2O **Potassium dihydrogen arsenate, KH_2AsO_4** Sol in 53 pts H_2O at 6° , forming a solution of sp gr 1.1134 Much more sol in hot H_2O Insol in alcohol

Sol in 26 666 pts boiling conc alcohol (Wenzel)

Potassium sodium hydrogen arsenate, $\text{KNaHAsO}_4 + 16\text{H}_2\text{O}$ Sol in H_2O $\text{K}_3\text{Na}_2\text{H}_6(\text{AsO}_4)_4 + 9\text{H}_2\text{O}$ Sol in H_2O , and not easily decomp thereby into its constituents (Filhol and Senderens, C R 95 343)**Potassium strontium arsenate, K_2SrAsO_4**

(Lefevre, C R 108 1058)

Potassium vanadium arsenate, $\text{K}(\text{VO})_2\text{AsO}_4 + 2\frac{1}{2}\text{H}_2\text{O}$

See Arseniovanadate, potassium

Potassium zinc arsenate, KZnAsO_4

(Lefevre)

Potassium arsenate sulphate

See Arseniosulphate, potassium

Rhodium arsenate (?)

Ppt

Rubidium metaarsenate, RbAsO_3 Sol in H_2O (Bouchonnet, C R 1907 144 642)**Rubidium arsenate, $\text{Rb}_3\text{AsO}_4 + 2\text{H}_2\text{O}$** Very hygroscopic, sol in H_2O to give an alkaline solution Absorbs CO from the air (Bouchonnet, l c)**Rubidium pyroarsenate, Rb_4AsO_6**

(Bouchonnet, l c)

Rubidium hydrogen arsenate, $\text{RbHAsO}_4 + \text{H}_2\text{O}$ Absorbs CO from the air Very hygroscopic, sol in H_2O Insol in alcohol (Bouchonnet, l c)**Rubidium dihydrogen arsenate, RbH_2AsO_4** Not hygroscopic Very sol in H_2O , aq solution is acid to litmus (Bouchonnet, l c)**Silver arsenate, Ag_3AsO_4** Insol in H_2O Sol in acids, easily sol in $\text{H}_3\text{AsO}_4 + \text{Aq}$ (Joly, C R 103 1071)11 H_2O dissolves 0.0085 g Ag_3AsO_4 at 20° (Whitby, Z anorg 1910, 67 108)Much less sol in H_3AsO_4 than Ag_3PO_4 (Graham)Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Scheele)Sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Insol in NH_4 sulphate nitrate, or succinate + Aq (Wittstein)Very sl sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$, more easily in $\text{HCl} \cdot \text{H}_2\text{O}_2 + \text{Aq}$ (Graham)Sol in $\text{Na}_2\text{S}_2\text{O}_4 + \text{Aq}$, but not so easily as Ag_3PO_4 Not pptd in presence of Na citrate (Spiller)Insol in liquid NH_3 (Gore Am Ch J 1898, 20 829)**Silver hydrogen arsenate, Ag_2HAsO_4** Decomp by H_2O , with formation of Ag_3AsO_4 (Setterberg, Berz J B 26 208) AgHAsO_4 Decomp by H_2O (Joly, C R 103 1071) $\text{Ag}_2\text{O} \cdot 2\text{As}_2\text{O}_5$ Decomp by H_2O Rather sl sol in $\text{H}_2\text{NO}_3 + \text{Aq}$ Very easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Hurtzig and Geuther, A 111 168)**Silver arsenate ammonia, $\text{Ag}_3\text{AsO}_4 \cdot 4\text{NH}_3$** Easily sol in H_2O (Widmann, Bull Soc (2) 20 64)**Silver arsenate sulphate, $3\text{Ag}_2\text{O} \cdot \text{As}_2\text{O}_5 \cdot \text{SO}_3$** Decomp by H_2O with separation of Ag_3AsO_4 decomp by dil $\text{HNO}_3 + \text{Aq}$ (Setterberg, Berz J B 26 209)**Sodium arsenate, $\text{Na}_3\text{AsO}_4 + 12\text{H}_2\text{O}$** Permanent in dry air Sol in 3.57 pts H_2O at 15° (Graham) 100 pts H_2O at 15.5° dissolve 28 pts $\text{NaAsO}_4 + 12\text{H}_2\text{O}$ (Berzelius) Sol in 3.75 pts H_2O at 17° or 100 pts H_2O at 17° dissolve 26.7 pts or sat $\text{Na}_3\text{AsO}_4 + \text{Aq}$ at 17° contains 21.1% $\text{NaAsO}_4 + 12\text{H}_2\text{O}$ or 10.4% NaAsO_4 and has sp gr 1.1186 (Schiff, A 113 550)Melts in crystal H_2O at 55° Sp gr of $\text{NaAsO}_4 + \text{Aq}$ at 17°
 $c_c = c_c \text{NaAsO}_4 + 12\text{H}_2\text{O}$

c_c	Sp gr	c_c	Sp	c_c	Sp
1	1.0033	9	1.0490	17	1.0943
2	1.0107	10	1.0547	18	1.1005
3	1.0161	11	1.0603	19	1.1061
4	1.0215	12	1.0659	20	1.1121
5	1.0270	13	1.0716	21	1.1179
6	1.0325	14	1.0775	22	1.1238
7	1.0380	15	1.0830		
8	1.0435	16	1.0887		

(Schiff, calculated by Gerlach Z anal 8 289)

Arsenate of soda dissolves in 1 pt boiling alcohol (Wenzel)

 $+41\text{H}_2\text{O}$ (Hall Chem Soc 51 93) $+10\text{H}_2\text{O}$ (Hall Chem Soc 51 93)

Arsenioarsenic acid, $3\text{As}_2\text{O}_3$, $2\text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$

Decomp by H_2O (Joly, C R 100 1221)

$3\text{As}_2\text{O}_3$, $\text{As}_2\text{O}_5 + \text{H}_2\text{O}$ Decomp by H_2O (Joly)

As_2O_3 , $\text{As}_2\text{O}_5 + \text{H}_2\text{O}$ Decomp by H_2O (Joly)

See also *Arsenic trioxide pentoxide*

Arseniochromic acid

Ammonium arseniochromate, $2(\text{NH}_4)_2\text{O}$, As_2O_5 , $4\text{CrO}_3 + \text{H}_2\text{O}$

Insol in H_2O (Friedheim and Mozkin, Z anorg 1894, 6 280)

$3(\text{NH}_4)_2\text{O}$, As_2O_5 , 8CrO_3 Decomp by recryst from H_2O (Friedheim and Mozkin, Z anorg 1894, 6 281)

Potassium arseniochromate, $2\text{K}_2\text{O}$, As_2O_5 , 4CrO_3

Decomp by recryst from H_2O (Friedheim and Mozkin, Z anorg 1894, 6 275)

$2\text{K}_2\text{O}$, As_2O_5 , $4\text{CrO}_3 + \text{H}_2\text{O}$ Decomp by recryst from H_2O (Friedheim and Mozkin, l c)

Arseniomolybdic acid, As_2O_5 , $6\text{MoO}_3 + 10\text{H}_2\text{O}$

By recryst from H_2O the comp with $18\text{H}_2\text{O}$ is formed (Pufahl, Dissert 1888)

+ $16\text{H}_2\text{O}$ Sol in H_2O (Debray)
+ $18\text{H}_2\text{O}$ Completely sol in H_2O Sp gr of sat solution at $18^\circ = 2.21$ Easily sol in abs alcohol Insol in CS_2 , liq hydrocarbons and CHCl_3 (Pufahl, l c)

As_2O_5 , $7\text{MoO}_3 + 14\text{H}_2\text{O}$ (Seyberth, B 7 391)

As_2O_5 , $18\text{MoO}_3 + 28\text{H}_2\text{O}$ Very sol in H_2O Sp gr of sat solution at $18^\circ = 2.45$ and 1 cc contains 2.16 g acid Easily sol in absolute alcohol insol in CS_2 liquid hydrocarbons and CHCl_3 (Pufahl, l c)

Sol in ether with subsequent separation into two layers See Phosphotungstic acid (Diedrichs B 20 1122)

+ $5\text{H}_2\text{O}$ Fluorescent When recryst comp with $28\text{H}_2\text{O}$ is formed (Pufahl, l c)

As_2O_5 , $20\text{MoO}_3 + 27\text{H}_2\text{O}$ Sl sol in HNO_3 + Aq (Debray, C R 78 1408)

Ammonium arseniomolybdate, $(\text{NH}_4)_3\text{O}$, As_2O_5 , $2\text{MoO}_3 + \text{H}_2\text{O}$

(Friedheim, Z anorg 1894, 6 28)

+ $4\text{H}_2\text{O}$ (Friedheim, l c)

$(\text{NH}_4)_3\text{O}$, As_2O_5 , $6\text{MoO}_3 + 2\text{H}_2\text{O}$ Sl sol in cold H_2O sol in acids (Debray)

+ $4\text{H}_2\text{O}$ Sl sol in cold very easily sol in hot H_2O (Pufahl, l c)

$2(\text{NH}_4)_3\text{O}$, As_2O_5 , $6\text{MoO}_3 + 6\text{H}_2\text{O}$ Sl sol in H_2O Cannot be recryst therefrom (Pufahl)

+ $12\text{H}_2\text{O}$ (Friedheim, Z anorg 1894, 6 281)

$3(\text{NH}_4)_3\text{O}$, As_2O_5 , $6\text{MoO}_3 + 4\text{H}_2\text{O}$ (Friedheim, l c)

+ $8\text{H}_2\text{O}$ (Friedheim, l c)

$(\text{NH}_4)_2\text{O}$, $2\text{H}_2\text{O}$, 7MoO_3 , $\text{As}_2\text{O}_5 + 4\text{H}_2\text{O}$

Sol in hot H_2O (Seyberth, B 7 391)

Not obtained (Pufahl)

$7(\text{NH}_4)_2\text{O}$, $2\text{As}_2\text{O}_5$, $14\text{MoO}_3 + 28\text{H}_2\text{O}$ (Friedheim, l c)

$5(\text{NH}_4)_2\text{O}$, As_2O_5 , $16\text{MoO}_3 + 5\text{H}_2\text{O}$ (Friedheim, Z anorg 1894, 6 31)

$5(\text{NH}_4)_2\text{O}$, As_2O_5 , $16\text{MoO}_3 + 9\text{H}_2\text{O}$ Neely insol in cold, sol in boiling H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gibbs, Am Ch J 3 4)

+ $12\text{H}_2\text{O}$ (Pufahl, l c)

$2(\text{NH}_4)_2\text{O}$, As_2O_5 , $18\text{MoO}_3 + 17\text{H}_2\text{O}$ (Pufahl, l c)

$3(\text{NH}_4)_2\text{O}$, As_2O_5 , $18\text{MoO}_3 + 14\text{H}_2\text{O}$ Very sol in H_2O and alcohol (Kehrmann, Z anorg 1894, 7 421)

$3(\text{NH}_4)_2\text{O}$, As_2O_5 , 20MoO_3 Easily sol in H_2O (Debray, C R 78 1408)

$3(\text{NH}_4)_2\text{O}$, As_2O_5 , $24\text{MoO}_3 + 12\text{H}_2\text{O}$ composed by H_2O , especially when boiled

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, less easily sol in warm H_2SO_4 and boiling $\text{H}_3\text{AsO}_4 + \text{Aq}$

Sl sol in molybdic acid + Aq, HNO_3 , and conc $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Pufahl, l c)

Barium arseniomolybdate, BaO , As_2O_5

$6\text{MoO}_3 + 10\text{H}_2\text{O}$

Sl sol in H_2O Partially decomp by boiling (Pufahl, l c)

3BaO , As_2O_5 , 6MoO_3 Sl sol in H_2O (Pufahl, l c)

3BaO , As_2O_5 , 7MoO_3 Ppt (Seyberth)

3BaO , As_2O_5 , 18MoO_3 Decomp by H_2O (Pufahl, l c)

Cadmium arseniomolybdate, CdO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3 + 11\text{H}_2\text{O}$

(Pufahl)

3CdO , $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3 + 3\text{H}_2\text{O}$ (Pufahl)

Cæsium arseniomolybdate, CsO , As_2O_5 , 6MoO_3

Sl sol in H_2O (Pufahl, l c)

4CsO , As_2O_5 , $26\text{MoO}_3 + 15\text{H}_2\text{O}$ ppt (Lippmann, Z anorg 1910, 65 216)

Calcium arseniomolybdate, CaO , As_2O_5 , $6\text{MoO}_3 + 10\text{H}_2\text{O}$

Rather difficultly sol in cold H_2O (Pufahl, l c)

3CaO , As_2O_5 , 6MoO_3 As Ppt salt (Pufahl, l c)

3CaO , As_2O_5 , $18\text{MoO}_3 + 32\text{H}_2\text{O}$ Very sol in H_2O Solution sat at 18° has sp gr = 2.163 (Pufahl, l c)

Cobalt arseniomolybdate, CoO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3 + 11\text{H}_2\text{O}$

(Pufahl)

3CoO , $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3 + 3\text{H}_2\text{O}$ (Pufahl)

Cupric arseniomolybdate, CuO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3 + 11\text{H}_2\text{O}$ (Pufahl)

3CuO , $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3 + 34\text{H}_2\text{O}$ (Pufahl)

Lithium arseniomolybdate, Li_2O , As_2O_5 , $6\text{MoO}_3+14\text{H}_2\text{O}$

Very sol in H_2O (Pufahl, *l c*)

$3\text{Li}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+34\text{H}_2\text{O}$ Solution sat at 15° has sp gr of 2.481 (Pufahl, *l c*)

Magnesium arseniomolybdate, MgO , As_2O_5 , $6\text{MoO}_3+13\text{H}_2\text{O}$

Very sol in H_2O (Pufahl, *l c*)

3MgO , As_2O_5 , $18\text{MoO}_3+36\text{H}_2\text{O}$ Sol in H_2O (Pufahl, *l c*)

Manganese arseniomolybdate, MnO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3+11\text{H}_2\text{O}$

(Pufahl)

3MnO , $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+33\text{H}_2\text{O}$ (Pufahl)

Nickel arseniomolybdate, NiO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3+11\text{H}_2\text{O}$

(Pufahl)

3NiO , $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+34\text{H}_2\text{O}$ (Pufahl)

Potassium arseniomolybdate, K_2O , As_2O_5 , $2\text{MoO}_3+5\text{H}_2\text{O}$

Sol in H_2O (Friedheim, Z anorg 2 314)

K_2O , As_2O_5 , $6\text{MoO}_3+5\text{H}_2\text{O}$ Sol in hot H_2O without decomp (Friedheim, Z anorg 1892, 2 330)

K_2O , As_2O_5 , $18\text{MoO}_3+25\text{H}_2\text{O}$ Easily sol in cold H_2O Decomp on dilution (Pufahl, *l c*)

$3\text{K}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+26\text{H}_2\text{O}$ Easily sol in H_2O (Pufahl, *l c*)

$3\text{K}_2\text{O}$, As_2O_5 , 20MoO_3 Insol in H_2O (Debray, C R 78 1408)

$3\text{K}_2\text{O}$, As_2O_5 , $24\text{MoO}_3+12\text{H}_2\text{O}$ Somewhat sol in H_2O acidified with HNO_3 (Pufahl, *l c*)

Rubidium arseniomolybdate, 3RbO , 3AsO_3 , $5\text{MoO}_3+9\text{H}_2\text{O}$

Easily sol in H_2O (Ephraim, Z anorg 1910, 65 241)

Rb_2O , As_2O_5 , 6MoO_3 Sl sol in H_2O (Pufahl, *l c*)

4RbO , As_2O_5 , $18\text{MoO}_3+40\text{H}_2\text{O}$ Pptd (Ephraim, Z anorg 1910, 65 241-4)

Silver arseniomolybdate, 3AgO , As_2O_5 , $6\text{MoO}_3+11\text{H}_2\text{O}$

(Pufahl, Leipzig 1888)

6AgO , As_2O_5 , $18\text{MoO}_3+22\text{H}_2\text{O}$ Sl sol in H_2O Very sol in NH_4OH and in dil HNO_3 (Pufahl, *l c*)

7AgO , $2\text{As}_2\text{O}_5$, $36\text{MoO}_3+30\text{H}_2\text{O}$ Sl sol in cold, easily sol in hot H_2O strongly acidified with HNO_3 (Pufahl, *l c*)

Sodium arseniomolybdate, Na_2O , As_2O_5 , $2\text{MoO}_3+5\text{H}_2\text{O}$

(Friedheim, Z anorg 1892, 2 357)

Na_2O , As_2O_5 , $6\text{MoO}_3+12\text{H}_2\text{O}$ Very sol in H_2O Solution sat at 19.8° has sp gr = 1.678 (Friedheim, *l c*)

$3\text{Na}_2\text{O}$, As_2O_5 , $6\text{MoO}_3+11\text{H}_2\text{O}$, $+12\text{H}_2\text{O}$, and $+13\text{H}_2\text{O}$ Sl sol in cold H_2O (Pufahl, *l c*)

$3\text{Na}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+24\text{H}_2\text{O}$ Easily sol in H_2O (Pufahl, *l c*)

$+30\text{H}_2\text{O}$ Sl sol in cold H_2O (Pufahl, *l c*)

Strontium arseniomolybdate, SrO , As_2O_5 , $6\text{MoO}_3+10\text{H}_2\text{O}$

As Ba salt (Pufahl, *l c*)

3SrO , As_2O_5 , 6MoO_3 As Ba salt (Pufahl, *l c*)

3SrO , As_2O_5 , $18\text{MoO}_3+32\text{H}_2\text{O}$ Very sol in H_2O (Pufahl, *l c*)

Thallium arseniomolybdate, $6\text{Tl}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+2\text{H}_2\text{O}$

Ppt (Pufahl)

$3\text{Tl}_2\text{O}$, $3\text{H}_2\text{O}$, As_2O_5 , $18\text{MoO}_3+3\text{H}_2\text{O}$ Ppt (Pufahl)

Zinc arseniomolybdate, ZnO , $2\text{H}_2\text{O}$, As_2O_5 , $6\text{MoO}_3+11\text{H}_2\text{O}$

(Pufahl)

3ZnO , As_2O_5 , $18\text{MoO}_3+37\text{H}_2\text{O}$ Very sol in H_2O (Pufahl)

Arseniophosphovanadicotungstic acid

Ammonium arseniophosphovanadicotungstate

69V

Sol in

(Rogers, J Am Chem Soc 1903, 25 314)

Arseniophosphovanadocovanadotungstic acid

Ammonium arseniophosphovanadocovanadotungstate, $99(\text{NH}_4)_2\text{O}$, $2\text{As}_2\text{O}_5$, $12\text{P}_2\text{O}_5$, $6\text{V}_2\text{O}_5$, $66\text{V}_2\text{O}_5$, $191\text{WO}_3+522\text{H}_2\text{O}$

Sl sol in cold H_2O (Rogers, J Am Chem Soc 1903, 25 314)

Arseniophosphovanadotungstic acid

Ammonium arseniophosphovanadotungstate, $82(\text{NH}_4)_2\text{O}$, $3\text{As}_2\text{O}_5$, $12\text{P}_2\text{O}_5$, $52\text{V}_2\text{O}_5$, $201\text{WO}_3+567\text{H}_2\text{O}$

Very sol in warm H_2O Insol in organic solvents (Rogers, J Am Chem Soc 1903, 25 312)

Arseniosulphuric acid

Ammonium arseniosulphate, $2(\text{NH}_4)_2\text{O}$, As_2O_3 , $2\text{SO}_3+3\text{H}_2\text{O}$

Cubic cryst from H_2O (Friedheim and Mozkin, Z anorg 1894, 6 290)

Potassium arseniosulphate, $2\text{K}_2\text{O}$, As_2O_3 , $2\text{SO}_3+3\text{H}_2\text{O}$

(Friedheim and Mozkin, Z anorg 1894, 6 289)

$5\text{K}_2\text{O}$, As_2O_3 , $\text{SSO}_3+6\text{H}_2\text{O}$ (Friedheim and Mozkin, Z anorg 1894, 6 291)

Sodium arseniosulphate, $2\text{Na}_2\text{O}, \text{As}_2\text{O}_5, 2\text{SO}_3+3\text{H}_2\text{O}$
(Friedheim and Mozkun, Z anorg 1894, 6 290)

Arseniotelluric acid

Ammonium arseniotellurate, $2(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, \text{TeO}_3+4\text{H}_2\text{O}$
Sol in H_2O (Weinland, Z anorg 1901, 28 65)
 $4(\text{NH}_4)_2\text{O}, 3\text{As}_2\text{O}_5, 2\text{TeO}_3+11\text{H}_2\text{O}$ Sol in H_2O (Weinland)

Sodium arseniotellurate, $2\text{Na}_2\text{O}, \text{As}_2\text{O}_5, 2\text{TeO}_3+9\text{H}_2\text{O}$
Ppt (Weinland l c)

Arseniotungstic acid, $3\text{H}_2\text{O}, \text{As}_2\text{O}_5, 16\text{WO}_3+32\text{H}_2\text{O}=\text{H}_3\text{AsW}_8\text{O}_{28}+16\text{H}_2\text{O}$ (α -an-hydroarsenolutedeutungstic acid)
Sol in H_2O (Kehrmann, A 245 45)
 $3\text{H}_2\text{O}, \text{As}_2\text{O}_5, 19\text{WO}_3(?)$ Sp gr of sat solution in H_2O is 3 279 (Fremery, B 17 296)

Is a mixture containing principally $\text{H}_3\text{AsW}_8\text{O}_{28}+16\text{H}_2\text{O}$ (Kehrmann)
 $\text{As}_2\text{O}_5, 18\text{WO}_3+x\text{H}_2\text{O}$ Sol in H_2O (Kehrmann, Z anorg 1899, 22 292)

Aluminum ammonium arsenotungstate

See **Aluminicoarsenotungstate**, ammonium

Ammonium arsenotungstate, $4(\text{NH}_4)_2\text{O}, 2\text{H}_2\text{O}, \text{As}_2\text{O}_5, 6\text{WO}_3+3\text{H}_2\text{O}$

Sl sol in cold H_2O or HNO_3+Aq , easily sol in boiling H_2O (Gibbs, Proc Am Acad 16 135)

$7(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 14\text{WO}_3+17\text{H}_2\text{O}$ Very sl sol even in boiling H_2O (Fremery, l c)
 $3(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 16\text{WO}_3+16\text{H}_2\text{O}=(\text{NH}_4)_3\text{AsW}_8\text{O}_{28}+8\text{H}_2\text{O}$ Sol in H_2O (Kehrmann)

$5(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 17\text{WO}_3+8\text{H}_2\text{O}$ Can be recryst from H_2O without decomp. Decomp by long boiling with H_2O (Kehrmann, Z anorg 1899, 22 294)

$3(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 18\text{WO}_3+14, \text{ or } 18\text{H}_2\text{O}$ Very sol in cold H_2O . Can be recryst from H_2O (Kehrmann, l c)

$3(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 21\text{WO}_3+x\text{H}_2\text{O}$ Easily sol in H_2O . Easily decomp on recryst (Kehrmann, l c)

$3(\text{NH}_4)_2\text{O}, \text{As}_2\text{O}_5, 24\text{WO}_3+12\text{H}_2\text{O}$ More sol in H_2O than corresponding phosphotungstate (Kehrmann, l c)

Barium arsenotungstate, $2\text{BaO}, \text{As}_2\text{O}_5, 16\text{WO}_3+x\text{H}_2\text{O}$

Sol in H_2O (Pechard, A ch (6) 22 262)
 $7\text{BaO}, \text{As}_2\text{O}_5, 22\text{WO}_3+54\text{H}_2\text{O}$ Sol in H_2O . Can be recryst therefrom (Kehrmann, l c)

Potassium arsenotungstate, $3\text{K}_2\text{O}, \text{H}_2\text{O}, \text{As}_2\text{O}_5, 6\text{WO}_3$

Insol in H_2O . Readily sol in alk hydrides + Aq (Gibbs)

$3\text{K}_2\text{O}, \text{As}_2\text{O}_5, 16\text{WO}_3+16\text{H}_2\text{O}=\text{K}_3\text{As}_2\text{O}_{18}+8\text{H}_2\text{O}$ Sol in H_2O (Kehrmann)

$5\text{K}_2\text{O}, \text{As}_2\text{O}_5, 17\text{WO}_3+22\text{H}_2\text{O}$ Scarcely sol in cold H_2O (Kehrmann, Z anorg 899, 22 295)

$3\text{K}_2\text{O}, \text{As}_2\text{O}_5, 18\text{WO}_3+14\text{H}_2\text{O}$ Efflorescent (Kehrmann, l c)

$3\text{K}_2\text{O}, \text{As}_2\text{O}_5, 19\text{WO}_3+16\text{H}_2\text{O}(?)$ Sol in H_2O (Fremery)

Silver arsenotungstate, $\text{Ag}_3\text{AsW}_8\text{O}_{28}$

Insol in H_2O (Kehrmann, A 245 55) perhaps identical with—

$6\text{Ag}_2\text{O}, \text{As}_2\text{O}_5, 16\text{WO}_3+11\text{H}_2\text{O}$ Insol in H_2O (Gibbs)

Sodium arsenotungstate, $3\text{Na}_2\text{O}, \text{As}_2\text{O}_5, 3\text{WO}_3+20\text{H}_2\text{O}$

Very sol in H_2O (Lefort, C R 92 61)

Arsenous acid, HAsO_2

Solubility of HAsO_2 in amyl alcohol + H_2O at 25°

a_w = mol of HAsO_2 in 1 l of H_2O

a_a = mol of HAsO_2 in 1 l of amyl alcohol

h = partition coefficient

a_w	a_a	h
0 0449	0 0082	5 48
0 0446	0 0083	5 38
0 0887	0 0164	5 41
0 0892	0 0161	5 53
0 1800	0 0324	5 55

(Auerbach, Z anorg 1903, 37 356)

Solubility of HAsO_2 in sat H_2BO_3 + H_2O and amyl alcohol

a_w = mol of HAsO_2 in 1 l of H_2O

a_a = mol of HAsO_2 in 1 l of amyl alcohol

h = partition coefficient

a_w	a_a	h
0 0859	0 0161	5 33
0 1720	0 0321	5 35

(Auerbach, l c)

Insol in ethyl acetate (Nannum B 1904, 37 3601)

See **Arsenic trioxide**

Arsenites

All arsenites, except those of the alkali metals, are partially or wholly insol in H_2O , but easily sol in acids, several also in $(\text{NH}_4)_2\text{SO}_4$, NH_4NO_3 , or $\text{NH}_4\text{Cl}+\text{Aq}$

All basic arsenites are sol in acids except those that give an insol salt with the bases. Many are sol in excess of $\text{As}_2\text{O}_3+\text{Aq}$

Cobaltous arsenite, $3\text{CoO}, \text{As}_2\text{O}_3$

Sol KOH+Aq with decomp (Identical with salt of Girard) (Reichard, B 1894, 27 1031)

+ $4\text{H}_2\text{O}$ Sl sol in H_2O , easily sol in acids (Stavenhagen, J pr 1895, (2) 51 39)

$3\text{CoO}, 2\text{As}_2\text{O}_3 + 4\text{H}_2\text{O}$ Sol in HNO_3 (Girard, C R 1852, 34 918)

$\text{Co}_3\text{H}_6(\text{AsO}_3)_4$ Insol in H_2O , sol in HNO_3 , HCl , or $\text{NH}_4\text{OH} + \text{Aq}$ (Proust)

Only sol in KOH, or NaOH+Aq when formed in a solution containing an excess of those reagents (Reynoso, C R 31 68)

$\text{Co}_2\text{As}_2\text{O}_5$ Ppt (Reichard, B 1898, 31 2165)

Sol in HNO_3 and $\text{HCl} + \text{Aq}$ (Proust)

Cupric arsenite, $\text{Cu}(\text{AsO}_2)_2$

(Avery, J Am Chem Soc 1906, 28 1161)
Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

+ H_2O Sl sol in H_2O (Stavenhagen, l c)

+ $2\text{H}_2\text{O}$ Sl sol in H_2O , insol in alcohol (Stavenhagen, l c)

$3\text{CuO}, \text{As}_2\text{O}_3$ Ppt (Stavenhagen, l c)

$2\text{CuO}, \text{As}_2\text{O}_3$ (Scheele's green) Insol in H_2O , sol in KOH+Aq, $\text{NH}_4\text{OH} + \text{Aq}$, and in most acids Formula is $\text{Cu}_3(\text{AsO}_2)_2 + 2\text{H}_2\text{O}$ (Sharples, C N 35 89)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ without decomp Sol in KOH+Aq with decomp (Reichard, B 1894, 27 1026)

Insol in pyridine (Schroeder, Dissert 1901)

$5\text{CuO}, \text{As}_2\text{O}_3$ Insol in H_2O , sol in acids, $\text{NH}_4\text{OH} + \text{Aq}$ and conc $\text{MOH} + \text{Aq}$ (Reichard, Ch Z 1902, 26 1142)

$x\text{CuO}, y\text{As}_2\text{O}_3$ Min *Trippherte* Easily sol in HNO_3 and in $\text{HCl} + \text{Aq}$

Didymium arsenite, $\text{D}_1 \text{H}_3(\text{AsO}_3)_3$

Ppt (Frerichs and Smith, A 191 355)

Does not exist (Cleve, B 11 910)

Glucinum arsenite iodide, $\text{GII}, 3\text{AsO}_3 + 8\text{H}_2\text{O}$

Decomp by H_2O (Gruhl, Dissert 1897)

Gold (aurous) arsenite, $3\text{AuO}, \text{As}_2\text{O}_3$

Decomp by light (Reichard B 1894, 27 1027)

Gold (auric) arsenite, $\text{AuAsO}_3 + \text{H}_2\text{O}$

Very sol in H_2O , $\text{NH}_4\text{OH} + \text{Aq}$ and dil acids (Stavenhagen, J pr 1895, (2) 51 28)

Iron (ferrous) arsenite, FeO, AsO

Decomp in the air when moist sol in $\text{NH}_4\text{OH} + \text{Aq}$ when freshly pptd (Reichard, B 1894, 27 1029-30)

FeAsO_3 Ppt Sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in NH_4 arsenite, or other NH_4 salts+Aq (Wittstein)

Iron (ferric) arsenite, basic, $4\text{Fe}_2\text{O}_3, \text{As}_2\text{O}_3 + 5\text{H}_2\text{O}$

Ppt H_2O extracts As_2O_3 Sol in one acid with separation of As_2O_3 Acetic acid is without action (Bunsen and Berzold, 1834)

Sol in KOH, or NaOH+Aq

Iron (ferric) arsenite, $\text{Fe}_2\text{O}_3, \text{As}_2\text{O}_3$

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ when freshly pptd (Reichard, B 1894, 27 1030)

$\text{Fe}_4\text{As}_2\text{O}_9$ Ppt (Reichard, B 1898, 31 2170)

+ $7\text{H}_2\text{O}$ Sol in NaOH, and KOH+Aq "Ferric arsenite" is sl sol in $\text{Al}_2(\text{SO}_4)_3 + \text{Aq}$ (Kynaston, Dingl 235 326)

Lanthanum arsenite, $\text{La}_2\text{H}_3(\text{AsO}_3)_3$

Ppt (Frerichs and Smith, A 191 3 5)

Does not exist (Cleve, B 11 910)

Lead arsenite, $\text{Pb}(\text{AsO}_2)_2 + x\text{H}_2\text{O}$

Sl sol in H_2O Insol in KOH, but sl in NaOH+Aq (Berzelius)

$\text{Pb}_3\text{As}_2\text{O}_5$ Insol in H_2O , NH_4OH NH_4 arsenite, or other NH_4 salts+Aq (Wittstein)

$\text{Pb}_3(\text{AsO}_3)_2$ Scarcely sol in H_2O , easily sol in HNO_3 , or $\text{HC}_2\text{H}_3\text{O} + \text{Aq}$ I dissolving H_2O dissolves some As_2O_3 Not completely insol in KOH+Aq (Streng, A 129 2 3)

Sol in acetic acid, insol in H_2O the presence of ammonium salts, sol in $\text{NH}_4\text{OH} + \text{Aq}$, sl sol in KOH+Aq (Reichard, B 1894, 27 1024)

+ H_2O Sl sol in H_2O , easily sol in dil acids (Stavenhagen, J pr 1895, (2) 33)

Lead arsenite chloride, $\text{Pb}_3\text{As}_2\text{O}_5, 2\text{PbCl}_2$

Min *Ekdemite* Easily sol in $\text{HNO}_3 + \text{Aq}$, and warm $\text{HCl} + \text{Aq}$

Magnesium arsenite, $\text{Mg}_3(\text{AsO}_3)_2$

Insol in $\text{NH}_4\text{OH} + \text{Aq}$, but sol in large excess of $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)

Very sol in boiling H_2O and in dil acids Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Reichard, B 1894, 27 1032)

Very sol in H_2O and dil acids (Stavenhagen, l c)

$\text{Mg}_2\text{As}_2\text{O}_7 + 4\text{H}_2\text{O}$ Hygroscopic Very sol in H_2O and acids (Stavenhagen, l c)

$3\text{MgO}, 2\text{As}_2\text{O}_3 + 3\text{H}_2\text{O} + 15\text{H}_2\text{O}$, and + $18\text{H}_2\text{O}$ (Perper Dissert 1894)

Magnesium arsenite iodide, $\text{Mg}_3\text{I}_2(\text{AsO}_3)_2 + 12\text{H}_2\text{O}$

Moderately sol in H_2O (Gruhl, Dissert 1897)

Manganous arsenite, $\text{Mn}_3(\text{AsO}_3)_2 + 3\text{H}_2\text{O}$

Sol in H_2O , insol in alcohol, easily oxidized by moist air (Stavenhagen, l c)

$3\text{MnO}, 2\text{As}_2\text{O}_3$ (Reichard B 1898, 27 1032)

$\text{Mn}_3\text{H}_2\text{As}_4\text{O}_{10} + 4\text{H}_2\text{O}$ Sl sol in H_2O
Very sol in acids and alkali (Stavenhagen, *lc*)
 $\text{Mn}_3\text{As}_2\text{O}_8$ Ppt (Reichard, B 1898, 31 2165)

Mercurous arsenite, $\text{Hg}_2\text{O} \cdot \text{As}_2\text{O}_3$

Decomp by light Decomp by H_2O
(Reichard, B 1894, 27 1022)

Hg_3AsO_3 Only sl sol in H_2O , sol in dil acids (Stavenhagen, J pr 1895, (2) 51 24)

Gradually and completely decomposed by H_2O (Reichard, Ch Z 1902, 26 1143)

Mercuric arsenite, $\text{Hg}_2(\text{AsO}_3)_2$

Sl sol in H_2O (Stavenhagen, *lc*)

Decomp more easily by H_2O than is the mercurous comp (Reichard, Ch Z 1902, 26 1143)

$2\text{HgO} \cdot \text{As}_2\text{O}_3$ Not decomp by boiling with H_2O Undecomp by boiling acids Decomp by $\text{KOH} + \text{Aq}$, $\text{K}_2\text{CO}_3 + \text{Aq}$ and $\text{NH}_4\text{OH} + \text{Aq}$ (Reichard, B 1894, 27 1021)

$\text{Hg}_3\text{As}_2\text{O}_8$ Ppt Decomp by boiling H_2O Very sl sol in $\text{H}_2\text{SO}_4 + \text{HCl}$ (Reichard, B 1898, 31 2170)

Nickel arsenite, $\text{Ni}_3(\text{AsO}_3)_2$

Insol in H_2O , easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Proust)

Ppt (Reichard, B 1898, 31 2165)

$3\text{NiO} \cdot 2\text{As}_2\text{O}_3$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (identical with salt of Girard) (Reichard, B 1894, 27 1031)

$+ 4\text{H}_2\text{O}$ Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Proust)

Sol in $\text{KOH} + \text{Aq}$ (Girard, C R 34 918)

$2\text{NiO} \cdot \text{As}_2\text{O}_3$ Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$, sol in $\text{KOH} + \text{Aq}$ (Reynoso, C R 31 68)

Platinum arsenite, $\text{Pt}_2(\text{AsO}_3)_4$

Sol in H_2O and alcohol, very unstable (Stavenhagen, *lc*)

Potassium arsenite, KAsO_3

Sol in H_2O sl sol in alcohol (Proust, A 68 309)

Insol in ethyl acetate (Nannum, B 1904, 37 5601)

Does not exist (Stavenhagen, *lc*)

K_3AsO_3 Very sol in H_2O , sol in alcohol (Stavenhagen, *lc*)

$\text{K}_4\text{AsO}_7 + 6\text{H}_2\text{O}$ Very sol in H_2O , sol in alcohol (Stavenhagen, *lc*)

$\text{KAs}_4\text{O}_7 + 2\text{H}_2\text{O}$ Sol in H_2O , sl sol in alcohol (Proust, A 68 309)

Potassium arsenite bromide, $4\text{AsO}_3 \cdot 2\text{KBr}$

More sol in H_2O than iodide (Schiff and Sestini, A 228 72)

$2\text{AsO}_3 \cdot \text{KBr}$ (Rudorff, B 19 2675)

Potassium arsenite chloride, $2\text{As}_2\text{O}_3 \cdot \text{KCl}$

Much more quickly sol in hot H_2O than bromide or iodide (Rudorff, B 19 2675)

$\text{As}_2\text{O}_3 \cdot \text{KCl}$ Decomp by H_2O

Potassium arsenite iodide, $3\text{As}_2\text{O}_3 \cdot 2\text{KI} + \text{H}_2\text{O}$

Sl sol in cold H_2O , sol in 20 pts boiling, and 40 pts cold H_2O (Emmet, Sill Am J (2) 18 583)

$6\text{KAsO}_3 \cdot 2\text{KI} + 3\text{H}_2\text{O}$ Sol in H_2O and alcohol Decomp by acids (Harms)

$2\text{KH}(\text{AsO}_3)_2 \cdot \text{As}_2\text{O}_3 \cdot 2\text{KI}$ Sl sol in H_2O (Harms, A 91 371)

$2\text{As}_2\text{O}_3 \cdot \text{KI}$ Very difficultly sol even in boiling H_2O Very easily sol in $\text{KOH} + \text{Aq}$, but much less so in $\text{K}_2\text{CO}_3 + \text{Aq}$ (Rudorff, B 19 2670)

Sol in 40 pts cold, 20 pts hot H_2O , sol in alkalies (Schiff and Sestini, A 228 72)

Potassium arsenite sulphate, $\text{K}_3\text{AsO}_3 \cdot 10\text{K}_2\text{SO}_4$

(Stavenhagen, Zeit angew ch 1894, 8 166)

Rubidium arsenite, RbAsO_3

Sol in H_2O , aq solution is alkaline to litmus Insol in alcohol (Bouchonnet, C R 1907, 144 641)

Rubidium arsenite bromide, $\text{As}_2\text{O}_3 \cdot \text{RbBr}$

Decomp by H_2O (Wheeler, Z anorg 4 451)

Rubidium arsenite chloride, $\text{As}_2\text{O}_3 \cdot \text{RbCl}$

As above

Rubidium arsenite iodide, $\text{As}_2\text{O}_3 \cdot \text{RbI}$

As above

Silver arsenite, AgAsO_3

Insol in H_2O Not pptd in presence of 20,000 pts H_2O (Harting)

11 H_2O dissolves 0.0115 g Ag_3AsO_3 at 20° (Whitby, Z anorg 1910, 67 108)

Only sl sol in H_2O and in dil acids, readily sol in $\text{NH}_4\text{OH} + \text{Aq}$ and conc acids (Stavenhagen, *lc*)

Decomp by light, by $\text{KOH} + \text{Aq}$ and by $\text{NH}_4\text{OH} + \text{Aq}$ (Reichard, B 1894, 27 1022-23)

Easily sol in $\text{HNO}_3 + \text{Aq}$ and other acids (Maret)

More easily sol in $\text{HC H}_3\text{O}_2 + \text{Aq}$ than Ag_3PO_4 sl sol in $\text{HC H}_3\text{O}_2 + \text{Aq}$ (Santos, C N 38 94)

Insol in $\text{KOH} + \text{Aq}$ (Kuhn, Arch Pharm (2) 69 267)

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Maret)

Insol in $\text{NH}_4\text{OH} + \text{Aq}$, but sol therein in presence of alkali nitrates (Santos *lc*)

Incompletely sol in $(\text{NH}_4)_2\text{CO}_3$, $(\text{NH}_4)_2\text{SO}_4$, or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Wittstein, Report 51 41)

Decomp by $\text{NH}_4\text{Cl} + \text{Aq}$ Sol in $\text{KAsO}_4 + \text{Aq}$ (Kuhn, *l c*)
 Not pptd in solutions containing sol citrates (Spiller)
 Sol in methyl acetate (Naumann, B 1909, **42** 3790)
 Sl sol in methyl acetate (Bezold, Dissert 1908)

Insol in ethyl acetate (Hamers, Dissert 1906), (Naumann, B 1910, **43** 314)
 $+ \text{H}_2\text{O}$ Very sol in H_2O , $\text{NH}_4\text{OH} + \text{Aq}$ and in dil acids (Stavenhagen, J pr 1895, (2) **51** 29)

$2\text{Ag}_2\text{O}, \text{As}_2\text{O}_3$ Ppt (Pasteur, J Pharm (3) **13** 395)

Could not be obtained (Stavenhagen, *l c*)
 $3\text{Ag}_2\text{O}, 2\text{As}_2\text{O}_3$ Sol in cold $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Santos)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ and in potassium arsenite + Aq (Girard, C R **34** 918)

Ppt (Reichard, B 1898, **31** 2167)
 Could not be obtained (Stavenhagen, *l c*)

Silver arsenite ammonia, $2\text{Ag}_2\text{O}, \text{As}_2\text{O}_3, 4\text{NH}_3$

Insol in H_2O or alcohol (Girard)

Sodium arsenites

Correspond to potassium arsenites, but have not been obtained in crystalline form. All are very sol in H_2O (Pasteur, A **68** 308)
 Na_3AsO_3 Very sol in H_2O (Stavenhagen, *l c*)

Insol in ethyl acetate (Naumann, B 1904, **37** 3602)

Sodium arsenite bromide, $2\text{As}_2\text{O}_3, \text{NaBr}$

Decomp by warm H_2O (Rudorff, B **21** 3052)

Sodium arsenite iodide, $2\text{As}_2\text{O}_3, \text{NaI}$

Decomp by hot H_2O (Rudorff)

Strontium arsenite, $\text{Sr}_3(\text{AsO}_3)_4$

Sol in H_2O (Stavenhagen, *l c*)
 Sol in H_2O , insol in alcohol (identical with Stein) (Reichard, B 1894, **27** 1036)
 $\text{Sr}_2\text{As}_2\text{O}_5 + 2\text{H}_2\text{O}$ Quite easily sol in H_2O (Stein)

Sl sol in H_2C , $\text{SrO}_2\text{H} + \text{Aq}$, or $\text{H}_3\text{AsO}_4 + \text{Aq}$ (Dumas)

Very sl sol in alcohol (Stein)
 Easily sol in H_2O and in acids (Stavenhagen, J pr 1895, (2) **51** 17)

$\text{Sr}_3\text{As}_4\text{O}_{13}$ Moderately sol in H_2O (Reichard, B 1894, **27** 1036)

Strontium arsenite iodide, $\text{SrI}_2, 3\text{As}_2\text{O}_3 + 12\text{H}_2\text{O}$

As Ba comp (Grühl, Dissert 1897)

Thallium arsenite, Tl_3AsO_3

Sl sol in H_2O and alcohol, easily sol in acids, especially in dil H_2SO_4 (Stavenhagen, *l c*)

Tin (stannous) arsenite, $\text{Sn}_3(\text{AsO}_3)_2$

Ppt, decomp by acids and alkali (Reichard, B 1898, **31** 2169)
 $+ 2\text{H}_2\text{O}$ Sl sol in H_2O Easily so in dil acids and alkalies (Stavenhagen, *l c*)

Tin (stannic) arsenite, $\text{Sn}_3(\text{AsO}_3)_4 + 5\text{H}_2\text{O}$

Sl sol in H_2O (Stavenhagen, *l c*)
 $5\text{SnO}_2, 2\text{As}_2\text{O}_3$ Ppt Sol in acids without decomp (Reichard, B 1894, **27** 102)
 $\text{Sn}_7\text{As}_2\text{O}_{17}$ Ppt (Reichard, B 1 2169) **8, 31**

Uranium arsenite, $\text{UO}_2, \text{As}_2\text{O}_3$

Insol in $\text{NH}_4\text{OH} + \text{Aq}$, only sl sol in H_2O (Reichard, B 1 1029) **OH + 4, 27**

Zinc arsenite, $\text{ZnO}, \text{As}_2\text{O}_3$

Ppt (Avery, J Am Chem Soc **1** 1163) **16, 28**

$3\text{ZnO}, \text{As}_2\text{O}_3$ Sol in acids without comp Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Reichard, B 1894, **27** 1033)

Arsenovanadic acid, $\text{As}_2\text{O}_5, \text{V}_2\text{O}_5, 2\text{H}_2\text{O}$

Easily sol in H_2O , but solution easily decomposes, crystallizes from H_2O with $3\text{H}_2\text{O}$
 Composition is vanadium dihydrogen arsenate $(\text{VO}_2)_2\text{H}_2\text{AsO}_4$ (Friedheim, B **23** 2600)
 $+ 14$, and $+ 18\text{H}_2\text{O}$ (Ditte, C **102** 757) Could not be obtained (Friedheim)

$3\text{As}_2\text{O}_5, 2\text{V}_2\text{O}_5$ (Berzelius) Corrt formula is as above (Friedheim)

$3\text{H}_2\text{O}, 7\text{As}_2\text{O}_5, 6\text{V}_2\text{O}_5$ (Gibbs, Am Ch J **7** 209) Could not be obtained (Friedheim)

$3\text{H}_2\text{O}, 5\text{As}_2\text{O}_5, 8\text{V}_2\text{O}_5 + 24\text{H}_2\text{O}$ (Gibbs) Could not be obtained (Friedheim)

Arsenovanadates

According to Friedheim (Z anorg **1892**, **2** 319) the arsenovanadates include arsenates of VO_2 and NH_4

Ammonium arsenovanadate, $(\text{NH}_4)_3\text{AsO}_4, 2\text{V}_2\text{O}_5 + 5\text{H}_2\text{O}$

Efflorescent in dry air, sl sol in cold, decomp by hot H_2O Composition is ammonium divanadium arsenate $= (\text{VO}_2)_2(\text{NH}_4)\text{AsO}_4 + 2\frac{1}{2}\text{H}_2\text{O}$ (Friedheim, B **23** 2600)

Sl sol in cold H_2O . Somewhat more easily sol in hot H_2O with separation of V_2O_5 (Schmitz-Dumont, Dissert **1891**)

$2(\text{NH}_4)_2\text{O}, 3\text{As}_2\text{O}_5, 2\text{V}_2\text{O}_5 + 4\text{H}_2\text{O}$ Cannot be crystallized from H_2O Composition is $(\text{NH}_4)_3\text{HAsO}_4 + 2(\text{VO}_2)_2\text{HAsO}_4$ (Friedheim)

Decomp under H_2O to $(\text{NH}_4)_3\text{AsO}_4 + 5\text{H}_2\text{O}$ (Schmitz-Dumont, *l c*)
 $5(\text{NH}_4)_2\text{O}, 4\text{As}_2\text{O}_5, 2\text{V}_2\text{O}_5 + 18\text{H}_2\text{O}$ sol in H_2O (Ditte, C R **102** 1019) Does not exist (Friedheim, B **23** 2605)

Calcium arseniovanadate, 2CaO , $3\text{As}_2\text{O}_5$, $2\text{V}_2\text{O}_5 + 21\text{H}_2\text{O} = \text{CaHAsO}_4 + 2(\text{VO}_2)_2\text{H}_2\text{AsO}_4 + 8\text{H}_2\text{O}$

Can be crystallized in presence of vanadic acid without decomp (Friedheim)

Efflorescent Sol in H_2O (Schmitz-Dumont, *lc*)

Cobalt arseniovanadate, CoO , As_2O_5 , $\text{V}_2\text{O}_5 + 9\text{H}_2\text{O} = \text{Co}(\text{VO}_2)_2\text{H}_2(\text{AsO}_4)_2 + 8\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

Copper arseniovanadate, CuO , As_2O_5 , $\text{V}_2\text{O}_5 + 4\text{H}_2\text{O} = \text{Cu}(\text{VO}_2)_2\text{H}_2(\text{AsO}_4)_2 + 3\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

Magnesium arseniovanadate, MgO , As_2O_5 , $\text{V}_2\text{O}_5 + 10\text{H}_2\text{O} = (\text{VO}_2)_2\text{MgH}_2(\text{AsO}_4)_2 + 9\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

Moderately sol in H_2O Solution decomp on standing (Schmitz-Dumont, *lc*)

2MgO , $3\text{As}_2\text{O}_5$, $2\text{V}_2\text{O}_5 + 23\text{H}_2\text{O} = \text{MgHAsO}_4 + 2(\text{VO}_2)_2\text{H}_2\text{AsO}_4 + 9\text{H}_2\text{O}$ Sol in H_2O (Friedheim)

Sol in H_2O but solution decomp on evaporation (Schmitz-Dumont, *lc*)

Potassium arseniovanadate, K_2O , As_2O_5 , $2\text{V}_2\text{O}_5 + 5\text{H}_2\text{O} = (\text{VO}_2)_2\text{KAsO}_4 + 2\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

Sl sol in cold H_2O Partially decomp on heating (Schmitz-Dumont)

Strontium arseniovanadate, 2SrO , $3\text{As}_2\text{O}_5$, $2\text{V}_2\text{O}_5 + 20\text{H}_2\text{O} = \text{SrHAsO}_4 + 2(\text{VO}_2)_2\text{H}_2\text{AsO}_4 + 7\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

$+21\text{H}_2\text{O}$ Easily sol in H_2O (Schmitz-Dumont)

Zinc arseniovanadate, ZnO , As_2O_5 , $\text{V}_2\text{O}_5 + 6\frac{1}{2}\text{H}_2\text{O} = \text{Zn}(\text{VO}_2)_2\text{H}_2(\text{AsO}_4)_2 + 5\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Friedheim)

2ZnO , $3\text{As}_2\text{O}_5$, $2\text{V}_2\text{O}_5 + 51\text{H}_2\text{O}$, and $+18\text{H}_2\text{O} = \text{ZnHAsO}_4 + 2(\text{VO}_2)_2\text{H}_2\text{AsO}_4$, and $+6\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O (Friedheim)

Arseniovanadicotungstic acid

Ammonium arseniovanadicotungstate, $17(\text{NH}_4)_2\text{O}$, $2\text{As}_2\text{O}_5$, $14\frac{1}{2}\text{V}_2\text{O}_5$, $29\text{WO}_3 + 98\text{H}_2\text{O}$

Sl sol in cold H_2O It is readily sol in boiling H_2O Insol in alcohol, ether, benzene, CS_2 , CHCl_3 , acetone, nitrobenzene, aniline and acetic acid (Rogers, J Am Chem Soc 25 17)

Arseniovanadicoivanadic acid

Ammonium arseniovanadicoivanadate, $5(\text{NH}_4)_2\text{O}$, $12\text{As}_2\text{O}_5$, 12VO , $6\text{V}_2\text{O}_5 + 7\text{H}_2\text{O}$

Sl sol in cold, sol in hot H_2O , from which crystallizes—

$4(\text{NH}_4)_2\text{O}$, $9\text{As}_2\text{O}_5$, 9VO_2 , $8\text{V}_2\text{O}_5 + 11\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Am Ch J 7 209)

Arseniovanadicoivanadotungstic acid

Ammonium arseniovanadicoivanadotungstate, $17(\text{NH}_4)_2\text{O}$, $2\text{As}_2\text{O}_5$, $7\text{V}_2\text{O}_5$, $4\text{V}_2\text{O}_3$, $32\text{WO}_3 + 73\text{H}_2\text{O}$

Sl sol in cold, readily sol in boiling H_2O (Rogers, J Am Chem Soc 1903, 25 310)

Arseniovanadotungstic acid

Ammonium arseniovanadotungstate, $18(\text{NH}_4)_2\text{O}$, $2\text{As}_2\text{O}_5$, $13\text{V}_2\text{O}_5$, $39\text{WO}_3 + 88\text{H}_2\text{O}$

Sol in H_2O Insol in organic solvents (Rogers, J Am Chem Soc 1903, 25 306)

Arseniuretted hydrogen, AsH_3

See Arsenic hydride

Arsenochromic acid

Potassium arsenochromate, $\text{K}_4\text{Cr}_2\text{As}_2\text{O}_{18} + 12\text{H}_2\text{O}$

Sol in moderately conc mineral acids (Tarugi, C C 1897, II 724)

$\text{K}_7\text{Cr}_2\text{As}_5\text{O}_{22} + 24\text{H}_2\text{O}$ Ppt Sol in dil warm acids (Tarugi)

Potassium hydrogen arsenochromate, $\text{K}_4\text{H}_6\text{Cr}_2\text{As}_2\text{O}_{18}$

(Tarugi, C C 1897, II 724)

Arsenosaoarsenotungstic acid

Potassium arsenosaoarsenotungstate, $10\text{K}_2\text{O}$, $4\text{As}_2\text{O}_5$, As_2O_3 , $21\text{WO}_3 + 26\text{H}_2\text{O}$

Prempitate Sol in a large amount of hot H_2O (Gibbs, Am Ch J 7 313)

Arsenosomolybdic acid

Ammonium arsenosomolybdate, $3(\text{NH}_4)_2\text{O}$, $5\text{As}_2\text{O}_5$, $12\text{MoO}_3 + 24\text{H}_2\text{O}$

Sl sol in H_2O (Gibbs, Am Ch J 7 313)

Ammonium barium arsenosomolybdate, $3(\text{NH}_4)_2\text{O}$, 2BaO , $5\text{As}_2\text{O}_5$, $10\text{MoO}_3 + 50\text{H}_2\text{O}$

Ppt (Lephaur, Z anorg 1910, 66 57)

Ammonium cupric arsenosomolybdate, $(\text{NH}_4)_2\text{O}$, CuO , $2\text{As}_2\text{O}_5$, $4\text{MoO}_3 + 2\text{H}_2\text{O}$, and $2(\text{NH}_4)_2\text{O}$, CuO , $3\text{As}_2\text{O}_5$, $6\text{MoO}_3 + 13\text{H}_2\text{O}$

Ppts (Lephaur, Z anorg 1910, 66 58)

Barium arsenosomolybdate, 3BaO , $2\text{As}_2\text{O}_5$, $8\text{MoO}_3 + 13\text{H}_2\text{O}$

Very sl sol in H_2O (Gibbs)

Copper arsenosomolybdate, 2CuO , $3\text{As}_2\text{O}_5$, 6MoO_3

Sol in H_2O (Gibbs)

Manganese arsenosomolybdate, 2MnO , $3\text{As}_2\text{O}_5$, $6\text{MoO}_3 + 6\text{H}_2\text{O}$, and $+15\text{H}_2\text{O}$

Insol in H_2O (Gibbs)

Potassium arsenosomolybdate, $3K_2O, As_2O_3, 5MoO_3 + 3H_2O$

Easily sol in H_2O (Ephraim, Z anorg 1910, 66 54)

$3K_2O, As_2O_3, 8MoO_3 + 18H_2O$ Easily sol in H_2O (Ephraim)

Sodium arsenosomolybdate, $Na_2O, As_2O_3, 2MoO_3 + 6H_2O$

Easily sol in H_2O (Ephraim, Z anorg 1910, 66 56)

$2Na_2O, As_2O_3, 4MoO_3 + 13H_2O$ Ppt (Ephraim)

Zinc arsenosomolybdate, $2ZnO, 3As_2O_3, 6MoO_3 + 6H_2O$

Sol in H_2O (Gibbs)

Arsenosophosphotungstic acid

Potassium arsenosophosphotungstate, $10K_2O, 14As_2O_3, 3P_2O_5, 32WO_3 + 28H_2O$

Moderately sol in cold, very easily in hot H_2O (Gibbs)

$7K_2O, 2As_2O_3, 4P_2O_5, 60WO_3 + 55H_2O$ Sol in hot H_2O with decomp (Gibbs)

Potassium sodium arsenosophosphotungstate, $5K_2O, Na_2O, 2As_2O_3, 2P_2O_5, 12WO_3 + 15H_2O$

(Gibbs, Am Ch J 7 313)

Arsenosotungstic acid

Ammonium arsenosotungstate, $7(NH_4)_2O, 2As_2O_3, 18WO_3 + 18H_2O$

Sol in H_2O (Gibbs)

Barium arsenosotungstate, $4BaO, As_2O_3, 9WO_3 + 21H_2O$

Precipitate Nearly insol in H_2O (Gibbs)

Sodium arsenosotungstate, $9Na_2O, 8As_2O_3, 18WO_3 + 55H_2O$

Very sol in H_2O (Gibbs, Am Ch J 7 313)

Arsenyl bromide, $AsOBr$

H_2O dissolves out As_2O_3 , insol in alcohol (Serullas)

$+H_2O$ (Wallace, Phil Mag (4) 17 122)

$As_2O_3Br_2 = 2AsBr_3, 3As_2O_3 + 12H_2O$

Arsenyl bromide with MBr

See Arsenite bromide, M

Arsenyl chloride, $AsOCl$

Sol in H_2O with decomp

$+H_2O$ (Wallace, Phil Mag (4) 16 358)

As_2O_4Cl (Wallace)

Arsenyl chloride with MCl

See Arsenite chloride, M

Arsenyl potassium fluoride, $AsOF_3, KF + H_2O$

(Margnac, A 145 237)

Arsenyl iodide, $As_2I_2O_{11} = 2AsO 3As_2O_3 + 12H_2O$

Decomp by H_2O (Wallace, Phil Mag (4) 17 122)

Sl sol in cold H_2O , less sol in alcohol (Phisson, J Pharm 14 46)

Arsenyl iodide with MI

See Arsenite iodide, M

Arsenyl sulphoiodide, $As_2I_2S_2O_8$

Scarcely attacked by cold H_2O Boiling H_2O extracts AsI_3 Decomp by HNO_3 or H_2SO_4 Easily sol in KOH , or $N_4OH + Aq$ (Schneider, J pr (2) 36 513)

Arsine

See Arsenic hydride

Atmospheric air

See Air, atmospheric

Auriamine, $Au(OH)_2NH_2$

(Jacobsen, C R 1908, 146 12)

Dauriamine, $Au_2(OH)_4NH$

(Jacobsen, C R 1908, 146 12)

Sesquauriamine, NAu_3, NH_3

Decomp by H_2O into NAu_3 taschig, A 235 341)

Auric acid, HAu_2O_4

Sol in HBr , or $HCl + Aq$ (Fuss, B 19 2546)

Ammonium aurate

See Auroamidoimide

Barium aurate, $BaAuO_4 + 5H_2O$

Sl sol in H_2O (Weigand, Zeit angew Ch 1905, 19 139)

$+6H_2O$ Sl sol in H_2O Sol in dil H_2SO_4 and in dil HNO_3 Sol in HCl Decomp by alcohol (Meyer, C R 1907, 14 806)

Calcium aurate (?)

Insol in H_2O , sol in $CaCl_2 + Aq$ (Fremy, A ch (3) 31 485)

$CaAu_2O_4 + 6H_2O$ As But sa (Meyer, C R 1907, 145 806)

Magnesium aurate (?)

Ppt Insol in H_2O , sol in $IgCl + Aq$ (Pellucet)

Potassium aurate, $KAuO_2 + 3H_2O$

Very sol in H_2O , and easily decomp (Fremy, A ch (3) 31 183)

Sol in alcohol, the solution in alcohol does not decomp below 50° (Lugnet, A ch (3) 11 364)

Potassium aurate sulphite, $KAuO_2, 2K_2SO_3 + 5H_2O$

Sol in H_2O with decomp early insol in alkaline solutions (Fremy, A ch (3) 31 485)

Sodium aurate, $\text{Na}_2\text{Au}_2\text{O}_4 + 2\text{H}_2\text{O}$

Sol in H_2O Sol in dil H_2SO_4 , dil HNO_3 , and HCl with decomp Decomp by alcohol (Meyer, C R 1907, **145** 806)

Strontium aurate, $\text{SrAu}_2\text{O}_4 + 6\text{H}_2\text{O}$

As Ba salt (Meyer)

Aurumide chloride, $\text{Au}(\text{NH})\text{Cl}$

(Raschig)

Aurumide nitrate, $\text{Au}_2\text{N}_2\text{H}_2\text{O}$, 2HNO_3 , or AuN , $\text{HNO}_3 + \frac{1}{2}\text{H}_2\text{O}$, or $\text{Au}_2\text{O}(\text{NH})_2$, 2HNO_3

Not deliquescent Decomp by hot H_2O into $\text{Au}_2\text{O}(\text{NH})_2$ (Schottlander, J B 1884 453)

Auroamidoumide, $\text{Au}(\text{HN})\text{NH}_2 + 3\text{H}_2\text{O}$

(Fulminating gold) Insol in H_2O , not attacked by dil acids, sol in conc acids, and in moderately dil acids, when freshly precipitated Insol in alkalis or alcohol Sol in $\text{KCN} + \text{Aq}$

Triauroamine, $\text{Au}_3\text{N} + 5\text{H}_2\text{O}$

Not decomp by boiling dil acetic acid, HNO_3 , or H_2SO_4 (Raschig, A 1886, **235** 349)

Auricyanhydric acid, $\text{HAu}(\text{CN})_4 + 1\frac{1}{2}\text{H}_2\text{O}$

Easily sol in H_2O , alcohol, or ether

See also Bromauricyanides

Chlorauricyanides

Iodauricyanides

Ammonium auricyanide, $\text{NH}_4\text{Au}(\text{CN})_4$

Easily sol in H_2O or alcohol Insol in ether

Cobaltous auricyanide, $\text{Co}[\text{Au}(\text{CN})_4]_2 + 9\text{H}_2\text{O}$

Sl sol in cold, easily in hot H_2O Sl sol in alcohol (Lindbom)

Potassium auricyanide, $\text{KAu}(\text{CN})_4 + 1\frac{1}{2}\text{H}_2\text{O}$

Efflorescent Sl sol in cold, easily in hot H_2O Easily sol in alcohol

Silver auricyanide, AgAuCN_4

Insol in H_2O or $\text{HNO}_3 + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Diaurodiamine nitrate

See Aurumide nitrate

Aurobromhydric acid

See Bromauric acid

Aurobromic acid

See Bromauric acid

Aurochlorhydric acid

See Chlorauric acid

Aurochloric acid

See Chlorauric acid

Aurocyanhydric acid**Aurocyanides with MCN**

See Cyanide, aurous with MCN

Azinosulphonic acid**Ammonium azinosulphonate**, $\text{N}_3\text{SO}_3\text{NH}_4$

(Traube, B 1914, **47** 944)

Barium azinosulphonate, $(\text{N}_3\text{SO}_3)_2\text{Ba}$

(Traube, B 1914, **47** 944)

Potassium azinosulphonate, $\text{N}_3\text{SO}_3\text{K}$

Easily sol in H_2O Can be cryst from boiling abs alcohol (Traube, B 1914, **47** 943)

Sodium azinosulphonate, $\text{N}_3\text{SO}_3\text{Na}$

(Traube, B 1914, **47** 944)

Azoumide, HN_3

Miscible with H_2O and alcohol (Curtius and Radershausen, J pr (2) **43** 207)

Stable in aq solution, decomp slowly by dil boiling HCl (Curtius, J pr 1898, (2) **58** 265)

For salts of HN_3 , see azoumide of metal under metal

Azoumide, hydroxylamine, $\text{N}_2\text{H}_4\cdot 2\text{NH}_4\text{OH}$

Sol in H_2O Gradually volatilizes at ord temp (Dennis, J Am Chem Soc 1907, **29** 22)

Azophosphoric acid

See Pyrophosphamic acid

Deutazophosphoric acid

See Pyrophosphodiamic acid

Barium, Ba

Decomp by H_2O and abs alcohol (Guntz, C R 1901, **133** 874)

Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 827)

Barium amalgam, BaHg_{13}

Stable in contact with liquid amalgam up to 30° Can be cryst from Hg without decomp if temp does not exceed 30° (Kerp, Z anorg 1900, **25** 68)

BaHg_{12} Stable in contact with liquid amalgam from 30° – 100° Can be cryst from Hg without decomp at any temp within these limits (Kerp)

Barium amide, $\text{Ba}(\text{NH})_2$

B-pt 280° (Mentrel, C C 1903, I 276)

Decomp by H_2O (Guntz and Mentrel, Bull Soc 1903, (3) **29** 578)

Barium potassium amide

See Potassium ammonobarate

Barium ammonia, $\text{Ba}(\text{NH}_3)_6$

Takes fire in the air Only sl sol in liquid NH_3 Violently decomp by H_2O (Mentrel, C R 1902, **135** 740)

Barium arsenide, Ba₃As₂

Decomp by H₂O (Lebeau, C R 1899, 129 48)

Barium azonide, Ba(N₃)₂

Very sl hygroscopic, explosive

12 5 pts are sol in 100 pts H₂O at 0°
 16 2 " " " " 100 " H₂O " 10 5°
 16 7 " " " " 100 " H₂O " 15°
 17 3 " " " " 100 " H₂O " 17°
 0 0172 pts are sol in 100 pts abs alcohol at 16°

Insol in ether (Curtius, J pr 1898, (2) 58 290)

See also Barium nitride

Barium boride, BaB₂

Sol in fused oxidizing agents, not decomp by H₂O, insol in aq acids, sl sol in conc H₂SO₄, sol in dil and conc HNO₃ (Moissan, C R 1897, 125, 634)

Barium subbromide sodium bromide, BaBr, NaBr

Decomp by H₂O (Guntz, C R 1903, 136 750)

Barium bromide, BaBr₂, and +2H₂O

100 pts H₂O dissolve—
 at 0° 20° 40° 60° 80° 100°
 98 104 114 123 135 149 pts BaBr₂

Sat BaBr₂+Aq contains at
 —20° —9° +7° 16° 19° 40°
 45 7 46 5 48 5 48 8 49 3 50 9% BaBr₂
 71° 76° 77° 104° 145° 160° 175°
 55 1 55 5 55 6 56 6 60 5 59 4 60 3% BaBr₂
 (Étard, A ch 1894, (7) 2 540)

Sp gr of BaBr₂+Aq at 19 5° containing
 5 10 15 20 25 30% BaBr₂
 1 045 1 092 1 114 1 201 1 262 1 329

35 40 45 50 55% BaBr₂

1 405 1 485 1 580 1 685 1 800
 (Kremers, Pogg 99 444, calculated by Gerlach Z anal 8 285)

BaBr + Aq containing 7 74% BaBr₂ has sp gr 20°/20° = 1 0716

BaBr₂+Aq containing 16 76% BaBr₂ has sp gr 20°/20° = 1 1674

(Le Blanc and Rohland, Z phys Ch 1896, 19 279)

Sat BaBr₂+Aq boils at 113° (Kremers, Pogg 99 43)

Solubility in BaI₂+Aq at t°

t°	Sat solution contains	
	% BaBr	% BaI
—16	4 7	57 9
—16	5 0	59 0
+60	5 5	66 0
135	9 3	67 3
135	9 0	67 2
170	11 0	67 4
210	14 9	67 7

(Étard, A ch 1894, (7) 3 287)

Very sol in absolute alcohol (Hüfelfeld) 100 pts absolute methyl alcohol dissolve 50 pts BaBr₂ at 22 5°

100 pts absolute ethyl alcohol dissolve 3 pts BaBr₂ at 22 5° (de Bruyn, Z phys Ch 10 783)

Sat solution in 87% alcohol contains 6% BaBr₂ (Richards, Z anorg 3 455)

100 pts absolute methyl alcohol dissolve 45 8 pts BaBr₂+2H₂O at 15°

100 pts 93 5% methyl alcohol dissolve 27 3 pts BaBr₂+2H₂O at 15°

100 pts 50% methyl alcohol dissolve 4 pts BaBr₂+2H₂O at 15° (de Bruyn, Z phys Ch 10 787)

100 g BaBr₂+CH₃OH contain 0 4 g BaBr₂ at the critical temp (Centnerszwer, Z phys Ch 1910, 72 437)

At 15°, 1 pt by weight is sol in

36 pts methyl alcohol, sp gr 0 7 9

207 " ethyl " " " 0 8 35

652 " propyl " " " 0 8 35

(Rohland, Z anorg 1897, 15 413)

Nearly insol in boiling amyl alcohol, 10 cc dissolving only an amt equal to 3 mg BaO (Browning, Sill Am J 144 45)

Sol in acetone (Naumann, B 19 1, 37 4328, Eidmann, C C 1899, II 1014)

Insol in benzonitrile (Naumann, E 1914, 47 1370)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3789)

Insol in ethylacetate (Naumann, E 1910, 43 314)

Barium cadmium bromide, BaBr, CdBr₂+4H₂O

Sol in H₂O (v Hauer, W A B 20 40)

Barium rhodium bromide

See Bromorhodite, barium

Barium bromide ammonia, BaBr₂·8NH₃

Decomp by H₂O (Joannis, C R 1905, 140 1244)

Barium bromide hydrazine, BaBr₂·2N₂H₄

Hygroscopic Very sol in H₂O Insol in alcohol (Fruizen, Z anorg 1908, 60 91)

Barium bromofluoride, BaBr₂·BaF₂

Insol in and undecomp by boiling alcohol Sol in HBr and in HNO₃ Decomp by H₂O, hot H₂SO₄, dil HCl, dil HNO₃, or dil acetic acid (Deffoe, C R 1904, 138 199)

Barium carbide, BaC₂

Decomp by H₂O (Maquenne, C I 144 360)

Sp gr 3 75 Easily decomp by H₂ and dil acids (Moissan, Bull Soc 1894, (1) 11 1008)

Barium carbonyl, Ba(CO)₂

Sol in H₂O (Guntz and Mentrel, Bull Soc 1903, (3) 29 586)

Barium subchloride, BaCl

Decomp by H₂O (Guntz, C R 1903, 136 751)

Barium subchloride sodium chloride, BaCl, NaCl

Decomp by H₂O (Guntz, C R 1903, 136 750)

Barium chloride, BaCl₂, and +2H₂O

Permanent in dry air

100 pts H₂O at t° dissolve (a) pts BaCl₂ and (b) pts BaCl₂+2H₂O

t°	a	b	t°	a	b
15 64	34 86	43 50	74 89	59 94	65 51
49 31	43 84	55 63	105 48	59 58	77 89

(Gay Lussac A ch. (2) 11 309)

100 pts H₂O at t° dissolve 32 62+0 2711t pts BaCl₂ (Kopp)

100 pts H₂O dissolve pts BaCl₂+2H₂O at t°

t°	Pts BaCl ₂ +2H ₂ O	t°	Pts BaCl ₂ +2H ₂ O
16 25	39 66	62 50	48 0
20 00	42 22	75 00	63 0
22 50	43 7	87 00	65 0
37 50	51 0	100	72 0
50 00	65 0		

(Brandes)

Sol in 2 67 pts H₂O at 18 75° (Abl)

1 pt BaCl₂ is sol in 2 86 pts H₂O at 15 5° and 1 67 pts at boiling temp (M R and P)

100 pts H₂O at 15 5° dissolve 20 pts BaCl and 43 pts at 87 7° (Ure's Diet)

Solubility in 100 pts H₂O at t°

t°	1 ts BaCl	t°	Pts BaCl ₂
0	31 1	77 5	51 9
12 2	43 9	95 65	57 7
38 4	41 2	102 5	58 9
62 7	47 7	10	59 7

(Nordenskiöld Pölg 136 316)

100 pts H₂O dissolve pts BaCl at t

t	Pts BaCl ₂	t	1 ts BaCl ₂
9	33 2	50	43 7
30	35 1	58	44 9
37	40 0		

(Gerardin A ch (4) 5 143)

1 pt BaCl₂+2H₂O is sol in 2 18 pts H₂O at 21 5°, and the solution has sp gr = 1 2878 (Schiff, A 109 326)

1 pt anhydrous BaCl₂ is sol in 2 86 pts H₂O at 15° (Gerlach)

Solubility in 100 pts H₂O at t°

t°	Pts BaCl ₂	t°	Pts BaCl ₂	t°	Pts BaCl ₂
0	30 9	36	39 7	71	49 7
1	31 2	37	40 0	72	50 0
2	31 5	38	40 2	73	50 3
3	31 7	39	40 5	74	50 6
4	31 9	40	40 7	75	50 9
5	32 2	41	41 0	76	51 2
6	32 4	42	41 3	77	51 5
7	32 6	43	41 6	78	51 8
8	32 8	44	41 9	79	52 1
9	33 1	45	42 2	80	52 4
10	33 3	46	42 5	81	52 7
11	33 5	47	42 7	82	53 0
12	33 8	48	43 0	83	53 3
13	34 0	49	43 3	84	53 6
14	34 2	50	43 6	85	54 0
15	34 5	51	43 9	86	54 3
16	34 7	52	44 2	87	54 6
17	35 0	53	44 4	88	55 0
18	35 2	54	44 7	89	55 3
19	35 5	55	45 0	90	55 6
20	35 7	56	45 3	91	55 9
21	36 0	57	45 6	92	56 2
22	36 2	58	45 9	93	56 6
23	36 5	59	46 2	94	56 9
24	36 7	60	46 4	95	57 2
25	37 0	61	46 7	96	57 6
26	37 2	62	47 0	97	57 9
27	37 5	63	47 3	98	58 2
28	37 7	64	47 6	99	58 5
29	38 0	65	47 9	100	58 8
30	38 2	66	48 2	101	59 2
31	38 5	67	48 5	102	59 5
32	38 7	68	48 8	103	59 8
33	39 0	69	49 1	104	60 2
34	39 2	70	49 4	104 1	60 3
35	39 5				

(Mulder, calculated from his own and other observations Scheik Verhandel 1864 45)

The saturated solution contains—

60 3 pts BaCl₂ to 100 pts H₂O, and boils at 104 1° (Mulder)

60 1 pts BaCl to 100 pts H₂O, and boils at 104 4° (Legrand)

61 8 pts BaCl₂ to 100 pts H₂O, and boils at 104 5° (Griffith)

59 58 pts BaCl₂ to 100 pts H₂O, and boils at 105 45° (Gay-Lussac), at 106° (Kilmers)

54 1 pts BaCl to 100 pts H₂O, and forms crust at 104 4°, highest temperature observed, 104 9° (Gerlach, Z anal 26 426)

Sat BaCl₂+Aq contains at

100° 130 144° 160° 180° 215°
36 37 37 5 38 9 40 7 43 1% BaCl₂
(Étard, A ch 1894, (7) 2 535)

Aq solution contains 27 6% BaCl₂ at 30° (Shimminakers, C C 1910, 1 9)

Solubility of $\text{BaCl}_2 + 2\text{H}_2\text{O}$ in H_2O equals 1.745 mol-litre at 30° (Masson, Chem Soc 1911, 99 1136)

$\text{BaCl}_2 + \text{Aq}$ sat at 8° has sp gr 1.27 (Anthon)
 $\text{BaCl}_2 + \text{Aq}$ sat at 15° has sp gr 1.282 (Michel and Kraft)
 $\text{BaCl}_2 + \text{Aq}$ sat at 18.1° has sp gr 1.285 and contains 44.31 pts $\text{BaCl}_2 + 2\text{H}_2\text{O}$ to 100 pts H_2O (Karsten.)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 19.5°

% BaCl_2	Sp gr	% BaCl_2	Sp gr
8.88	1.0760	27.53	1.2245
18.24	1.1521	35.44	1.2837

(Kremers Pogg 99 444)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 15°

% BaCl_2	Sp gr	% BaCl_2	Sp gr
1	1.00917	14	1.13778
2	1.01834	15	1.14846
3	1.02750	16	1.15999
4	1.03667	17	1.17152
5	1.04584	18	1.18305
6	1.05569	19	1.19458
7	1.06554	20	1.20681
8	1.07538	21	1.21892
9	1.08523	22	1.23173
10	1.09508	23	1.24455
11	1.10576	24	1.25736
	1.11643	25	1.27017
	1.12711		

(Gerlach, Z anal 8 283)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 21.5°

% $\text{BaCl}_2 + 2\text{H}_2\text{O}$	Sp gr	% $\text{BaCl}_2 + 2\text{H}_2\text{O}$	Sp gr
1	1.0073	16	1.1302
2	1.0147	17	1.1394
3	1.0222	18	1.1488
4	1.0298	19	1.1584
5	1.0374	20	1.1683
6	1.0452	21	1.1783
7	1.0530	22	1.1884
8	1.0610	23	1.1986
9	1.0692	24	1.2090
10	1.0776	25	1.2197
11	1.0861	26	1.2304
12	1.0947	27	1.2413
13	1.1034	28	1.2523
14	1.1122	29	1.2636
15	1.1211	30	1.2750

(Schiff, calculated by Gerlach, l c)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 18°

% BaCl_2	Sp gr	% BaCl_2	Sp gr
5	1.0445	20	1.2047
10	1.0939	24	1.2559
15	1.1473		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 20°

g mols BaCl_2 per l	Sp gr
0.01	1.001878
0.025	1.00475
0.05	1.00929
0.075	1.01369
0.10	1.01766
0.25	1.0456
0.40	1.0726

(Jones and Pearce, Am Ch J 1907, 38 11)

$\text{BaCl}_2 + \text{Aq}$ containing 6.94% BaCl_2 has sp gr $20^\circ/20^\circ = 1.0640$

$\text{BaCl}_2 + \text{Aq}$ containing 11.38% BaCl_2 has sp gr $20^\circ/20^\circ = 1.1086$

(Le Blanc and Rohland, Z phys Ch 1909, 29 279)

Sp gr of $\text{BaCl}_2 + \text{Aq}$ at 25°

$\text{BaCl}_2 + \text{Aq}$	Sp gr
1-normal	1.0884
$\frac{1}{2}$ "	1.0441
$\frac{1}{4}$ "	1.0226
$\frac{1}{8}$ "	1.0114

(Wagner, Z phys Ch 1890, 5 35)

Sp gr of $\text{BaCl}_2 + \text{Aq}$

t°	Concentration of $\text{BaCl}_2 + \text{Aq}$	Sp gr
25°	1 pt BaCl_2 in 3.684 pts H_2O	2194
22.8°	1 " " " 52.597 " "	0145

(Hittorf, Z phys Ch 1902, 39 62)

Temp of Maximum Density

Weight of BaCl_2 in 1000 grams H_2O	Temp of maximum density	Molecular weight of BaCl_2	Reduction of
0	3.982°		
6.73	3.207°	23	
10.42	2.783°	23	
20.83	1.572°	24	
41.72	-0.843°	24	

(De Coppet, C R 1897, 125 53)

$\text{BaCl}_2 + \text{Aq}$ containing 10% BaCl_2 has sp gr at 100.6° (Gerlach)

$\text{BaCl}_2 + \text{Aq}$ containing 20% BaCl_2 has sp gr at 101.9° (Gerlach)

B-pt of $\text{BaCl}_2 + \text{Aq}$ containing pts BaCl_2 to 100 pts H_2O G = according to Gerlach (Z anal 26 443), I = according to I and (A ch (2) 59 452)

B pt	C	I
100.5	6.4	11
101.0	12.7	19
101.5	19.0	26
102.0	25.3	32
102.5	31.6	38
103.0	37.7	44
103.5	43.7	50
104.0	49.5	56
104.4		60
104.5	55.2	

Less sol in H₂O containing HCl than in pure H₂O, and scarcely sol in conc HCl + Aq (Berzelius)

Solubility of BaCl₂ in HCl + Aq at 0°
BaCl₂ = no ½ mols (in milligrammes) dissolved in 10 cc of the liquid, HCl = no mols (in milligrammes) contained in the same quantity of liquid

BaCl ₂	HCl	Sum of mols	Sp gr
29 45	0	29 45	1 250
27 8	1 1	28 9	1 242
26 075	2 8	28 875	1 228
23 4	5 0	28 4	1 210
14 0	14 36	28 36	1 143
10 2	18 775	28 975	1 118
6 67	22 75	29 42	1 099
2 74	32 0	34 74	1 079
0 29	50 5	50 79	1 088

(Engel, Bull Soc (2) 45 653)

Sol in about 8000 pts conc HCl + Aq
Sol in about 20,000 pts conc HCl + Aq through which HCl gas was passed

Practically insol in conc HCl + Aq containing 1/6 vol ether (Mar, Sil Am J 143)

Solubility in HCl + Aq at 30°

Composition of the solution		Solid phase
% by wt HCl	% by wt BaCl ₂	
0	27 6	BaCl ₂ , 2H ₂ O
5 94	12 97	"
11 55	3 85	"
18 11	0 46	"
32 35	0 00	"
37 34	0 00	BaCl, 2H ₂ O + BaCl ₂ , H ₂ O
38 63	0 00	BaCl, H ₂ O

(Schreinemakers, Z phys Ch 1909, 68 89)

Much less sol in HNO₃ + Aq than in H₂O, because Ba(NO₃)₂ is nearly insol therein (Wurtz)

BaCl₂ is sol in about—

4 00 pts H₂O

5 00 pts NH₄OH + Aq (conc)

5 33 pts NH₄OH + Aq (1 vol conc 3 vols H₂O)

5 33 pts HCl + Aq (1 vol conc 4 vols H₂O)

8 00 pts HC₂H₃O + Aq (1 vol commercial acid 1 vol H₂O)

6 00 pts NH₄Cl + Aq (1 pt NH₄Cl 10 pts H₂O)

6 00 pts NH₄C₂H₃O + Aq (dil NH₄OH + Aq neutralized by dil HC₂H₃O + Aq)

6 67 pts NaC₂H₃O + Aq (commercial HC₂H₃O neutralized by Na₂CO₃, and dil with 4 vols H₂O)

6 33 pts Cu(C₂H₃O)₂ + Aq See Stolba (Z anal 2 390)

5 67 pts grape sugar (1 pt grape sugar 10 pts H₂O) (Pe arson, Zeit Chem 1869 662)

BaCl₂ + NH₄Cl Solubility of BaCl₂ in NH₄Cl + Aq at 30°

Composition of the solution		Solid phase
% NH ₄ Cl	% BaCl ₂	
0	27 6	BaCl ₂ , 2H ₂ O
5 71	22 16	"
10 06	18 36	"
13 84	15 42	"
20 00	10 89	"
24 69	8 33	"
25 79	7 95	BaCl ₂ , 2H ₂ O + NH ₄ Cl
26 06	7 99	"
27 47	3 56	NH ₄ Cl
29 5	0	"

(Schreinemakers, Z phys Ch 1909, 66 688)

See also under Ammonium chloride

BaCl₂ + Ba(OH)₂ Solubility of BaCl₂ in BaO + Aq at 30°

Composition of the solution		Solid phase
% by wt BaO	% by wt BaCl ₂	
0	27 6	BaCl ₂ , 2H ₂ O
1 78	27 42	BaCl ₂ , 2H ₂ O + BaCl(OH), 2H ₂ O
1 79	27 31	
1 75	27 41	"
2 33	24 98	BaCl(OH), 2H ₂ O
2 50	24 20	"
3 27	21 46	"
4 67	19 18	"
4 86	18 97	BaCl(OH), 2H ₂ O + BaO, 9H ₂ O
4 29	18 83	"
4 64	18 77	"
4 65	18 10	"
4 62	18 04	BaO, 9H ₂ O
4 60	17 08	"
4 58	12 81	"
4 45	10 77	"
4 99	0	"

(Schreinemakers, Z phys Ch 1909, 68 88)

Sol in CuCl₂, NH₄Cl + Aq at 30° (Schreinemakers, Z phys Ch 1909, 66 688)

The solubility data for the system BaCl + CuCl₂ + HCl + Aq have been determined at 40° and 60° (Schreinemakers, C C 1915, I 933)

BaCl + HgCl Solubility of BaCl + HgCl in H₂O

t	C mls per 100 cc solution		Solid phase
	BaCl	HgCl	
10 4°	23 58	50 54	BaCl, 2H ₂ O + HgCl
10 4	23 44	50 74	
10 4	22 58	51 23	BaCl ₂ , 3HgCl 6H ₂ O
10 4	22 48	51 41	
10 4	22 10	51 66	BaCl, 2H ₂ O + HgCl ₂
10 4	21 64	51 74	
25 0	23 02	54 83	

(Foote and Bristol, Am Ch J 32 248)

Solubility of $\text{BaCl}_2 + \text{HgCl}_2$ in H_2O

Temp = 30			Temp = 0°		
% HgCl_2	% BaCl_2	Solid phase	% HgCl_2	% BaCl_2	Solid phase
0	27 77	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	0	23 70	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$
2 90	27 56	"	14 25	24 0	"
7 09	27 47	"	36 20	24 89	"
12 98	26 99	"	46 12	24 07	$\text{BaCl}_2, 3\text{HgCl}_2 \cdot 6\text{H}_2\text{O} +$
22 61	26 89	"	46 05	24 03	" BaCl_2 I_2O
34 57	26 69	"	46 07	24 05	"
46 50	25 22	"	46 59	23 28	$\text{BaCl}_2, 3\text{HgCl}_2 \cdot 6\text{H}_2\text{O}$
55 16	23 46	$\text{HgCl}_2 + \text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	47 78	21 05	"
55 32	23 08	"	48 43	20 64	$\text{BaCl}_2, 3\text{HgCl}_2 \cdot 6\text{H}_2\text{O} + \text{I}_2\text{Cl}_2$
55 19	22 98	"	48 49	20 71	"
48 97	17 87	HgCl_2	44 33	18 50	HgCl_2
41 30	14 26	"	29 0	11 59	"
27 62	8 41	"	16 36	6 11	"
14 19	2 65	"	3 95	0	"
7 67	0	"			

Temp = 40°

56 57 | 22 98 | $\text{BaCl}_2 \cdot 2\text{H}_2\text{O} + \text{HgCl}_2$

(Schreinemakers, Ch Weekbl 1911, 7 202)

$\text{BaCl}_2 + \text{KCl}$ Sol in sat $\text{KCl} + \text{Aq}$, at first without pptn. The KCl is pptd after a time until a state of equilibrium is reached.

100 pts H_2O at 16.6° dissolve 33.8–27.2 pts KCl and 18.2–34.9 pts BaCl_2 (Kopp, A 34 267)

100 g sat solution of $\text{BaCl}_2 + \text{KCl}$ contain 13.83 g BaCl_2 and 18.97 g KCl at 25° (Foote, Am Ch J 32 253)

$\text{BaCl}_2 + \text{Ba}(\text{NO}_3)_2$ BaCl_2 is sol in sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$

Solubility of $\text{BaCl} + \text{Ba}(\text{NO}_3)_2$ in H_2O Both salts present in solid phase

t°	Gms per 100 gms solution		t°	Gms per 100 gms solution	
	BaCl	$\text{Ba}(\text{NO}_3)_2$		BaCl	$\text{Ba}(\text{NO}_3)_2$
0	22 5	4 3	100	31	14
20	24 5	6 0	140	32	20
40	26 5	7 5	180	33	26
60	28 5	9 5	210	32	32

(Luterd, A Ch (7) 2 535)

Very slowly sol in sat $\text{NaNO}_3 + \text{Aq}$ with separation of $\text{Ba}(\text{NO}_3)_2$

Rapidly sol in sat $\text{KNO}_3 + \text{Aq}$, forming $\text{Ba}(\text{NO}_3)_2$, which separates out (Karsten)

$\text{BaCl}_2 + \text{NaCl}$ BaCl_2 is sol in $\text{NaCl} + \text{Aq}$ at first without separation of NaCl , which, however, finally separates

100 pts H_2O dissolve, when both salt are in excess—

	1	2	3	4	5	6
NaCl	35 9	4 1		40 4	35	
BaCl_2		34 5	35 0		19 4	30 3
		38 6			54	

1, 2, and 3 are at 17° (Kopp, A 34 68)
4, 5, and 6 are at b -pt (Mulder)

Solubility of $\text{BaCl}_2 + \text{NaCl}$
100 pts H_2O dissolve pts BaCl and NaCl at t°

t°	Pts BaCl	Pts NaCl	t°	Pts BaCl	Pts NaCl
10	4 1	33 9	60	9 7	5
20	4 1	33 8	70	11 7	6
30	5 0	33 7	80	13 9	6
40	6 3	33 6	90	15 9	6
50	7 9	33 5	100	17 9	6

(Pfecht und Wittgen, B 14 1667)

Solubility of $\text{BaCl} + \text{NaCl}$ in $\text{HCl} + \text{Aq}$ 30°

Solid phase NaCl			Solid phase BaCl		
Sp gr of solution	C mol litre		Sp gr of solution	C mol	C
	HCl	NaCl		HCl	NaCl
1 2018	0 0000	5 400	1 3056	0 0000	745
1 1906	0 4575	4 932	1 2651	0 4709	468
1 1801	0 969	4 386	1 2147	1 107	122
1 1633	1 786	3 589	1 1789	1 622	861
1 1512	2 412	2 978	1 1419	2 234	592
1 1427	3 052	2 463	1 1068	3 041	307
1 1289	4 152	1 628	1 0880	3 953	124
1 1188	5 950	0 630	1 0895	3 059	020
1 1258	7 205	0 268	1 1024	6 234	00
			1 1609	10 25	00

(Masson, Chem Soc 1911, 99 113)

Solubility of $\text{BaCl}_2 + \text{NaCl}$ in $\text{HCl} + \text{Aq}$ at 30°

%HCl	%NaCl	%BaCl ₂	Solid phase
0	23 85	3 8	$\text{NaCl}, \text{BaCl}_2 \cdot 2\text{H}_2\text{O}$
4 84	18 07	2 27	"
12 02	9 55	0 82	"
17 20	4 65	0 29	"
23 16	1 54	0 00	"
28 66	0 47	0 00	"
36 51	0 12	0 00	$\text{NaCl} + \text{BaCl}_2 \cdot \text{H}_2\text{O}$

(Schrenemakers, Arch Néer Sc ex nat (2) 15 91)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Solubility in alcohol 100 pts alcohol of given sp gr dissolve pts of the anhydrous and crystallized salt

Sp gr	Pts BaCl ₂	Pts BaCl ₂ + 2H ₂ O
0 900	1 00	1 56
0 848	0 29	0 43
0 834	0 185	0 32
0 817	0 09	0 06

(Kirwan)

Insol in abs alcohol, or below 19° in alcohol of over 91% Dil alcohol dissolves less BaCl_2 than corresponds to the amount of H_2O present (Gerardin, A ch (4) 5 142)

Solubility in 100 pts alcohol at t° D=sp gr of alcohol, S=solubility

D=0 9904		D=0 9848		D=0 9793		D=0 9726	
t°	s	t	s	t	s	t°	s
14	29 1	14	25 0	11	19 6	15	15 6
25	32 0	32	29 1	15	20 4	23	17 0
32	33 3	39	30 9	20	21 7	33	19 1
47	37 4	50	33 2	35	24 0	50	22 0
60	39 8	63	37 6	45	26 8		

D=0 9573		D=0 9390		D=0 8967		D=0 8429	
t	s	t°	s	t°	s	t	s
13	10	12	6 3	12	0 1	12	0 00
24	11 4	23	7 2	30	4 3	19	0 00
34	12 9	31	8 3	47	4 9	25	0 04
39	13 8	37	9 0			30	0 25
50	15 2	47	10 1			67	0 377

(Gerardin, A ch (4) 5 142)

Solubility in dil alcohol of $x\%$ by weight at 15°

% alcohol	0	10	20	30	40	60	80
Pts BaCl ₂ · 2H ₂ O	30 2	23 7	18 0	12 8	9 3	3 4	0 5

(Scheff, A 118 365)

Sol in 6885-8108 pts 99 3% alcohol at 14.5° , and in 1857 pts at ebullition (Fresenius)

Solubility of BaCl_2 in alcohol + Aq

t°	% alcohol	% BaCl ₂	Solid phase
30°	0	27 95	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$
"	32 67	10 63	"
"	50 16	5 68	"
"	66 72	2 23	"
"	92 53	0 05	"
"	94 83	0 07	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O} + \text{BaCl}_2 \cdot \text{H}_2\text{O}$
"	94 75	0 05	"
"	94 60	0 07	"
"	97 14		$\text{BaCl}_2 \cdot \text{H}_2\text{O}$
"	98 17	0 08	$\text{BaCl}_2 \cdot \text{H}_2\text{O} + \text{BaCl}_2$
"	99 41		BaCl_2
60°	0	31 57	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$
"	16 68	20 16	"
"	34 10	13 21	"
"	66 02	2 82	"
"	88 55	0 25	"
"	90 11	0 09	$\text{BaCl}_2 \cdot 2\text{H}_2\text{O} + \text{BaCl}_2 \cdot \text{H}_2\text{O}$
"	90 39		"
"	93 95		$\text{BaCl}_2 \cdot \text{H}_2\text{O}$

(Schrenemakers and Massink, Chem Weekbl 1910, 7 213)

100 pts absolute methyl alcohol dissolve 2 18 pts BaCl_2 at 15.5° , and 7 3 pts $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ at 6° (de Bruyn, Z phys Ch 10 783)

At 15°C 1 pt by weight is sol in —
 78 pts methyl alcohol of sp gr 0 790
 7,000 " ethyl " " " 0 8035
 100,000 " propyl " " " 0 8085
 (Rohland, Z anorg 1897, 15 413)

Absolutely insol in boiling amyl alcohol (Browning, Sill Am J 144 459)

Absolutely insol in acetic ether (Cann, C R 102 363)

Very sl sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

100 pts by weight of glycerine dissolve 10 pts BaCl_2 at 15.5° (de Bruyn, Z phys Ch 10 783)

Insol in acetone (Naumann, B 1904, 37 4329) (Ludmann, C C 1899, 11 1014)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in anhydrous pyridine, 97% pyridine + Aq and 95% pyridine + Aq. Sl sol in 93% pyridine + Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

+ H_2O Solution of monohydrate sat at 6° contains 31 57% BaCl_2 (Schrenemakers, Chem Weekbl 1910, 7 213)

2 5 grams of the monohydrate are sol in 100 cc of methyl alcohol at 14° (Kirschner, Z phys Ch 1911, 76 176)

Exact solubility in methyl alcohol cannot be determined as $\text{BaCl}_2 + \text{H}_2\text{O}$ separates out from a sat solution of the dihydrate (Kirschner, Z phys ch 1911, 76 177)

Barium cadmium chloride, $\text{BaCl}_2 \cdot \text{CdCl}_2 + 4\text{H}_2\text{O}$

Easily sol in H_2O (v Hauer)

Solubility in H_2O at t°

t°	100 pts solution contain pts			100 g of solution contain g salt	100 g H_2O dissolve g salt	100 mol dissolve anhydro	H O ls of salt
	Cl	Ba	Cd				
22 5	15 19	14 71	11 98	41 88	72 06	3	
32 9	16 18	16 09	12 40	44 59	80 73	3	
41 4	16 95	16 81	13 05	46 87	88 01	4	
53 4	18 21	18 13	13 95	50 30	101 21	4	
62 0	18 81	18 74	14 73	52 28	109 56	5	
97 8	22 48	22 00	17 57	62 05	163 50	7	
108 3	23 51	22 79	18 53	64 83	184 33	8	
109 2	23 69	29 95	18 67	65 31	188 27	8	

(Rimbach, B 1897, 30 3083)

 $BaCl_2 \cdot 2CdCl_2 + 5H_2O$ Quite difficultly sol in H_2O (v Hauer)Solubility in H_2O at t°

t°	100 pts by wt of solution contain pts by wt			100 g of solution contain g salt	100 g H_2O dissolve g salt	100 mol dissolve anhydro	H O ls of salt
	Cl	Ba	Cd				
22 6	16 89	11 00	17 71	45 60	83 82	2	
41 3	18 15	11 77	19 22	49 14	96 62	3	
53 9	18 78	12 41	19 85	51 04	104 25	3	
62 2	19 66	12 83	20 59	53 08	113 13	3	
69 5	20 18	13 09	21 20	54 47	119 64	3	
107 2	23 31	14 87	24 11	62 29	165 18	5	
107 2	23 16	14 93	24 39	62 48	166 53	5	

(Rimbach, B 1897, 30 3083)

mercuric chloride, basic, $BaCl_2 \cdot HgO$ Decomp by H_2O (André, C R 104 431)**Barium mercuric chloride**, $BaCl_2 \cdot 2HgCl_2 + 2H_2O$ Efflorescent in dry air, sol in H_2O (v Bonsdorff, Pogg 17 130)The salt $BaCl_2 \cdot 2HgCl_2 + 2H_2O$ described by Bonsdorff does not form under the conditions which he gives (Foote, Am Ch J 1904, 32 251) $BaCl_2 \cdot 3HgCl_2 + 6H_2O$ Solubility determinations with mixtures of $BaCl_2$ and $HgCl_2$ show that these chlorides do not form a double salt at 25° , but that a transition temp exists at about 17.2° below which the salt $BaCl_2 \cdot 3HgCl_2 + 6H_2O$ forms (Foote, Am Ch J 1904, 32 251) $+8H_2O$ Less sol in H_2O than the Sr and Mg double salts (Swan, Am Ch J 1898, 20 633)**Barium rhodium chloride**, $3BaCl_2 \cdot RhCl_3$

See Chlororhodite, barium

Barium stannous chloride, $BaCl_2 \cdot SnCl_2 + 4H_2O$ Sol in H_2O (Poggialk, C R 20 1183)**Barium stannic chloride**

See Chlorostannate, barium

Barium uranium chloride, $BaCl_2 \cdot UCl_4$ Decomp by H_2O (Aloy, Bull Soc 1899, (3) 21 265)**Barium zinc chloride**, $BaCl_2 \cdot ZnCl_2 + 4H_2O$
Deliquescent, and sol in H_2O (Werner, C N 27 271)

Pptd from warm solution only (Epbaum, Z anorg 1910, 67 381)

 $+2\frac{1}{2}H_2O$ Pptd from cold solution (Ephraim)**Barium chloride hydrazine**, $BaCl_2 \cdot 2NH_4$

Hydrosopic (Franzen, Z anorg 1908, 60 290)

Barium chloride hydroxylamine, $BaCl_2 \cdot 2NH_2OH$ Very sol in H_2O (Crismer, Bull S 3 118)**Barium chloride sulphuric anhydride**, $BaCl_2 \cdot 2SO_3$ Decomp by H_2O (Schultz-Selluck B 4 113)**Barium chlorofluoride**, $BaClF$ Difficultly sol in H_2O , but much more sol than BaF_2 . Decomp by H_2O , so that when washed on filter, the filtrate contains more $BaCl_2$ than BaF_2 (Berzelius, Pogg 1 9)Insol in and undecomp by boiling alcohol, sol in conc HCl and HNO_3 . Decomposed by hot H_2SO_4 , dil acetic acid, dil HCl or dil HNO_3 (Defacqz, C R 190 138 198)**Barium cyanamide**, $BaCN_2$ Decomp by H_2O (Frank, C C 16 2, II 774)

Barium subfluoride sodium fluoride, BaF, NaF

Decomp by H₂O (Guntz, C R 1903, 136 750)

Barium fluoride, BaF₂

Scarcely sol in H₂O (Berzelius), less sol in H₂O than CaF₂

1 liter H₂O dissolves 1630 mg BaF₂ at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

1605 mg are contained in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

Insol in molten MnCl₂, MnBr₂, MnI₂, MnCl₂+BaCl₂, MnBr₂+BaBr₂ and MnI₂+BaI₂ (Defacqz, A ch 1904, (8) 1 350)

Easily sol in HCl, HNO₃, or HF+Ag (Gay-Lussac and Thénard)

Sl sol in liquid HF (Franklin, Z anorg 1905, 46 2)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sol in an aqueous solution of sodium citrate (Spiller)

Barium tin (stannic) fluoride

See Fluostannate, barium

Barium tellurium fluoride, BaF₂, 2TeF₄

Decomp by H₂O (Hogbom, Bull Soc (2) 35 60)

Barium titanium fluoride

See Fluotitanate, barium

Barium titanyl fluoride, TiO₂F₂, BaF₂

See Fluoxypertitanate and fluoxytitanate, barium

Barium uranyl fluoride

See Fluoxyuranate, barium

Barium vanadyl fluoride

See Fluoxyvanadate, barium

Barium zirconium fluoride, 3BaF₂, 2ZrF₄+2H₂O

Insoluble precipitate (Marignac)

See also Fluozirconate, barium

Barium fluoiodide, BaF₂, BaI₂

Decomp by H₂O, dil HCl, dil HNO₃ or hot H₂SO₄. Sol in HI and HNO₃. Insol in and undecomp by boiling alcohol. Decomp by dil acetic acid (Defacqz, C R 1904, 138 199)

Barium hydride, BaH₂

Decomp by H₂O or HCl+Ag (Winkler, B 24 1979)

Decomp by H₂O (Guntz, C R 1901, 132 964)

Barium hydrosulphide, BaS₂H₂

Easily sol in H₂O. Insol in alcohol +4H₂O. Sol in H₂O, and the solution dissolves S (Veley, Chem Soc 49 369)

Barium hydroxide, BaO₂H₂

100 pts cold H₂O dissolve 5 pts BaO₂H₂ boiling 50

(Davy)

100 pts H₂O at 20° dissolve 3.45 pts BaO (Bureau C R 41. 509)

100 pts H₂O at 13° dissolve 2.86 pts BaO
47° 13 3
70° 17 9

(Osann)

100 pts H₂O dissolve pts BaO at t°

t°	Pts BaO	t°	Pts BaO	t°	Pts BaO
0	1 5	30	5 0	60	18 76
5	1 75	35	6 17	65	24 67
10	2 22	40	7 36	70	31 9
15	2 89	45	9 12	75	56 85
20	3 48	50	11 75	80	90 77
25	4 19	55	14 71		

(Rosenthal and Ruhlmann, J B 1870 314)

100 pts H₂O dissolve at 25° 55.08 millimols BaO₂H₂ (Herz and Knoch, Z anorg 1904, 41 315)

Sp gr of BaO₂H₂+Aq

%BaO	Sp gr	%BaO	Sp gr
30	1 6	1 8	1 02
19	1 3	0 9	1 01
2 6	1 03		

(Dalton)

Sp gr of BaO₂H₂+Aq at 18° containing 1 25% BaO₂H₂=1 0120, containing 2 5%=1 0253 (Kohlrausch, W Ann 1879, 6 41)

Sp gr of BaO₂H₂+Aq at 80°

Sp gr	%BaO ₂ H ₂ by volume	%BaO ₂ H ₂ by weight	Sp gr	%BaO ₂ H ₂ by volume	%BaO ₂ H ₂ by weight
1 514	58 22	38 45	1 219	24 53	20 12
1 500	56 31	37 54	1 200	23 00	19 17
1 479	54 14	36 60	1 195	22 15	18 53
1 458	49 38	33 87	1 174	19 83	16 89
1 450	48 90	33 72	1 152	17 78	15 43
1 413	45 99	32 55	1 129	16 01	14 18
1 400	45 00	32 14	1 125	15 80	14 04
1 390	44 22	31 81	1 114	14 56	13 07
1 375	42 40	30 84	1 100	13 06	11 87
1 368	41 45	30 30	1 076	10 58	9 83
1 350	38 60	28 59	1 062	9 16	8 62
1 338	37 30	27 88	1 049	7 55	7 20
1 312	35 02	26 69	1 040	6 51	6 26
1 301	34 02	26 13	1 031	5 18	5 02
1 278	31 48	24 67	1 022	4 78	4 67
1 249	28 14	22 52	1 015	3 90	3 84
1 236	26 41	21 36	1 009	3 37	3 34

(Haff, C N 1902, 86 284)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 827)

More sol in NaCl+Ag, KNO₃+Ag, or NaNO₃+Ag than in H₂O (Karsten)

Not precipitated by alcohol

Sol with combination in absolute alcohol and anhydrous methyl alcohol Insol in ether

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Solubility in acetone + Aq at 25°

A = cc acetone in, 100 cc acetone + Aq

$\text{BaO}_2\text{H}_2 = \text{millimols BaO}_2\text{H}_2 \text{ in } 100 \text{ cc of}$

the solution

S = sp gr of the solution

A	$\frac{\text{BaO}_2\text{H}_2}{2}$	S
0	55 08	1 04790
10	31 84	1 01677
20	17 79	0 99268
30	9 10	0 97630
40	4 75	0 95605
50	1 54	0 93980
60	0 48	0 91790
70	0 08	0 89562

(Herz, Z anorg 1904, 41 321)

BaO_2H_2 is sol in an aqueous solution of cane sugar (Hunton, Phil Mag (3) 11 156), also in an aqueous sol of mannite (Favre, A ch (3) 11 76), sorbine (Pelouze), hot solution of quercite, separating on cooling (Des-saignes)

+3H₂O Decomp by H₂O free from carbonic acid Sl sol in alcohol and ether (Bauer, Z anorg 1905, 47, 416)

Solubility in H₂O the same as that of the comp with 8H₂O Insol in alcohol and ether (Bauer, Zeit angew Ch 1903, 17 341)

Nearly insol in alcohol and ether (Bauer, Zeit angew Ch 1903, 16 349)

+8H₂O Sol in 20 pts cold, and 3 pts boiling H₂O (Graham), 17 5 pts H₂O at 15°, and in all proportions of hot H₂O (Hope) Sol in 19 pts H₂O at 15°, and 2 pts at 100° (Wittstein)

If $\text{BaO}_2\text{H}_2 + 8\text{H}_2\text{O}$ is heated it dissolves in the crystal H₂O and the solution has the following bpts

%BaO 49 05 50 05 52 43 53 72
B-pt 103° 104° 105° 106°

%BaO 55 35 57 49 58 74 61 44
B-pt 107° 108° 108 5° 109°

$\text{BaO}_2\text{H}_2 + 3\text{H}_2\text{O}$ separates at 109° (Bauer, Zeit angew Ch 1903, 17 345)

B-pt of $\text{BaO}_2\text{H}_2 \cdot 8\text{H}_2\text{O} + \text{Aq}$ at 732 mm

Bpt	Time	%BaO
78° (mpt)	0	48 45
78	4'	48 45
103	6' 30"	49 05
104	6' 45"	50 05
105	7' 30"	52 43
106	9' 25"	53 72
107	10' 45"	55 35

B-pt of $\text{BaO}_2\text{H}_2 \cdot 8\text{H}_2\text{O} + \text{Aq}$, etc — C *continued*

Bpt	Time	%	BaO
108	12'	5	49
108 5	—	5	74
109	13'	6	44
109	17' 40"	6	65
108	17' 50"	6	53
105	18'	6	51
100	18' 45"	6	17

(Bauer, Z anorg 1905, 47 40)

Solubility in $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at 25°
Solution sat with respect to both 1 and $\text{BaO}_2\text{H}_2 \cdot 8\text{H}_2\text{O}$ (NO_3)₂

Sp gr 25°/25°	g BaO as $\text{Ba}(\text{OH})_2$ in 100 g H ₂ O	g Ba 100	(NO_3) ₂ in H ₂ O
1 1448	5 02	1	48
1 1371	4 93	1	21
1 1288	4 83		66
1 1220	4 72		55
1 1133	4 72		01
1 1062	4 65		82
1 1044	4 61		55
1 1010	4 64		08
1 0975	4 60		66
1 0949	4 55		46
1 0937	4 54		32
1 0885	4 52		44
1 0864	4 53		41
1 0840	4 52		04
1 0790	4 48		47
1 0774	4 46		14
1 0731	4 40		79
1 0711	4 42		53
1 0651	4 35		88
1 0626			
1 0640	4 35		45
1 0538	4 29		43
1 0512	4 29		

(Parsons and Coison, J Am Chem Soc 1910, 32 1385)

Solubility of $\text{Ba}(\text{OH})_2 + \text{H}_2\text{O}$ (solid phase) in $\text{MCl} + \text{Aq}$ (mol per litre of solution) at 25°

Solution of	(Cl)	(C)
LiCl	0	0 35
"	0 75	0 15
"	1 42	0 37
"	2 30	1 36
KCl	0 86	0 15
"	1 75	0 30
"	3 10	0 76
NaCl	0	0 35
"	0 73	0 30
"	1 43	0 39
"	2 82	0 36
RbCl	1 25	0 18

(Herz, Z anorg 1910, 67 36)

Solubility of BaO in NaOH + Aq at 30°

% Na ₂ O	% BaO	Solid phase
0	4.99	BaO 9H ₂ O
4.78	1.29	"
6.43	0.89	"
9.63	0.57	"
11.62	0.53	"
17.87	0.47	"
23.28	1.06	"
24.63	1.87	BaO 9H ₂ O + BaO 4H ₂ O
26.14	1.84	BaO 4H ₂ O
27.72	1.75	"
28.43	1.58	"
29.24	1.34	BaO 4H ₂ O + BaO 2H ₂ O
32.12	0.82	BaO 2H ₂ O
34.72	0.59	"
41.09	0.57	BaO 2H ₂ O + NaOH H ₂ O
42	0	NaOH H ₂ O

(Schreinemakers, Z phys Ch 1909, 68 84)

50% alcohol dissolves less than 0.5% of its wt of BaO₂·H₂+8H₂O (Beckmann, J pr 1883, (2) 27 138)

Barium subiodide sodium iodide, BaI, NaI
Decomp by H₂O (Guntz, C R 1903, 136 750)

Barium iodide, BaI₂

Not deliquescent. Very sol in H₂O and alcohol. 100 pts of anhydrous salt dissolve at 0° 19 5° 30° 40° 60° 90° 106° in 59 48 44 43 41 37 35 pts H₂O (Kremers, Pogg 103 66)

Sp gr of BaI₂ + Aq containing

5	10	15	20	25	30% BaI ₂
1.045	1.091	1.143	1.201	1.265	1.333

35	40	45	50	55	60% BaI ₂
1.412	1.495	1.596	1.704	1.825	1.970

(Kremers, Pogg 111 63, calculated by Gruber, Z anal 8 279)

Easily sol in alcohol (Henry)

Sl sol in benzontitrile (Naumann, B 1914, 47 1369)

Sol in acetone (Naumann, B 1904, 37 4328; Ludm un, C C 1899, II 1014)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

+2H₂O At 15°C, 1 pt by weight in sol in

22 pts	methyl alcohol	sp gr	0.790
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93	"	"	0.5035
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307	"	"	0.8085
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(Rohland, Z anorg 1897, 15 413)

+7H₂O (Thomson, B 10 1343)

The composition of the hydrates formed by BaI₂ at different dilutions is calculated from determinations of the lowering of the fr-pt produced by BaI₂ and of the conductivity and sp gr of BaI₂ + Aq (Jones, Am Ch J 1905, 34 306)

Barium iodide, basic, Ba(OH)I + 9H₂O

See Barium oxyiodide

Barium bismuth iodide, BaI₂, 2BiI₃ + 18H₂O
Deliquescent, decomp by H₂O (Linan, Pogg 111 240)

Barium cadmium iodide, BaI₂, CdI₂ + 5H₂O
Deliquescent (Croft)

Barium mercuric iodide, BaI₂, 2HgI₂

Decomp by much H₂O (Boullay)

BaI₂, HgI₂ Sol in H₂O (Boullay)

Sp gr of sat solution = 3.575–3.588 (Rohrbach, W Ann 20 169)

+5H₂O (Duboin, C R 1906, 143 314)

2BaI₂, 3HgI₂ + 16H₂O (Duboin, C R 1906, 142 888)

BaI₂, 5HgI₂ + 8H₂O As the corresponding Ca salt (Duboin, C R 1906, 142 888)

3BaI₂, 5HgI₂ + 21H₂O Very deliquescent (Duboin, C R 1906, 142 889)

Barium stannous iodide

Very sol in H₂O (Boullay)

Barium zinc iodide, BaI₂, 2ZnI₂

Deliquescent, and sol in H₂O (Rammelsberg)

+4H₂O Very hygroscopic (Ephraim, Z anorg 1910, 67 385)

Barium nitride, Ba₃N

Decomp H₂O violently, not alcohol quence, A ch (6) 29 219)

Ba₃N₆

See Barium azonide

Barium oxide, BaO

Sol in H₂O with evolution of heat

Easily sol in dil HNO₃, or HCl + Aq

Solubility in NaOH + Aq See Barium hydroxide

Solubility in Na₂O, HCl, +H₂O at 30° (Schreinemakers, Z phys Ch 1909, 68 98)

Solubility in Na₂O, NaCl, BaCl + Aq at 30° (Schreinemakers)

Insol in liquid NH₃ (Gore, Am Ch J 1898, 20 827)

Sol with combination in absolute alcohol and anhydrous wood-spirit Insol in ether

Easily sol in absolute methyl alcohol

1 l absolute ethyl alcohol sat with BaO at 0° contains 213 g BaO (Berthelot, Bull Soc 8 389)

Sol in methyl alcohol (Neuberg and Neumann, Biochem Z 1906, 1 173)

Insol in acetone (Fidmann, C C 1899, II 1014; Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

See also Barium hydroxide

Barium peroxide, BaO₂

Insol in H₂O, decomp by boiling H₂O

Sol in acids with formation of hydrogen dioxide

Forms hydrate with $8\text{H}_2\text{O}$, also $10\text{H}_2\text{O}$ (Berthelot, A ch (5) 21 157), also a compound $\text{BaO}_2 \cdot \text{H}_2\text{O}_2$, which is very unstable, sl sol in cold H_2O , and insol in alcohol or ether (Schone, A 192 257)

+ $8\text{H}_2\text{O}$ 100 cc pure H_2O dissolve 0.168 g $\text{BaO}_2 \cdot 8\text{H}_2\text{O}$, if H_2O contains 0.3 g $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$, only 0.102 g $\text{BaO}_2 \cdot 8\text{H}_2\text{O}$ are dissolved, if 0.6 g $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ only 0.019 g $\text{BaO}_2 \cdot 8\text{H}_2\text{O}$ are dissolved (Schone, A 1878, 192 266)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Barium oxybromide, $\text{Ba}(\text{OH})\text{Br} \cdot 2\text{H}_2\text{O}$

Decomp by H_2O (Beckmann, J pr (2) 27 132)

$\text{BaBr}_2 \cdot \text{BaO} \cdot 5\text{H}_2\text{O}$ Sl sol in H_2O (Tassilly, C R 1895, 120 1340)

Barium oxychloride, $\text{Ba}(\text{OH})\text{Cl} \cdot 2\text{H}_2\text{O}$

Decomp by H_2O (Beckmann, J pr (2) 26 388, 474)

Barium mercury oxychloride, $\text{BaCl}_2 \cdot \text{HgO} + 6\text{H}_2\text{O}$

Decomp by H_2O (André, C R 104 431)

Barium oxyiodide, $\text{Ba}(\text{OH})\text{I} \cdot 9\text{H}_2\text{O}$

Decomp by H_2O and alcohol (Beckmann, B 14 2154)

$\text{BaI}_2 \cdot \text{BaO} \cdot 9\text{H}_2\text{O}$ Sl sol in H_2O (Tassilly, C R 1895, 120 1340)

Barium oxysulphides, $\text{Ba}_2\text{O}_3\text{S}_2 + 58\text{H}_2\text{O}$,

$\text{Ba}_2\text{OS} + 10\text{H}_2\text{O}$, $\text{Ba}_2\text{OS}_2 + 28\text{H}_2\text{O}$

Very unstable, decomp by recrystallization into BaS_2H_2 and BaO_2H

Barium phosphide, Ba_3P_2

Decomp by H_2O (Dumas, A ch 32 364)

Ba_3P Crystallized Sol in dil acids, insol in conc acids, decomp by H_2O Insol in organic solvents at ord temp (Jaboin, C R 1899, 129 765)

Barium selenide, BaSe

Sol in H_2O with decomp

Sl sol in H_2O (Favre, C R 102 1469)

Barium silicide, BaSi

(Jungst, C C 1905, I 195)

BaSi Slowly decomp by H_2O , not by $\text{NH}_4\text{OH} + \text{Aq}$ Rapidly decomp by conc NaOH Sol in HNO_3 , H_2SO_4 and H_3PO_4 with evolution of spontaneously inflammable gas Sol in HCl and HCl Sol in acetic acid without evolution of gas (Moissan, Compt Rend 1904, III 680)

Decomp rapidly in both hot and cold H_2O (Bradley, C N 1900, 82 150)

Barium sulphide, BaS

Sol in H_2O with decomp

Crystallized Decomp by H_2O

Attacked by cold conc HNO_3 (Mourlot, A ch 1899, (7) 17 521)

Cryst modification is less readily effected on by air and other reagents than the amorphous modification, sol in fuse oxidizing agents (Mourlot, C R 1898, 126 645)

+ H_2O (Neuberg and Neumann, Z 1906, 1 174)

+ $6\text{H}_2\text{O}$ Slowly sol in boiling F_2 , with decomp, insol in, but decomp by boiling alcohol (Schone)

Barium sulphide, $\text{Ba}_4\text{S}_7 + 25\text{H}_2\text{O}$ (?)

Sol in H_2O (Schone, Pogg 112 215)

Barium trisulphide, BaS_3

Sol in large amount of boiling H_2O (Schone, Pogg 112 215)

Barium tetrasulphide, $\text{BaS}_4 + \text{H}_2\text{O}$

Easily sol in H_2O , especially if heated, sol in 2.42 pts H_2O at 15° , insol in CS_2 or alcohol (Schone, Pogg 112 224)

+ $2\text{H}_2\text{O}$ (Velej, Chem Soc 49 69)

Barium pentasulphide, BaS_5

Known only in solution

Barium mercuric sulphide, $\text{BaS} \cdot \text{HgS} \cdot 5\text{H}_2\text{O}$

Sol in H_2O (Wagner, J pr 98)

Barium nickel sulphide, $\text{BaS} \cdot 4\text{NiS}$

Sol in warm conc HCl (Bellucci, C A 1909, 293)

Barium stannic sulphide

See Sulphostannate, barium

Barium uranyl sulphide, $6\text{BaS} \cdot 10\text{UO}_2\text{S} + x\text{H}_2\text{O}$ (?)

Decomp by $\text{HCl} + \text{Aq}$ (Remond, Pogg 124 159)

Baryta

See Barium oxide, BaO

Beryllium, Be

For beryllium and its salts, see C Beryllium and the corresponding salts

Bismuth, Bi

Not attacked by H_2O Very slowly attacked by $\text{HCl} + \text{Aq}$ (Roost) Very sl sol in conc $\text{HCl} + \text{Aq}$ (Schutzenberger, Willm) Not attacked by dil $\text{HCl} + \text{Aq}$ (Niet and Humot) Very slowly attacked by cold $\text{HCl} + \text{Aq}$ (Godeffroy) According to various experiments pure Bi is absolutely unattacked by hot or cold, dil or conc $\text{HCl} + \text{Aq}$ in presence of oxygen (Ditte and Metzner, A ch (6) 29 397)

Not attacked by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ decomp

by hot conc H_2SO_4 . Easily sol in dil or conc $\text{HNO}_3 + \text{Aq}$, or aqua regia.

Not attacked by pure $\text{HNO}_3 + \text{Aq}$ of 1.52 to 1.42 sp gr at 20° ; violently attacked by a more dil acid, but the acid becomes concentrated thereby. Conc $\text{HNO}_3 + \text{Aq}$ attacks only by heating or adding NO_2 (Millon, A ch (3) 6 95).

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827).

$\frac{1}{2}$ ccm oleic acid dissolves 0.0091 g Bi in 6 days (Gates, J phys Chem 1911, 15 143).

Bismuth arsenide, Bi_2As_3

(Descamp, C R 86 1065)

Bismuth dibromide, Bi_2Br_4

Not known in a pure state (Weber, Pogg 107 599).

Bismuth tribromide, Bi_2Br_3

Very deliquescent. Decomp by H_2O . Sol in alcohol or ether.

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84 27).

Bismuth hydrogen bromide, $\text{BiBr}_3 \cdot 2\text{HBr} + 4\text{H}_2\text{O}$

Deliquescent.

Decomp in the air (Aloy, Bull Soc 1906, (3) 35 398).

Bismuth caesium bromide, $2\text{BiBr}_3 \cdot 3\text{CsBr}$

Ppt. Insol in HBr .

Sol in HCl and in HNO_3 (Hutchins, J Am Chem Soc 1907, 29 33).

Bismuth potassium bromide, $\text{BiBr}_3 \cdot 2\text{KBr}$

Decomp by H_2O (Aloy, Bull Soc 1906, (3) 35 398).

Bismuth bromide ammonia, $\text{BiBr}_3 \cdot 3\text{NH}_3$

Sol in $\text{HCl} + \text{Aq}$.

$\text{BiBr}_3 \cdot 2\text{NH}_3$ (?)

$2\text{BiBr}_3 \cdot 5\text{NH}_3$. Not deliquescent, not decomp by H_2O , easily sol in dil acids (Mun, Chem Soc 29 144).

Bismuth bromide potassium chloride,

$\text{K BiCl}_2\text{Br} + 1\frac{1}{2}\text{H}_2\text{O}$

Decomp by H_2O (Atkinson, Chem Soc 43 289).

Bismuth dichloride, Bi_2Cl_4

Very deliquescent. Decomp by H_2O dil acids, or conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Weber, Pogg 107 596).

Bismuth trichloride, BiCl_3

Deliquescent. Decomp by H_2O . Sol in dil $\text{HCl} + \text{Aq}$, and alcohol. Not decomp by H_2O in presence of citrates (Spiller).

0.08 g sol in 100 ccm liquid H_2S (Antony, C C 1905, I 1692).

Moderately sol in liquid NH_3 (Gore, Am Ch J 1898, 20 827).

1 g BiCl_3 is sol in 5.59 g acetone at 18° . Sp gr of sat solution $18^\circ/4^\circ = 0.9194$ (Naumann, B 1904, 37 4331).

Sol in acetone and in methylal (Erdmann, C C 1899, II 1014).

Sol in benzonitrile (Naumann, B 1914, 47 1369).

Sol in ethyl acetate (Naumann, B 1910, 43 314).

1 pt is sol in 60.36 pts ethyl acetate at 18° . Sp gr at $18^\circ/40^\circ = 0.9106$ (Naumann, B 1910, 43 320).

Sol in methyl acetate (Naumann, B 1909, 42 3790).

Bismuth chloride, Bi_2Cl_3 (?)

Decomp by H_2O (Dehérain, C R 54 724).

Bismuth hydrogen chloride, $2\text{BiCl}_3 \cdot \text{HCl} + 3\text{H}_2\text{O}$

Not deliquescent. Decomp by H_2O (Engel, C R 106 1797).

$\text{BiCl}_3 \cdot 2\text{HCl}$ (Jacquelin, A ch (2) 62 363).

Bismuth caesium chloride, $\text{BiCl}_3 \cdot 3\text{CsCl}$

Decomp by H_2O . Sl sol in cold dil $\text{HCl} + \text{Aq}$, but easily sol on warming (Brigham, Am Ch J 14 181).

$2\text{BiCl}_3 \cdot 3\text{CsCl}$. As above (Brigham). $\text{BiCl}_3 \cdot 6\text{CsCl}$. Easily sol in H_2O and in $\text{HCl} + \text{Aq}$ (Godfrey, B 8 9).

Does not exist (Brigham).

Bismuth hydrazine chloride, $\text{BiCl}_3 \cdot 3\text{N}_2\text{H}_4\text{HCl}$

Sol in acids, from which it is pptd by H_2O (Ferratin, C A 1912 1613).

Bismuth nitrosyl chloride, $\text{BiCl}_3 \cdot \text{NOCl}$

Very deliquescent. Decomp by H_2O (Sudborough, Chem Soc 59 662).

Bismuth potassium chloride, $\text{BiCl}_3 \cdot \text{KCl} + \text{H}_2\text{O}$

Decomp by H_2O . Cannot be recryst except from conc $\text{BiCl}_3 + \text{HCl}$. Decomp by $\text{HCl} + \text{Aq}$ into $\text{BiCl}_3 \cdot 2\text{KCl} + 2\text{H}_2\text{O}$ (Brigham, Am Ch J 14 167).

$\text{BiCl}_3 \cdot 2\text{KCl}$. Decomp by H_2O (Aippe, Pogg 64 37).

Deliquescent.

Sol in H_2O with decomp into the oxychloride when excess H_2O is used (Aloy, Bull Soc 1906, (3) 35 397).

$+ 2\text{H}_2\text{O}$. Decomp by H_2O (Jacquelin, J pr 14 1).

Sol in moderately conc $\text{HCl} + \text{Aq}$.

$\text{BiCl}_3 \cdot 3\text{KCl}$. Decomp by H_2O (Aippe). Does not exist (Brigham).

Bismuth rubidium chloride, BiCl_3 , $\text{RbCl} + \text{H}_2\text{O}$

Decomp by H_2O , sol in dil $\text{HCl} + \text{Aq}$, from which BiCl_3 , 3RbCl crystallizes (Brigham, Am Ch J 14 174)

BiCl_3 , 3RbCl Decomp by H_2O , sol in dil $\text{HCl} + \text{Aq}$ without decomp (Brigham)

BiCl_3 , 6RbCl Decomp by H_2O , sol in $\text{HCl} + \text{Aq}$ (Godeffroy, B 8 9), does not exist (Brigham)

10BiCl_3 , 23RbCl (?) As above (Brigham)

Bismuth sodium chloride, BiCl_3 , $2\text{NaCl} + \text{H}_2\text{O}$

+ $3\text{H}_2\text{O}$ Decomp by H_2O (Arppe, Pogg 64 237)

BiCl_3 , 3NaCl

Bismuth thallous chloride, BiCl_3 , 3TlCl

Ppt (Ephraim, Z anorg 1909, 61 254)

BiCl_3 , 6TlCl Ppt (Ephraim)

Bismuth chloride ammonia, 2BiCl_3 , NH_3

Stable (Dehéram, C R 54 724)

BiCl_3 , 2NH_3 (D)

BiCl_3 , 3NH_3 (D)

Bismuth chloride nitric oxide, BiCl_3 , NO

Very hygroscopic (Thomas, C R 1895, 121 129)

Bismuth chloride nitrogen peroxide, BiCl_3 , NO_2

Decomp by moist air, but stable in dry air (Thomas, C R 1896, 122 612)

Bismuth chloride selenide

See Bismuth selenochloride

Bismuth trifluoride, BiF_3

Insol in H_2O or alcohol (Gott and Muir, Chem Soc 53 138)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Bismuth hydrogen fluoride, BiF_3 , 3HF

Deliquescent. Decomp by boiling H_2O (Muir, Chem Soc 39 21)

Bismuth gold, Au_3Bi

Insol in equal pts of HNO_3 and tartaric acids (Roessler, Z anorg 1895, 9 71)

Bismuthous hydroxide, $\text{Bi}(\text{OH})_3$

Sol in strong acids Insol in solutions of alkalis, alkali carbonates, $(\text{NH}_4)_2\text{CO}_3$, or NH_4NO_3 , or of amyl amine (Wurtz) When recently pptd is sol in $\text{NH}_4\text{Cl} + \text{Aq}$, but insol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett, 1837) Not pptd in presence of Na citrates (Spiller)

Solubility of freshly pptd $\text{Bi}(\text{OH})_3$ in $\text{NaOH} + \text{Aq}$

g NaOH per l	g Bi dissolved per l at 20°	g Bi dissolved per l at 100°
400	0 16	1 1
320	0 11	1 1
240	0 11	
200	0 10	0 1
160	0 08	0 1
120	0 07	
80	0 04	0
40	trace	0 1
20	0	0 1

(Moser, Z anorg 1909, 61 386)

Solubility of freshly pptd $\text{Bi}(\text{OH})_3$ in $\text{KOH} + \text{Aq}$

KOH per l g	g Bi dissolved per l at 20°	g Bi dissolved per l at 100°
560	0 14	1 6
448	0 11	1 2
336	0 11	
280	0 10	0 5
224	0 08	0 5
168	0 06	
112	0 03	0 3
56	trace	0 2
28	0	0 1

(Moser, Z anorg 1909, 61 386)

Bi_2O_3 , $2\text{H}_2\text{O}$

Bi_2O_3 , H_2O (Muir, Chem Soc 32 31)

See also Bismuth trioxide

Bismuth tetrahydroxide, Bi_2O_4 , H_2O

Bi_2O_4 , $2\text{H}_2\text{O}$ (Wernicke, Pogg 141 109)

Bismuthic hydroxide (Bismuthic acid), Bi_2O_5 , H_2O

Insol in H_2O , easily decomp by acids (Fremy, A ch (3) 12 495) Decomp by H_2SO_4 , not attacked by $\text{SO} + \text{Aq}$, neither dissolved nor decomp by dil $\text{HNO}_3 + \text{Aq}$, but slowly converted into in allotropic modification (?) Partially decomp by conc HNO_3 . Slowly but wholly dissolved by hot conc HNO_3 . Sol in conc $\text{KOH} + \text{Aq}$ (Arppe) Sol in about 100 pts boiling $\text{KOH} + \text{Aq}$, so conc that it solidifies on removing the unp (Muir, Chem Soc 51 77)

Bi_2O_5 , $2\text{H}_2\text{O}$ (Bodcker, A 123 61)

Does not exist (Hoffmann und Grotthaus)

Bismuth iodide, BiI_3

Not attacked by cold H_2O , but by boiling, BiOI is formed 100 pts absolute alcohol dissolve $3\frac{1}{2}$ pts salt at 20° (Gott and Muir, Chem Soc 57 138)

Sol in HNO_3 , and $\text{HI} + \text{Aq}$, from which it is reprecipitated by H_2O or alcohol Sol in $\text{K} + \text{Aq}$ or $\text{KOH} + \text{Aq}$ (Rammelsberg)

Sl sol in liqnd NH_3 (Franklin, Am Ch J 1898, 20 827)

100 g absolute alcohol dissolve 3.5 g BiI_3 at 20° (Gott and Muir, Chem Soc 57 138)

Sol in acetone (Naumann, B 1904, 37 4328)

100 pts methylene iodide dissolve 0.15 pt BiI_3 at 12° , and very little more at higher temperatures (Retgers, Z anorg 3 343)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Bismuth hydrogen iodide, BiI_3 , $\text{HI}+4\text{H}_2\text{O}$
(Arppe, Pogg 44 248)

Bismuth caesium iodide, $3\text{CsI} \cdot 2\text{BiI}_3$

Very sl sol in H_2O (Wells, Am J Sci 1897, (4) 3 464)

Bismuth calcium iodide, 2BiI_3 , $\text{CaI}_2+18\text{H}_2\text{O}$
Deliquescent, decomp by H_2O (Linna, Pogg 111 240)

Bismuth magnesium iodide, 2BiI_3 , $\text{MgI}_2+12\text{H}_2\text{O}$

Deliquescent, decomp by H_2O (Linna, Pogg 111 240)

Bismuth potassium iodide, BiI_3 , 4KI

Ppt (Arppe, Pogg 44 237)

BiI_3 , 3KI (Astre, C R 110 1137)

BiI_3 , 2KI Sol in acetic ether (Astre)
 $+4\text{H}_2\text{O}$ Sol in small amt H_2O without pptn, but decomp by much H_2O

BiI_3 , 2KI , HI (Arppe)

2BiI_3 , $3\text{KI}+2\text{H}_2\text{O}$ (Astre)

BiI_3 , $\text{KI}+\text{H}_2\text{O}$ Decomp by H_2O (Nickles, C R 51 1097)

2BiI_3 , KI Sol in acetic ether (Astre)

Bismuth sodium iodide, BiI_3 , $\text{NaI}+\text{H}_2\text{O}$

Deliquescent, decomp by H_2O (Nickles, C R 51 1097)

2BiI_3 , $3\text{NaI}+12\text{H}_2\text{O}$ As above (Linna, Pogg 111 240)

Bismuth zinc iodide, 2BiI_3 , $\text{ZnI}_2+12\text{H}_2\text{O}$

Very deliquescent (Linna, Pogg 111 240)

Bismuth iodide ammonia, BiI_3 , 3NH_3

Decomp by H_2O (Rammelsberg)

Bismuth iodide zinc bromide

Sol in H_2O (Linna, Pogg 111 240)

Bismuth nitride

Explosive (Fischer, B 1910, 43 1471)

BiN Ppt Decomp by H_2O or dil acids (Franklin, J Am Chem Soc 1905, 27 847)

Bismuth dioxide, Bi_2O_3

Sol in conc HNO_3+Aq Decomp by strong acids, and boiling $\text{KOH}+\text{Aq}$

Decomp by H_2O (Linna, Z anorg 1901, 27 438)

Bismuth trioxide, Bi_2O_3

Insol in H_2O Sol in conc acids

Solubility of Bi_2O_3 in HNO_3+Aq at 20°

In 100 g of the liqnd phase		Solid phase
g Bi_2O_3	g N_2O_5	
0 321	0 963	Bi_2O_3 N_2O_5 $2\text{H}_2\text{O}$
0 337	0 982	"
3 54	4 68	"
6 37	7 17	"
13 67	12 50	"
14 85	13 31	"
18 74	15 90	Bi_2O_3 N_2O_5 H_2O
23 50	19 21	"
23 50	19 29	"
27 15	20 96	"
28 11	21 64	"
29 50	22 53	"
30 19	22 90	"
31 48	23 70	"
32 93	24 83	{ Bi_2O_3 N_2O_5 $\text{H}_2\text{O}+$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}$
32 80	24 86	
32 67	24 70	
32 59	24 60	"
32 24	24 68	"
30 74	25 13	"
29 83	25 30	"
24 16	28 25	"
16 62	35 40	"
12 17	43 37	"
11 66	46 62	"
11 19	49 38	"
11 19	50 20	"
15 20	54 66	"
20 76	53 75	"
27 85	51 02	{ Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}+$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $3\text{H}_2\text{O}$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $3\text{H}_2\text{O}$
8 58	68 28	
4 05	74 90	

(Rutten, Z anorg 1902, 30 386)

Solubility of Bi_2O_3 in HNO_3+Aq at t°

t	g Bi_2O_3	g N_2O_5	Solid phase
9°	20 8	17 1	{ Bi_2O_3 N_2O_5 $\text{H}_2\text{O}+$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}$
	24 02	19 1	
	31 09	23 8	
	31 2	25 9	
30°	34 2	26 5	Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}$
	28 2	29 6	
	16 1	17 7	
	-	-	
65°	5 55	7 11	{ Bi_2O_3 N_2O_5 $\text{H}_2\text{O}+$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $10\text{H}_2\text{O}$ Bi_2O_3 $3\text{N}_2\text{O}_5$ $3\text{H}_2\text{O}$
	27 62	22 16	
	10 80	31 60	
	37 82	55 80	
	55 73	47 02	
	4 59	77 90	

(Rutten)

Solubility of Bi_2O_3 in $\text{HNO}_3 + \text{Aq}$ at t°			
t°	% Bi_2O_3	% N_2O_5	Solid phase
72°	37 23	47 76	$\text{Bi}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5 \cdot 4\text{H}_2\text{O}$ "
75°	36 74	47 91	
80°	39 75	45 16	
9°	31 2	23 9	$\text{Bi}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5 \cdot 10\text{H}_2\text{O} + \text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5 \cdot \text{H}_2\text{O}$ "
20°	32 8	24 8	
30°	34 2	26 4	
50°	36 9	28 9	"
64°	40 6	31 1	"
65°	40 8	31 6	"
75°	45 4	34 6	"
72°	45 9	35 6	"
11°	25 36	52 57	$\text{Bi}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5 \cdot 10\text{H}_2\text{O} + \text{Bi}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5 \cdot 3\text{H}_2\text{O}$ " " "
20°	27 85	51 02	
50°	32 22	49 29	
65°	35 73	47 02	

(Rutten)

Solubility in $\text{NaOH} + \text{Aq}$ at 25°

Conc of NaOH Mol/l	g Bi_2O_3 in 100 cc of solution Mean result
1 0	0 0013 $\pm$ 0 0002
2 0	0 0026 $\pm$ 0 0002
3 0	0 0049 $\pm$ 0 0005

(Knox, Chem Soc 1909, 95 1767)

Insol in acetone (Fidmunn, C C 1899, II 1011)

Min *Bismate* Easily sol in $\text{HNO}_3 + \text{Aq}$

See also **Bismuthous hydroxide**

Bismuth tetroxide, Bi_2O_4

Sol in conc $\text{HCl} + \text{Aq}$, with evolution of Cl_2 in oxygen acids with evolution of O_2 . Easily sol in conc H_2SO_4 than in HNO_3 , or $\text{HCl} + \text{Aq}$

Bismuth oxide, Bi_2O_3 (?)

(Hoffmann and Cuthbert)

Bismuth pentoxide, Bi_2O_5

Sol in dil acids. Combines with H_2O to form bismuthic hydroxide which see (Husebroek B 20 213)

Bismuth oxybromide, etc

See **Bismuthyl bromide, etc**

Bismuth palladium, PdBi

Insol in equal pts HNO_3 and tartaric acids (Roessler Z anorg 1899, 9 70)

Bismuth platinum, PtBi

Insol in equal pts HNO_3 and tartaric acids (Roessler Z anorg 1899, 9 69)

Bismuth phosphide, BiP

(Cavazzi)

Bismuth triselenide, Bi_2Se_3

Insol in H_2O , alkalies, or alkali sulphides + Aq , sl attacked by $\text{HCl} + \text{Aq}$, oxidised by $\text{HNO}_3 + \text{Aq}$ (Schneider, Pogg 94 6)

Min Frenzelte

Bismuth potassium selenideSee **Selenobismuthite, potassium****Bismuth selenochloride, BiSeCl**

Not attacked by H_2O , very sl sol in $\text{HCl} + \text{Aq}$, easily and completely sol with comp in $\text{HNO}_3 + \text{Aq}$ (Schneider)

Bismuth disulphide, $\text{Bi}_2\text{S}_2 + 2\text{H}_2\text{O}$ (?)

Insol in H_2O Decomposed by $\text{HCl} + \text{Aq}$

Bismuth trisulphide, Bi_2S_3

Insol in H_2O

1 l H_2O dissolves 0.35×10^{-6} mo of Bi_2S_3 at 18° (Weigel, Z phys Ch 1907, 1 294)

Easily sol in moderately dil $\text{HNO}_3 + \text{Aq}$, and conc $\text{HCl} + \text{Aq}$, with separation of S as $\text{a}_2\text{S}_2\text{O}_3$, or $\text{KCN} + \text{Aq}$, insol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett). Insol in potassium carbonate + Aq (Rosenblatt, Z anal 26 5). Insol in alkali hydroxides or alkali hydro-sulphides

Insol in $2\text{N}-(\text{NH}_4)_2\text{S} + \text{Aq}$

0 0090 g Bi_2S_3 is sol in 100 cc $\text{N} \text{Na}_2\text{S}_2 + \text{Aq}$ at 25° (Knox, Chem Soc 09, 95 1764)

Somewhat sol in $\text{Na}_2\text{S} + \text{Aq}$, 1 cc of $\text{N} \text{Na}_2\text{S} + \text{Aq}$ (sp gr 1 06) dissolves amt of Bi_2S_3 corresponding to 0 031 g Bi_2O_3 (Stillman, J Am Chem Soc 1896, 18 6)

Solubility in $\text{Na}_2\text{S} + \text{N}(\text{OH}) + \text{Aq}$ 25°

Conc of Na_2S Mol/l	Conc of $\text{N}(\text{OH})$ Mol/l	g Bi_2S_3 in 100 cc solution
0 5	1 0	0 185
1 0	1 0	0 535

(Knox, Chem Soc 1909, 95 1 3)

Bismuth sulphide pptd from acid solution is not dissolved by subsequent treatment with $\text{K}_2\text{S} + \text{Aq}$ (Stone, J Am Chem Soc 1896, 18 1091)

Sol in $\text{K}_2\text{S} + \text{Aq}$ (Dittc, C R 95, 120 157)

Solubility in $\text{K}_2\text{S} + \text{KOH} + \text{Aq}$ at 5°

Conc of K_2S Mol/l	Conc of KOH Mol/l	g Bi_2S_3 in 100 cc solution
0 5	1 0	0 1240
1 0	1 0	0 1230
1 25	1 25	0 2354

(Knox, Chem Soc 1909, 95 63)

Solubility in alkali sulphides + Aq at 25°

Alkali sulphide	Conc of alkali sulphide Mol / l	g Bi ₂ S ₃ in 100 cc of solution
Na ₂ S	0.5	0.0040
	1.0	0.0238
	1.5	0.1023
K ₂ S	0.5	0.0042
	1.0	0.0337
	1.25	0.0639

(Knox, Chem Soc 1909, **95** 1762)Decomp by FeCl₃ + Aq (Cammerer, C C **1891**, II 525)Insol in KCN + Aq (Hoffmann, A 1884, **223** 134)Min *Bismuthinite* Easily sol in HNO₃ + Aq**Bismuth cuprous sulphide**, Bi₂S₃, Cu₂SInsol in H₂O Sol with decomp in HNO₃ + Aq (Schneider, J pr (2) **40** 564)Min *Emplectonite***Bismuth potassium sulphide**, Bi₂S₃, K₂S(Schneider, Pogg **136** 460)Insol in ethyl acetate (Naumann, B **1910**, **43** 314)Bi₂S₃.4K₂S + 4H₂O Decomp by H₂O Very sol in K₂S + Aq Efflorescent in dry air (Ditte, C R 1895, **120** 186)See also *Sulphobismuthite*, potassium**Bismuth silver sulphide**, Bi₂S₃, Ag₂SInsol in cold HCl, or HNO₃ Sol in warm HNO₃ with separation of S, in boiling HCl with separation of H₂SMin *Plenargyrite*, *Matildite*(Schneider, J pr 1890, (2) **41** 414)**Bismuth sodium sulphide**, Bi₂S₃, Na₂S

(Schneider)

Bismuth sulphide telluride, Bi₂S₃, 2Bi₂Te₃Min *Tetradymite* Sol in HNO₃ with separation of SBi₂S₃.2Bi₂Te₃Min *Joselite* As above**Bismuth sulphobromide**, Bi₂SBi₂(Muir and F. H. K., Chem Soc 1895, **67** 91)**Bismuth sulphochloride**, BiSClInsol in H₂O or dil HCl + Aq Sol in conc HCl, or HNO₃ + Aq Decomp by alkalis + Aq (Schneider, Pogg **93** 464)**Bismuth sulphiodide**, BiSINot attacked by boiling H₂O, and dil acids Decomp by hot conc HCl + Aq, and HNO₃ + Aq KOH + Aq dissolves out I (Schneider, Pogg **110** 114)**Bismuth telluride**, Bi₂Te₃Min *Tetradymite* Sol in HNO₃ + AqSee also *Bismuth sulphide telluride***Bismuthic acid**, HBiO₃See *Bismuthic hydroxide***Potassium bismuthate**, KBiO₃Sol in H₂O (Arppe)KH(BiO₃)₂ Insol in H₂ONot decomp by boiling H₂O (André, C R **113** 860)No salts of HBiO₃ can exist (Muir and Carnegie, Chem Soc **51** 77)**Bismuthicotungstic acid****Ammonium bismuthicotungstate**, 3(NH₄)₂O, 2Bi₂O₃, 11WO₃ + 10H₂OA yellow oil which dries to a yellow glass (E F Smith, J Am Chem Soc 1903, **25** 1232)**Potassium bismuthicotungstate**, 3K₂O, 2Bi₂O₃, 11WO₃ + 15H₂OA yellow oil which dried to a pale yellow glass (E F Smith, J Am Chem Soc 1903, **25** 1233)**Strontium bismuthicotungstate**, 3SrO, 2Bi₂O₃, 11WO₃ + 11H₂OA yellow wax, insol in pure H₂O, but sol in H₂O containing a few drops HNO₃ F Smith, J Am Chem Soc 1903, **25****Bismuthyl bromide**, BiOBrInsol in H₂O, sol in moderately conc HBr + AqInsol in H₂O (Herz, Z anorg 1903, **36** 348)Bi₂O₃Br₂ Insol in H₂O, easily sol in conc HCl, or HNO₃ + Aq, less sol in dil HNO₃ + AqBi₁₁O₁₃Br₇ As the preceding comp (Muir)**Bismuthyl chloride**, BiOClInsol in H₂O or dil acids Sol in conc HCl, or HNO₃ + AqInsol in liquid NH₃ (Franklin, Am Ch J 1898, **20** 827)Insol in acetone (Naumann, B 1904, **37** 4329)+ H₂O (Heintz, Pogg **63** 55)+ 3H₂O (Phillips, Bi Arch (1) **39** 41)Bi₇O₅Cl₃ (Arppe)BiO₂Cl₃ Insol in H₂O, sol in hot HCl, or HNO₃ + Aq (Muir)**Bismuthyl fluoride**, BiOFInsol in H₂O, sol in HCl, HBr, or HI + Aq (Gott and Muir, Chem Soc **33** 139)BiOF, 2HF Insol in H₂O

Bismuthyl iodide, BiOI

Not decomp by H_2O or alkaline solutions
Sol in $HCl + Aq$ Decomp by $HNO_3 + Aq$
(Schneider, J pr 79 424)

Insol in KCl , or $KI + Aq$
 $3BiOI, 7Bi_2O_3$ Sol in dil HCl , decomp
by HNO_3 , insol in boiling H_2O and alkali
(Blyth, C N 1896, 74 200)

$BiI_3, 5Bi_2O_3$ Ppt Sl sol in $HC_2H_3O_2 + Aq$
Not decomp by H_2O (Fletcher and
Cooper, Pharm J (3) 13 254)

$4BiI_3, 5Bi_2O_3$ Easily sol in $HCl + Aq$
Decomp by $HNO_3 + Aq$ Sl attacked by
 H_2SO_4 , somewhat sol in $H_2C_4H_4O_6$, and
 $KHC_4H_4O_6 + Aq$

Sol in $(NH_4)_2S$, and $KOH + Aq$ (Storer's
Dict)

Bismuthyl sulphide, Bi_2O_3S

(Hermann, J pr 75 452)
 Bi_2O_3S Insol in H_2O (Scherpenberg,
C C 1889, II 641)

Bi_4O_5S
Min *Karehnite*

Boracic acid

See Boric acid

Borax

See Tetraborate, sodium

Boric acid, anhydrous, B_2O_3

See Boron trioxide

Metaboric acid, HBO

Sol in H_2O
Sl sol in hot glacial acetic acid (Holt,
Chem Soc 1911, 100 (2) 720)

Orthoboric acid, H_3BO_3

Sol in 53 pt H_2O at 10°

23 100

(Fierzsch)

Sol in 20 pt H_2O at 18° (Alli)

100 pt H_2O at 100° in 2 pt (Curre Dict)

1 pt crystallized acid dissolves in -

2) 66 pts H_2O at 19°

14 88 23

12 66 57

10 16 50

6 12 62

4 7 75

3 3 87

2 97 100

Or, 100 pts H_2O dissolve at -

19 5 9 pts H_3BO_3

23 6 8

57 7 8

50 9 8

62 16 0

75 21 0

87 28 0

100 34 0

Or, sat aqueous solution contains at -

19° 3 75% H_3BO_3

25° 6 27 " "

37.5° 7 32 " "

50° 8 96 " "

62.5° 14 04 " "

75° 17 44 " "

87.5° 21 95 " "

100° 25 17 " "

(Brandes and Firnhaber, Arch Pharm 7 50)

1 litre H_2O dissolves at -

0° 19 47 g H_3BO_3

12° 29 20 " "

20° 39 92 " "

40° 69 91 " "

62° 114 16 " "

80° 168 15 " "

102° 291 16 " "

(Ditte, C R 85 1069)

1 l H_2O dissolves 0 901 mol H_3B at 25°
(Herz, Z anorg 1910, 66 359)

1 l H_2O dissolves 0 898 mol H_3B at 25°
Sp gr of the solution = 1 0168 (Miller, Z
phys Ch 1907, 57 529)

1 l H_2O dissolves 0 887 mol H_3B at 25°
and 1 025 mol at 30° (Ageno and Valla,
Ist Ven (VIII) 14 II, 331)

Solubility in H_2O at t°

t	g H_3BO_3 in 100 g of the	lution
0	2 59	
12 2	3 69	
21	4 90	
31	6 44	
40	8 02	
50	10 35	
60	12 90	
69 5	15 58	
80	19 11	
90	23 30	
99 5	28 10	
108	36 7	
115	45 0	
120	52 1	

(Nasmi and Ageno, Z phys Ch 1909, 69
18)

Solubility curve for orthoboric acid in
 H_2O at various temp up to 120° (Nasmi
and Ageno, Gazz ch 1911, 41 131)

Sp gr of $H_3BO_3 + Aq$ at 18° 1 014 (Nasmi A
24 11)
Sp gr of $H_3BO_3 + Aq$ at 100° 1 028 (Nasmi A
11 90 1)

Sp gr of $H_3BO_3 + Aq$ at 1°

H_3BO_3	Sp gr	H_3BO_3	Sp
1	1 0054	4	0147
2	1 0069	Sat sol	015
3	1 0106		

(Görlsch, Z anal 28 473)

Sp gr of $\text{H}_3\text{BO}_3 + \text{Aq}$ at 18°
 $\% \text{H}_3\text{BO}_3$ 0 776 1 92 2 88 3 612
 Sp gr 1 0029 1 0073 1 0109 1 0131
 (Bock, W Ann 1887, 30 638)

Volatile with steam
 More sol in dil $\text{HCl} + \text{Aq}$ than in H_2O
 Sol in warm conc H_2SO_4 , HCl , or $\text{HNO}_3 + \text{Aq}$

Solubility in $\text{HCl} + \text{Aq}$ at 25°	
Millimols HCl in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the sat solution
7 0	9 01
13 7	7 69
	6 66

(Herz, Z anorg 1910, 66 359)

Solubility of H_3BO_3 in $\text{HCl} + \text{Aq}$ at 16°	
Normality of HCl	Normality of H_3BO_3
0	0 907
0 130	0 895
0 260	0 870
0 390	0 842
1 30	0 645
2 16	0 542
4 32	0 308
6 00	0 338
7 08	0 327
5 74	0 327
9 51	0 338

(Herz, Z anorg 1902, 33 354)

Solubility in $\text{HF} + \text{Aq}$ at 26°			
(1) Titer of HF	(2) Liter after saturation with H_3BO_3 at 26°	(3) Titer after addition of mannitol	(3)-(2) equals free boric acid
3 21n	1 61	2 36	0 75
2 80n	1 25(1 40?)	2 21	0 96(0 81?)

The values 0 75 and 0 81 represent the solubility of H_3BO_3 in the concentrations of fluorboric acid resulting from the original concentration of $\text{HF} + \text{Aq}$

(Abegg, Z anorg 1903, 35 145)

Solubility of H_3BO_3 in acids + Aq at 26°		
Acid	Normality of the acid	Normality of H_3BO_3
H_2SO_4	0 548	0 746
	2 74	0 518
	5 48	0 312
	5 75	0 092
HNO_3	0 241	0 818
	1 206	0 676
	1 607	0 593
	2 411	0 567
	5 96	0 268
	7 38	0 238

(Herz, Z anorg 1903, 34 205)

Solubility in $\text{KOH} + \text{Aq}$
See Borates, potassium
 Solubility in $\text{NaOH} + \text{Aq}$
See Borates, sodium

Solubility in $\text{LiCl} + \text{Aq}$ at 25°

Millimols LiCl in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the sat solution
7 1	9 01
10 3	8 13
22 3	7 65
37 2	6 42
	5 02

(Herz, Z anorg 1910, 66 359)

Solubility in $\text{KCl} + \text{Aq}$ at 25°

Millimols KCl in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the sat solution
1 9	9 01
7 9	9 20
15 6	9 44
30 6	9 80
	10 75

(Herz)

Solubility in $\text{RbCl} + \text{Aq}$ at 25°

Millimols RbCl in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the sat solution
14 0	9 01
25 3	9 66
	10 60

(Herz)

Solubility in $\text{NaCl} + \text{Aq}$ at 25°

Millimols NaCl in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the sat solution
8 2	9 01
15 2	8 49
29 4	8 25
	8 20

(Herz)

Solubility in H_2O is increased by presence of KCl , KNO_3 , K_2SO_4 , NaNO_3 and Na_2SO_4

In general the solubility in H_2O is increased by the presence of both electrolytes and non-electrolytes (Bogdan, C C 1903, II 2)

Sol in borax + Aq (McLauchlan, Z anorg 1903, 37 371)

Sl sol in liquid NH_3 (Frankln, Am Ch J 1898, 20 827)

Unattacked and undissolved by liquid NO_2 (Frankland, Chem Soc 1901, 79 1362)

Sol in 6 pts alcohol (Wittstein), 5 pts boiling alcohol (Wenzel) Only traces dissolve in anhydrous ether (Schiff) Sol in 100 pts ether (Hager's Comm) Sol in several essential oils

1 l H_2O sat with amyl alcohol dissolves 0 8952 mol H_3BO_3 at 25° (Auerbach, Z anorg 1903, 37 357)

Solubility of H_3BO_3 in amyl alcohol + Aq at t° M = millimols H_3BO_3 in 1 l of H_2O A = millimols H_3BO_3 in 1 l of alcohol

t°	M	A
15°	607 2	176 4
	589 3	177 4
	589 0	177 1
	586 0	173 4
	427 4	127 6
	425 8	127 0
	289 1	84 9
	894 0	264 0
	372 0	110 0
	371 8	110 8
25°	301 2	85 7
	180 8	54 0
	49 15	15 45
	51 04	15 45
	26 02	8 05
35°	146 3	44 27

(Müller, Z phys Ch 1907, 57 514)

Sp gr of amyl alcohol + Aq sat with H_3BO_3

g water in 1 l of alcohol + Aq	d _{25°/4°}
32 481	0 82229
35 465	0 82324
37 339	0 82321
42 479	0 82392
45 175	0 82447
45 636	0 82456
47 883	0 82454
51 461	0 82527
52 043	0 82585
59 270	0 82699
63 179	0 82739
64 254	0 82779
66 403	0 82701
66 624	0 82670
68 253	0 82856
69 211	0 82884
75 610	0 82999

(Muller)

Solubility of H_3BO_3 in amyl alcohol and NaCl + Aq at 25°

Water phase		Amyl alcohol phase			
NaCl normality	mol H_3BO_3	Sp gr 25°/4°	1 l contains		
			mol H_2O	mol amyl alcohol	mol H_3BO_3
0 00	0 880	0 8296	4 10	8 39	0 340
0 945	0 866	0 8277	3 55	8 49	0 338
1 490	0 850	0 8268	3 27	8 54	0 359
1 865	0 844	0 8259	3 03	8 56	0 724
2 355	0 833	0 8254	2 86	8 59	0 850
2 845	0 827	0 8247	2 62	8 62	0 877
3 06	0 810	0 8241	2 39	8 66	0 891
3 48	0 810	0 8240	2 32	8 69	0 006
3 57	0 807	0 8236	2 15	8 70	0 066
4 01	0 801	0 8233	1 99	8 72	0 162
4 28	0 798	0 8229	1 78	8 75	0 210

(Muller)

Solubility in hydroxy-compounds + Aq at 25

Organic substance added	Mol of organic substance in 100 mol of the mixture	Mol of boric acid sol in 1 l of solution	Sp gr of the pure mixture	Sp gr of mixture sat with boric acid
Lactic acid	2 321	1 07	1 0252	1 441
	6 819	1 61	1 0722	1 386
	18 77	1 86	1 1405	1 635
	36 33	2 08	1 2023	1 254
Glycerine	24 64	1 208	1 1574	1 707
	46 75	2 132		1 260
	67 71	2 96	1 2370	1 526
	90 58	3 78	1 2531	1 710

Solubility in hydroxy-compounds, etc—*Continued*

Organic substance added	Mol of organic substance in 100 mol of the mixture	Mol of boric acid sol in 1 l of solution	Sp gr of the pure mixture	Sp gr of the mixture sat with boric acid
Mannitol	0 790	1 007		1 0425
	0 810	1 015	1 0244	1 0433
	0 945	1 029	1 0288	
	1 585	1 136	1 0475	
Dulcitol	0 065	0 8876	0 9995	1 0686
	0 130	0 9078	1 0018	1 0212
	0 260	0 9360	1 0060	1 0260

(Muller)

Solubility of H_2BO_3 in alcohols+Aq at 25°
M = Mol of alcohol in 100 mol of alcohol+Aq
 H_2BO_3 = Mol of H_2BO_3 in 1 l of the solution
 d_1 = Sp gr of alcohol+Aq
 d_2 = Sp gr of alcohol+Aq sat with H_2BO_3

Alcohol added	M	H_2BO_3	d_1	d_2
Methyl alcohol	11 74	0 895		
	28 64	1 012		
	36 02	1 098		
	43 95	1 161		
	52 31	1 307		
	100	2 900	0 7924	0 8904
Ethyl alcohol	8 996	0 829		
	22 28	0 800		
	44 46	0 729		
	55 62	0 700		
	79 89	0 893		
	88 10	1 105		
	99 26	1 527	0 7860	0 8353
n-Propyl alcohol	23 66	0 6437	0 9043	0 9193
	53 63	0 4569	0 8231	0 8570
	83 65	0 5776	0 8133	0 8466
	100	0 961	0 8010	0 8297
i-Butyl alcohol	0 70	0 884	0 9923	1 0124
	2 15	0 857	0 9853	0 0038
	2 18	0 857	0 9855	0 0046
	71 4	0 323	0 8173	0 8351
	77 1	0 347	0 8133	0 8220
	85 6	0 4212	0 8081	0 8195
	100	0 6927	0 7984	0 8172
i-Amyl alcohol	0 448	0 883	0 9943	1 0132
	0 520	0 880	0 9935	1 0125
	0 525 ¹	0 880	0 9931	1 0123
	67 26	0 2584	0 8232	0 8295
	75 54	0 2722	0 8183	0 8253
	83 40	0 3190	0 8142	0 8223
	100	0 5703	0 8068	0 8220

¹ Water sat with alcohol² Alcohol sat with water

(Muller)

Easily sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

Solubility in acetone + Aq at 20°

A = ccm acetone in 100 ccm acetone + Aq
 H_3BO_3 = millimols H_3BO_3 in 100 ccm of the solution

A	H_3BO_3
0	79 15
20	81 71
30	83 35
40	82 74
50	81 61
60	76 40
70	67 62
80	55 05
100	8 06

(Herz, Z anorg 1904, 41 319)

100 g pure anhydrous ether dissolve 0 00775 g H_3BO_3

100 g ether sat with H_2O dissolve 0 2391 g H_3BO_3

(J A Rose, Dissert 1902)

Sol in 10 pts glycine (Hager)

100 pts glycine (sp gr 1 26 at 15 5°) dissolve pts H_3BO_3 at t°

t°	Pts H_3BO_3	t°	Pts H_3BO_3	t°	Pts H_3BO_3
0	20	40	35	80	61
10	24	50	44	90	67
20	25	60	50	100	72
30	33	70	56		

(Hooper Ph J Trans (3) 13 258)

Solubility of H_3BO_3 in glycine + Aq at 25°

G = g glycine in 100 g glycine + Aq
 H_3BO_3 = Millimols H_3BO_3 in 100 cc of the solution

G	H_3BO_3	Sp Gr
0	90 1	1 0170
7 15	90 1	1 0379
20 44	90 6	1 0629
31 35	92 9	1 0897
46 95	97 0	1 1130
58 7	103 0	1 1328
69 2	140 2	1 1871
100	390 3	1 2719

(Herz, Z anorg 1903, 45 268)

Solubility of H_3BO_3 in organic acids + Aq at 26

Acid	Normality of the acid	Normality of H_3BO_3
Acetic	0 570	0 887
	2 55	0 538
	5 70	0 268

Solubility of H_3BO_3 , etc — Continue

Acid	Normality of the acid	Normality of H_3BO_3
Tartaric	0 955	0 890
	1 909	0 923
	2 51	0 962
	3 316	1 07

(Herz, Z anorg 1903, 34 206)

The solubility of H_3BO_3 in H_2O is increased by the presence of racemic acid

Millimols racemic acid in 10 ccm of the solvent	Millimols boric acid in 10 ccm of the solution
0	9 01
6 3	9 86
12 6	10 46
24 7	11 65

(Herz, Z anorg 1911, 70 71)

Solubility of H_3BO_3 in H_2O is increased by the presence of tartaric acid

Millimols tartaric acid in 10 ccm of the solvent	Millimols boric acid in 10 ccm of the solution
0	9 01
7 5	10 00
15	10 70
30	12 07

(Herz, Z anorg 1911, 70 71)

Solubility in oxalic acid + Aq at 25°

Millimols oxalic acid in 10 ccm of the solution	Millimols H_3BO_3 in 10 ccm of the solution
	9 01
	9 95
2 97	10 80
5 95	11 98
13 77	

(Herz, Z anorg 1910, 66 93)

Solubility in H_2O is increased by the presence of urea, acetone or propyl alcohol (Bogdan, C C 1903, II 2)

Readily sol in hot glacial acetic acid (Holt Chem Soc 1911, 100 (2) 720)

Sol in 250 pts benzene (Hager)

Solubility of H_3BO_3 in mannite + Aq at t°

Solid phase H_3BO_3					
t°	Mm mol in 1 l	t	Mm in 1 l	t	Mm in 1 l
	Mannite		H_3BO_3		H_3BO_3
25°	0	0 887	30	0	1 025
	0 1	0 951		0 1	1 056
	0 3	1 015		0 2	1 086
	0 4	1 039		0 3	1 118
	0 5	1 071		0 4	1 157
	0 6	1 102		0 5	1 193
	0 7	1 142		0 6	1 219
	0 8	1 173		0 7	1 258
	1 043	1 244			
	1 409	1 404			
	1 781	1 521			

Solid phase mannite		
t°	Mg mols in 1 l	
	Mannite	H ₃ BO ₃
25°	1 075	0
"	1 1424	0 2646
"	1 259	0 463
"	1 265	0 559
"	1 354	0 794
"	1 409	0 927
"	1 536	1 243
"	1 781	1 521

(Ageno and Valla, Ist Ven (VIII) 14 331)

Distribution between H₂O and amyl alcohol at 25°w = concentration of H₃BO₃ in H₂O layer expressed in millimolsa = concentration of H₃BO₃ in alcohol layer expressed in millimols

w	a
265 8	76 6
196 5	59 5
159 6	47 5
126	37 1
87 9	33 2
75 2	22 7
64 6	19 76

(Abegg, Z anorg 1903, 35 130)

Partition of H₃BO₃ between water and mixtures of amyl alcohol and CS₂W = Millimols H₃BO₃ in 10 ccm of the aqueous layerG = Millimols H₃BO₃ in 10 ccm of the amyl alcohol—CS₂ layer

Composition of the solvent mixture	c	w	w, G
75% by vol amyl alcohol + 25% by vol CS ₂	0 145	0 624	4 31
	0 375	1 198	4 36
	0 429	1 844	4 30
	0 589	2 565	4 45
50% by vol amyl alcohol + 50% by vol CS ₂	0 145	0 756	5 47
	0 259	1 353	5 21
	0 364	1 946	5 34
	0 555	2 889	5 22
25% by vol amyl alcohol + 75% by vol CS ₂	0 085	0 699	8 24
	0 175	1 467	8 40
	0 264	2 165	8 12
	0 384	3 129	8 14

(Herz, Z Elektrochem 1910, 16 870)

Distribution between HF + Aq and amyl alcohol at 25°

c = HF concentration (millimols)

a = H₃BO₃ concentration in alcohol layer (expressed in millimols)w = H₃BO₃ concentration in water layer (expressed in millimols)

c	a	w
500	14 3	71 2
"	19 2	99 2
"	25 3	144 2
"	114 3	979 0
250	30 1	144 5
"	37 0	194 8
"	56 8	321 5
"	108 0	652 0
125	39 0	170 5
"	47 2	214 0
"	52 8	240 5
"	96 0	442 0
62 5	30 4	111 2
"	39 4	151 8
"	65 (68°)	272 8
"	90 0	362 2

(Abegg, Z anorg 1903, 35 131)

See also Boron trioxide

Pyroboric (tetraboric) acid, H₂B₄O₇Sol in H₂OSp gr of solutions of boric acid, calc as H₂B₄O₇, containing—

6 3	1 27	1 91	2 54%
1 0034	1 0069	1 0106	1 0147 sp gr

Sat solution at 15° has sp gr 1 015 (Gerlach, Z anal 28 473)

Insol in hot glacial acetic acid (Holt, Chem Soc 1911, 100 (2) 720)

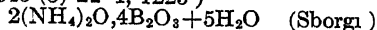
Borates

No borate is quite insol in H₂O, the alkali borates are very sol. The less sol borates are easily decomp by H₂O, the easily sol salts are also decomp, but less quickly. The less sol borates are easily sol in H₃BO₃, HNO₃, etc. They are more sol in H₂O containing tartaric acid or potassium tartrate than in pure H₂O (Souberain). The normal borates of the alkaline earths are sol to no inconsiderable extent in H₂O and more readily in hot, than in cold H₂O (Berzelius, Pogg 34 568).

All borates are insol, or sl sol in alcohol

Aluminum borate, 2Al₂O₃, B₂O₃Min *Jeremicumite*+ 3H₂O Ppt (Rose, Pogg 91 452)3Al₂O₃, B₂O₃ *Crystallized* Insol in HNO₃ + Aq (Ebelmen, A ch (3) 33 62)3Al₂O₃, 2B₂O₃ + 7H₂O Ppt (Rose, l c)**Ammonium borate**The system (NH₄)₂B₄O₇, H₂O at 60° has

been studied by Sborgi (Real Ac Linc 1915 (5) **24** I, 1225)



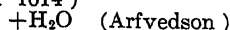
Ammonium diborate

Difficultly sol in acetone (Naumann, B 1904, **37** 4328)

Ammonium tetraborate, $(\text{NH}_4)_2\text{B}_4\text{O}_7 + 4\text{H}_2\text{O}$, or perhaps $\text{NH}_4\text{H}(\text{BO}_2)_2 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in 12 pts cold H_2O , decomp by heat (Rammelsberg, Pogg **90** 21)

Sol in acetone (Eidmann, C C **1899**, II 1014)



Ammonium octoborate, $(\text{NH}_4)_2\text{B}_8\text{O}_{13} + 6\text{H}_2\text{O}$

Sol in 8 pts cold, decomp by boiling H_2O (Rammelsberg, Pogg **90** 21)



Min *Lardellerite* Sol in H_2O with decomp

Ammonium dekaborate, $(\text{NH}_4)_2\text{B}_{10}\text{O}_{16} + 6\text{H}_2\text{O}$

Permanent Sol in H_2O (Rammelsberg) $+ 8\text{H}_2\text{O}$ (Atterberg, Bull Soc (2) **22** 350)

Ammonium dodekaborate, $(\text{NH}_4)_2\text{B}_{12}\text{O}_{18} + 9\text{H}_2\text{O}$

Sol in hot H_2O (Bechi, Sill Am J (2) **17** 129)

Ammonium perborate, NH_4BO_3

See Perborate, ammonium

Ammonium calcium borate, $(\text{NH}_4)_8\text{CaB}_4\text{O}_{11} = \text{CaB}_4\text{O}_7 + 4(\text{NH}_4)_2\text{O}$

(Ditte, C R **96** 1663)

Ammonium magnesium borate

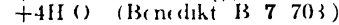
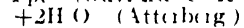
Sol in H_2O , decomp by boiling (Rammelsberg, Pogg **49** 451)

Ammonium zinc borate, $4(\text{NH}_4)_2\text{B}_4\text{O}_7 \cdot \text{Zn}(\text{BO}_2)_2 + 5\text{H}_2\text{O}$

(Ditte, C R **96** 1663)

Barium borate, $\text{Ba}(\text{BO}_2)_2$

Ppt (Ouvrard C R 1906 **142** 283)



Sol in 3 300 pts 45% alcohol

7,500 " 50 "

25,000 " 60 "

55,000 " 75 "

(Beig, Z anal **16** 25)

$+ 10\text{H}_2\text{O}$ Sl sol in cold, more readily in hot H_2O , especially in presence of ammonium salts (Berzelius, Pogg **34** 568) Sol in sodium citrate + Aq (Spiller) Insol in wood spirit (Fehlimen)

$2\text{Ba}(\text{O})\text{B}_2\text{O}_3$ Decomp by H_2O forming $\text{Ba}(\text{O})\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$ (Ouvrard, C R 1906, **142** 283)

$3\text{BaO}, \text{B}_2\text{O}_3$ Easily sol in mineral acids Sl attacked by dil acetic acid (Ouvrard, C R 1901, **132** 258)

$\text{Ba}_2\text{B}_4\text{O}_{11}$ Slowly sol in warm dilute HNO_3 + Aq (Ditte, C R **77** 892)

$+ 5\text{H}_2\text{O}$ Sol in 100 pts cold, and more freely in hot H_2O When freshly pptd sol in cold NH_4Cl + Aq (Wackenroder, **41** 315), NH_4NO_3 + Aq (Brett, Phil Mag (10 96), and BaCl_2 + Aq (Rose)

$\text{Ba}_2\text{B}_4\text{O}_{10} + 13\text{H}_2\text{O}$ (Laurent, A ch (67 215)

$\text{Ba}_2\text{B}_2\text{O}_5$ (Bloxam, Chem Soc **14** 43)

$5\text{BaO}, 2\text{B}_2\text{O}_3$ Sol in 100 pts cold

$\text{Ba}_2\text{B}_{10}\text{O}_{18} + 6\text{H}_2\text{O}$ Easily sol in ammonium nitrate, or chloride, or barium chloride + Aq (Rose, Pogg **87** 1)

$\text{Ba}_2\text{B}_6\text{O}_{11}$ Easily sol in warm dilute acids $+ 6\text{H}_2\text{O}$

$+ 7\text{H}_2\text{O}$ (Laurent, A ch (2) **67** 2)

$+ 15\text{H}_2\text{O}$ (Laurent, A ch (2) **67** 2)

Barium borate bromide, $3\text{BaO}, 5\text{B}_2\text{O}_3, \text{HBr}$ (Ouvrard, C R 1906, **142** 283)

Barium borate chloride, $3\text{BaO}, 5\text{B}_2\text{O}_3, \text{HCl}$ (Ouvrard, C R 1906, **142** 283)

Unaffected by H_2O Sol in acids

Bismuth borate, $\text{BiBO}_3 + 2\text{H}_2\text{O}$

Ppt Sl sol in H_2O Decomp by H_2S Not decomp by KOH + Aq (Vanino, pr 1906, (2) **74** 152)

Cadmium borate, $\text{Cd}_3(\text{BO}_3)_2$

Insol in H_2O , easily sol in dil acids (Ouvrard, C R 1900, **130** 174)

$\text{Cd}(\text{BO}_2)_2$ Difficultly sol in H_2O (from cyer), insol in H_2O , sol in HCl + Aq (Ouvrard, easily sol in warm NH_4Cl + Aq (Rose)

(Guertler, Z anorg 1904, **40** 242)

$3\text{CdO}, 2\text{B}_2\text{O}_3 + 3\text{H}_2\text{O}$ Ppt Sl in H_2O (Rose, Pogg **88** 299)

$\text{CdO}, 2\text{B}_2\text{O}_3 + 2\text{H}_2\text{O}$ (Ditte, A ch **883**, (5) **30** 255)

$\text{CdO}, 4\text{B}_2\text{O}_3 + 10\text{H}_2\text{O}$ Sol in H_2O decomp on heating (Ditte, A ch **188**, (5) **30** 255)

Cadmium borate bromide, $6\text{CdO}, 3\text{B}_2\text{O}_3, 3\text{HBr}$ (dBr)

Insol in H_2O and fuming HCl or HBr - Aq (Rousseau and Allure, C R 1894 **116** 72)

Cadmium borate chloride, $6\text{CdO}, 3\text{B}_2\text{O}_3, 3\text{HCl}$ (dCl)

(Rousseau and Allure, C R 1894 **116** 72)

Cadmium borate iodide, $6\text{CdO}, 3\text{B}_2\text{O}_3, 3\text{HI}$ (dI)

(Allure, C R 1898 **127** 557)

Cæsium borate, $\text{Cs}_3\text{B}_3\text{O}_{10}$

Very sol in H_2O , less in alcohol (Reichle, Z anorg **4** 116)

Calcium borate, $\text{Ca}(\text{BO}_2)_2$

Sl sol in H_2O , insol in alkali chlorides, or boiling conc acetic acid + Aq, sol in cold or hot solutions of ammonium salts, especially ammonium nitrate, in CaCl_2 + Aq, and also easily sol in dilute mineral acids at 50° (Ditte, C R 80 490, 561)

+ $2\text{H}_2\text{O}$

+ $4\text{H}_2\text{O}$, two modifications of which one is very unstable (van't Hoff and Meyerhoffer, A 1906, 351 101)

+ $6\text{H}_2\text{O}$ When warmed in H_2O it goes over into $\text{CaB}_2\text{O}_4 + 4\text{H}_2\text{O}$ (van't Hoff and Meyerhoffer)

Sol in H_2O without decomp, 1 l solution contains 2 g salt (Ditte, C R 96 1663)

CaB_2O_7 Decomp by H_2O (Blount, C N 54 208)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ $3\text{H}_2\text{O}$ (Ditte, C R 96 1663)

+ $4\text{H}_2\text{O}$ Min *Bechlite*

+ $6\text{H}_2\text{O}$ Min *Borocalcite* Sol in acids

$\text{CaB}_3\text{O}_{10} + 4\text{H}_2\text{O}$

+ $8\text{H}_2\text{O}$ Unstable On standing in the solution in which it is formed it changes into $\text{CaB}_6\text{O}_{10} + 4\text{H}_2\text{O}$

+ $12\text{H}_2\text{O}$ Unstable Goes over into $\text{CaB}_6\text{O}_{10} + 8\text{H}_2\text{O}$ (van't Hoff and Meyerhoffer, A 1906, 351 104)

$\text{CaB}_6\text{O}_{13} + 12\text{H}_2\text{O}$ (Ditte, C R 96 1663)

$2\text{CaO} \cdot \text{B}_2\text{O}_3$ Insol in H_2O , sol in dil acids (Ouvrard, C R 1905, 141 353)

$\text{Ca}_2\text{B}_6\text{O}_{11}$ (Ditte, C R 77 785)

+ $3\text{H}_2\text{O}$ Min *Pandermite*, *Pricente* See 4CaO, $5\text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$

+ $5\text{H}_2\text{O}$ Min *Colemanite*

If all the Ca is in form of colemanite, the solution contains in 100 g, 4.8 g H_3BO_3 and 0.1 g CaO (van't Hoff, B A B 1907, 653)

+ $7\text{H}_2\text{O}$

+ $9\text{H}_2\text{O}$ (van't Hoff and Meyerhoffer, A 1906, 351 101)

$3\text{CaO} \cdot \text{B}_2\text{O}_3$ Easily sol in dil acids (Ouvrard, C R 1901, 132 258)

$3\text{CaO} \cdot 5\text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$ (van't Hoff, B A B 1906, II 568)

$4\text{CaO} \cdot 5\text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$ True composition of Pandermite (van't Hoff, B A B 1906, II 572)

Calcium iron (ferrous) borate silicate,

$\text{Ca}_2\text{Fe}(\text{B}_2\text{Si}_2\text{O}_{10})$

Min *Hommelite* Easily sol in HCl + Aq

Calcium magnesium borate, CaO , MgO , $3\text{B}_2\text{O}_3 + 6\text{H}_2\text{O}$

Min *Hydroboracite* Somewhat sol in H_2O Easily sol in warm HCl + Aq or HNO_3 + Aq

3CaO , 3MgO , $4\text{B}_2\text{O}_3$ (Ditte, C R 77 894)

Calcium sodium borate, 2CaO , Na_2O , $5\text{B}_2\text{O}_3 + 8\text{H}_2\text{O}$

(van't Hoff, B A B 1907, 303)

$\text{Ca}_4\text{B}_{10}\text{O}_{18}$, $\text{Na}_3\text{B}_3\text{O}_8 + 15$, or $24\text{H}_2\text{O}$

Min *Natroborocalcite*, *Ulexite* Decomp by boiling with H_2O Sol in acids

$\text{Ca}_2\text{Na}_4\text{B}_{12}\text{O}_{22} + 15\text{H}_2\text{O}$ Min *Franklan-dite* Sl sol in H_2O , easily sol in HCl , and HNO_3 + Aq

Calcium borate bromide, 3CaO , $3\text{B}_2\text{O}_3$, CaBr_2

Sl attacked by H_2O Very sol in dilute acetic acid (Ouvrard, C R 1905, 141 1023)

3CaO , $5\text{B}_2\text{O}_3$, CaBr_2 Hardly attacked by cold H_2O or very dil acetic acid Sol in strong acids, even when dilute (Ouvrard, C R 1905, 141 1023)

Calcium borate chloride, $\text{Ca}_2\text{B}_2\text{O}_6$, CaCl_2

Decomp quickly by moist air or H_2O , slowly by absolute alcohol (Chatelier, C R 99 276)

3CaO , $3\text{B}_2\text{O}_3$, CaCl_2 (Ouvrard, C R 1905, 141 353)

3CaO , $5\text{B}_2\text{O}_3$, CaCl_2 Sl attacked by cold H_2O and dil acetic acid + Aq Strong acids dissolve even when very dilute (Ouvrard, C R 1905, 141 352)

Calcium borate silicate, 2CaO , B_2O_3 , $2\text{SiO}_2 + \text{H}_2\text{O}$

Min *Datolite* Sol in HCl + Aq with separation of gelatinous silica

+ $2\text{H}_2\text{O}$ Min *Botryolite*

CaO , B_2O_3 , SiO_2 Min *Danburite* Very sl attacked by HCl + Aq before ignition

Chromous borate

Precipitate Sol in free acids, borax + Aq (Moberg)

Chromic borate, $7\text{Cr}_2\text{O}_3$, $4\text{B}_2\text{O}_3$

Insol in H_2O , sol in excess of borax + Aq (Hebberling, C C 1870 122)

Chromic magnesium borate, $3\text{Cr}_2\text{O}_3$, 6MgO , $2\text{B}_2\text{O}_3$

Not attacked by acids (Ebelmen, A ch (3) 33 52)

$2\text{Cr}_2\text{O}_3$, 9MgO , $3\text{B}_2\text{O}_3$ (Mallard, C R 105 1260)

Cobaltous borate, 3CoO , $2\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$

Sl sol in H_2O (Rose, Pogg 88 299)

3CoO , B_2O_3 (Mallard, C R 105 1260)

2CoO , B_2O_3 (Ouvrard, C R 1900, 130 337)

Cobaltous borate bromide, 6CoO , $8\text{B}_2\text{O}_3$, CoBr_2

(Rousseau and Allanc, C R 1894, 119 73)

Cobaltous borate chloride, 6CoO , $8\text{B}_2\text{O}_3$, CoCl

(Rousseau and Allanc, C R 1894, 118 1257)

Cobaltous borate iodide, 6CoO , $8\text{B}_2\text{O}_3$, CoI_2

(Allanc, C R 1898, 127 557)

Cuprous borate, $3\text{Cu}_2\text{O}$, $2\text{B}_2\text{O}_3$

(Guertler, Z anorg 1904, 38 459)

Cupric borate

Composition depends on temperature and concentration of solutions Boiling H_2O dissolves out all the boric acid Sol in acids, slowly sol in hot conc $\text{NH}_4\text{Cl} + \text{Aq}$

$\text{Cu}(\text{BO}_2)_2$ Insol in cold dil acids, even HF Slowly sol in hot conc HCl Not attacked by alkalies or alkali carbonates + Aq (Guertler, Z anorg 1904, **38** 456)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Cupric borate ammonia, $\text{CuB}_4\text{O}_7 \cdot 4\text{NH}_3 + 6\text{H}_2\text{O}$

Efflorescent Can be recrystallized from a little $\text{NH}_4\text{OH} + \text{Aq}$ (Pasternack, A 151 227)

Didymium borate, Dy_2BO_3

Insol in H_2O acidulated with HCl + Aq (Cleve, Bull Soc (2) **43** 363)

$\text{Dy}_2(\text{B}_4\text{O}_7)_3$ Insol in H_2O , sol in acids (Friedrichs and Smith, A 191 355)

Glucinum borate, basic, $5\text{GfO} \cdot \text{B}_2\text{O}_3$

Insol in H_2O , sol in acids (Kruss and Moraht, B 23 735)

Iron (ferrous) borate

Ppt H_2O dissolves out all the boric acid (Tunnerman)

Iron (ferric) borate, $\text{Fe} \cdot (\text{BO}_2)_3 + 3\text{H}_2\text{O}$

Ppt Insol in H_2O
Min *Lagonite* Sol in acids
 $2\text{Fe}_2\text{O}_3 \cdot 3\text{B}_2\text{O}_3$ (Mallard, C R **105** 1260)
 $6\text{Fe}_2\text{O}_3 \cdot \text{B}_2\text{O}_3 + 6\text{H}_2\text{O}$ Ppt (Rose, Pogg 89 473)

$9\text{Fe}_2\text{O}_3 \cdot \text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$ Ppt (Rose)

Iron (ferric) magnesium borate, $3\text{Fe}_2\text{O}_3 \cdot 6\text{MgO} \cdot 2\text{B}_2\text{O}_3$

Insol in H_2O Sol in conc HCl + Aq (Ebelmen, A ch (3) **33** 53)

$2\text{Fe}_2\text{O}_3 \cdot 9\text{MgO} \cdot 3\text{B}_2\text{O}_3$ (Mallard, C R **105** 1260)

Iron (ferroferric) magnesium borate, $3\text{MgO} \cdot \text{FeO} \cdot \text{Fe}_2\text{O}_3 \cdot \text{B}_2\text{O}_3$

Min *Ludwigite* Slowly sol in HCl + Aq when finely powdered

Iron (ferrous) borate bromide, $6\text{FeO} \cdot 3\text{B}_2\text{O}_3 \cdot \text{FeBr}_3$

Slowly sol in hot $\text{HNO}_3 + \text{Aq}$ (Rousseau and Allard, C R **116** 1445)

Iron (ferrous) borate chloride, $6\text{FeO} \cdot 3\text{B}_2\text{O}_3 \cdot \text{FeCl}_3$

Slowly sol in hot $\text{HNO}_3 + \text{Aq}$ (Rousseau and Allard, C R **116** 1195)

Lanthanum borate, $2\text{La}_2\text{O}_3 \cdot \text{B}_2\text{O}_3$

(Nordenskjöld, Pogg. **114** 618)

$\text{La}_2(\text{B}_4\text{O}_7)_3$ Ppt (Smith)

Formula is $\text{La}_2\text{B}_6\text{O}_{11} + x\text{H}_2\text{O}$ (Cleve, B 11 910)

Lead borate, basic,

$2\text{PbO} \cdot \text{B}_2\text{O}_3 + 2\text{H}_2\text{O}$ Ppt
 $4\text{PbO} \cdot 3\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$ Ppt
+ $5\text{H}_2\text{O}$ Ppt
 $6\text{PbO} \cdot 5\text{B}_2\text{O}_3 + 6\text{H}_2\text{O}$ Ppt
 $8\text{PbO} \cdot 3\text{B}_2\text{O}_3 + 8\text{H}_2\text{O}$ Ppt
 $9\text{PbO} \cdot 5\text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$ Ppt (Rose, ogg 87 470)

Lead borate, $\text{Pb}(\text{BO}_2)_2 + \text{H}_2\text{O}$

Insol in H_2O Easily sol in dil HN SO_4 , or boiling $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Decomp by I SO_4 , HCl, also by boiling KOH, or NaOH Aq
Insol in alcohol (Herapath, Phil M (3) **34** 375)

Sol in $\text{NH}_4\text{Cl} + \text{Aq}$, sol in sat NaCl Aq'
 $2\text{PbO} \cdot 3\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$ (Herapath)
 $\text{PbB}_4\text{O}_7 + 4\text{H}_2\text{O}$ Slightly sol in pure H_2O , but insol in solutions of Na salts as Na $\text{B}_4\text{O}_7 + \text{Aq}$ (Soubeiran)

Lead borate chloride, $\text{Pb}(\text{BO}_2)_2 \cdot \text{PbCl}_2 + \text{H}_2\text{O}$

Insol in cold, very slowly decomp l hot H_2O into its constituents Easily sol in dil hot $\text{HNO}_3 + \text{Aq}$, insol in alcohol (Herapath, Phil Mag (3) **34** 375)

Lead borate nitrate, $\text{Pb}(\text{BO}_2)_2 \cdot \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$

Insol in alcohol (Herapath)

Lithium borate, LiBO

Solubility in H_2O				
100 g H_2O dissolve g	LiBO	at t°		
t°	g	t°	g	l
0	0.7	30	4	
10	1.4	40	11	2
20	2.6	45	20	

(Le Châtelier, C R 1897, **124** 109)

Insol in acetone (Friedmann, C C 1899, II 1014, Naumann, B 1904 **37** 4329)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Insol in ethyl acetate (Naumann, B 1910, **43** 314)

+ H_2O (Le Châtelier, Bull Soc 1899 (3) **21** 55)

+ $16\text{H}_2\text{O}$ Effloresces in the air slowly sol in cold H_2O rapidly in hot H_2O (Le Châtelier, C R 1897, **124** 1092)

$\text{Li}_2\text{H}_2(\text{BO}_3)_2 + 14\text{H}_2\text{O}$ (Roeschke, Z anorg **4** 166)

$\text{Li}_2\text{B}_4\text{O}_7$ Deliquescent easily sol in H_2O (Arfvedson, A ch **10** 82)

Sol in acetone (Friedmann, C C 1899, II 1014)

Insol in acetone (Naumann, B 1904, **37** 4329)

Insol in methyl acetate (Naumann, B 1909 **42** 3790)

+ $5\text{H}_2\text{O}$ Insol in alcohol (Friedmann, A ch Ph (3) **8** 195)

Li_2O , $3\text{B}_2\text{O}_3 + 6\text{H}_2\text{O}$ Very sol in H_2O , insol in alcohol (Filsinger)
 Li_2O , $4\text{B}_2\text{O}_3$ Insol in H_2O (Le Chatelier, Bull Soc 1899, (3) 21 35)
 $+10\text{H}_2\text{O}$ Sol in H_2O , insol in alcohol (Filsinger)
 "Acid lithium borate" is less sol than the tetraborate (Gmelin)
 Li_2O , $5\text{B}_2\text{O}_3 + 10\text{H}_2\text{O}$ (Dukelski, C A 1908 1089)

Magnesium borate, $\text{Mg}(\text{BO}_2)_2$

(Ditte, C R 77 893)
 $+3\text{H}_2\text{O}$ Min *Pinnite*
 $+4\text{H}_2\text{O}$ (Laurent, A ch (2) 67 215)
 $+8\text{H}_2\text{O}$ Insol in cold or hot H_2O , easily sol in $\text{HCl} + \text{Aq}$ Decomp by conc $\text{HCl} + \text{Aq}$ into H_3BO_3 and MgCl_2 (Wohler)
 $\text{MgB}_4\text{O}_7 + 8\text{H}_2\text{O}$ (Popp, A Suppl 8 1)
 MgO , $3\text{B}_2\text{O}_3 + 8\text{H}_2\text{O}$ Very slowly sol in H_2O (Rose, A 84 221)
 Sol in 75 pts cold H_2O (Rammelsberg, Pogg 49 445)
 2MgO , B_2O_3 Insol in H_2O , but sol in $\text{Na}_2\text{CO}_3 + \text{Aq}$ (Guertler, Z anorg 1904, 40 236)
 $+ \text{H}_2\text{O}$ Very sl sol in $1/10$ N $\text{HCl} + \text{Aq}$ (van't Hoff, B A B 1907, 658)
 Min *Ascharite*
 3MgO , B_2O_3 Insol in H_2O , easily sol in acids (Ebelmen, A 80 208)
 Very sl sol in cold, but somewhat decomp by boiling H_2O (Rammelsberg)
 $+9\text{H}_2\text{O}$ Somewhat sol in cold H_2O (Wohler, Pogg 28 525)
 3MgO , $2\text{B}_2\text{O}_3$ Sol in warm H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ (Ditte, C R 77 893)
 MgO , $6\text{B}_2\text{O}_3 + 18\text{H}_2\text{O} = \text{Mg}(\text{BO}_2)_2$, $10\text{HBO}_2 + 13\text{H}_2\text{O}$ (Rammelsberg, Pogg 49 445)
 3MgO , $4\text{B}_2\text{O}_3$ Sol in hot dil acids, insol in acetic acid (Ditte, C R 77 893)
 5MgO , $2\text{B}_2\text{O}_3 + 1\frac{1}{2}$, and $3\text{H}_2\text{O}$ Min *Szibuite*
 Difficultly sol in $\text{HCl} + \text{Aq}$
 9MgO , B_2O_3 (Mallard, C R 105 260)

Magnesium manganous borate, $3\text{Mg}_2\text{B}_2\text{O}_5$, $4\text{MnB}_2\text{O}_7 + 7\text{H}_2\text{O}$

Min *Susselite* Sol in $\text{HCl} + \text{Aq}$

Magnesium potassium borate, $\text{KMgB}_{11}\text{O}_{19} + 9\text{H}_2\text{O}$

Min *Kaliborite* Insol in H_2O (Feit, Ch Z 1899, 13 1188)
 2MgO , $2\text{K}_2\text{O}$, $11\text{B}_2\text{O}_3 + 20\text{H}_2\text{O}$ (van't Hoff and Ichnsten, B A B 1904, 936)

Magnesium sodium borate, MgB_4O_7 , $\text{Na}_4\text{B}_4\text{O}_7 + 30\text{H}_2\text{O}$

Efflorescent About as sol in cold H_2O as borax solution separates out a Mg borate on warming, which redissolves on cooling
 Decomp by boiling H_2O (Rammelsberg)

Magnesium strontium borate, 3MgO , 3SrO , $4\text{B}_2\text{O}_3$

Easily sol in dil acids (Ditte, C R 77 895)

Magnesium borate bromide, $2\text{Mg}_2\text{B}_2\text{O}_5$, MgBr_2 or 6MgO , $8\text{B}_2\text{O}_3$, MgBr_2

(Rousseau and Allaire, C R 1894, 119, 71)

Magnesium borate chloride, $2\text{Mg}_2\text{B}_2\text{O}_5$, MgCl_2

Min *Boracite* Insol in H_2O , slowly sol in acids (Kraut)
Stassfurthite Easily sol in warm acids (Bischof)

Magnesium borate iodide, 6MgO , $8\text{B}_2\text{O}_3$, MgI_2

(Allaire, C R 1898, 127 556)

Magnesium borate phosphate, $\text{Mg}(\text{BO}_2)_2$, $2\text{MgHPO}_4 + 7\text{H}_2\text{O}$

Min *Lüneburgite*

Magnesium borate sulphate, $2\text{Mg}_2\text{B}_2\text{O}_5$, $3\text{MgSO}_4 + 12\text{H}_2\text{O}$

Min *Magnesium sulphoborate*
 Sol in mineral acids when ground (Nau-pert, B 1893, 26 874)

Manganous borate, MnB_4O_7 (?)

Insol in H_2O (Berzelius), very sl sol in H_2O (Thomas, Am Ch J 4 358), decomp by warm, slowly by cold H_2O Sol in $\text{MgSO}_4 + \text{Aq}$ (Berzelius)
 $+3\text{H}_2\text{O}$ (Endemann and Paisley, Zeit angew Ch 1903, 16 176)
 $+5\text{H}_2\text{O}$ Ppt (Endemann and Paisley, J 1903, 29 72)
 Very hygroscopic (Endemann, Ar J 1903, 29 72)
 3MnO , B_2O_3 (Mallard, C R 105 1260)
 Not attacked by H_2O Very sol in acids (Ouvrard, C R 1900, 130 336)
 3MnO , $2\text{B}_2\text{O}_3$ (Mallard)
 $\text{MnH}_4(\text{BO}_3)_2$ Very sl sol in H_2O
 Solubility in 2% $\text{Na}_2\text{SO}_4 + \text{Aq}$ At 18° , 0.77 g; $\text{MnH}_4(\text{BO}_3)_2$ are dissolved per litre, at 40° , 0.65 g, at 60° , 0.36 g, at 80° , 0.12 g
 Solubility in 2% $\text{NaCl} + \text{Aq}$ 1 l solution dissolves 1.31 g salt at 18° , 0.6 g at 59° and 0.29 g at 80°
 Solubility in 2% $\text{CaCl}_2 + \text{Aq}$ 1 l $\text{CaCl}_2 + \text{Aq}$ dissolves 2.91 g salt at 17° , 2.44 g at 43° , 2.25 g at 61° , and 1.35 g at 80° (Hartley and Ramuge, Chem Soc 63 129)

Manganous borate bromide, 6MnO , $8\text{B}_2\text{O}_3$, MnBr

(Rousseau and Allaire, C R 1894, 119 73)

Manganous borate chloride, 6MnO , $8\text{B}_2\text{O}_3$, MnCl

(Rousseau and Allaire, C R 1894, 118 1257)

Molybdenum borate, MoO_3 , $2\text{B}_2\text{O}_3$ (?)

Insol in H_2O , sol in $\text{H}_3\text{BO}_3 + \text{Aq}$ (Berzelius)

Molybdenum borate, $\text{Mo}_2\text{O}_3, \text{B}_2\text{O}_3$

Precipitate Insol in H_2O , sl sol in a solution of boric acid (Berzelius)

See **Boromolybdic Acid**

Nickel borate, $\text{Ni}(\text{BO}_2)_2 + 2\text{H}_2\text{O}$

Insol in H_2O Easily sol in acids Easily sol in warm $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose, Pogg 88 299)

$2\text{NiO}, \text{B}_2\text{O}_3 + x\text{H}_2\text{O}$ Easily sol in acids (Rose)

$3\text{NiO}, 2\text{B}_2\text{O}_3 + 5\text{H}_2\text{O}$ Easily sol in acids (Rose)

$3\text{NiO}, \text{B}_2\text{O}_3$ Not attacked by H_2O , sol in acids (Ouvrard, C R 1900, 130 337)

Nickel borate bromide, $6\text{NiO}, 8\text{B}_2\text{O}_3, \text{NiBr}_2$
(Rousseau, C R 1894, 119 73)**Nickel borate chloride, $6\text{NiO}, 8\text{B}_2\text{O}_3, \text{NiCl}_2$**
(Rousseau, C R 1894, 118 1257)**Potassium borates**

Solubility of B_2O_3 in $\text{K}_2\text{O} + \text{Aq}$ at 30°

Solution contains		Solid phase
% by wt K_2O	% by wt B_2O_3	
47 50		$\text{KOH}, 2\text{H}_2\text{O}$
46 45	0 72	"
46 36	0 91	$\text{K}_2\text{O}, \text{B}_2\text{O}_3, 2 5\text{H}_2\text{O}$
40 51	1 25	"
36 82	1 80	"
36 72	1 85	"
32 74	3 51	"
29 63	6 98	"
26 89	12 12	"
24 84	17 63	"
23 30	18 19	$\text{K}_2\text{O}, 2\text{B}_2\text{O}_3, 4\text{H}_2\text{O}$
16 21	13 10	"
11 78	9 82	"
9 18	8 00	"
6 22	9 13	"
7 79	13 20	"
7 73	13 37	$\text{K}_2\text{O}, 2\text{B}_2\text{O}_3, 4\text{H}_2\text{O} + \text{K}_2\text{O}, 5\text{B}_2\text{O}_3, 8\text{H}_2\text{O}$
7 81	13 28	"
7 67	13 19	"
7 71	13 21	$\text{K}_2\text{O}, 5\text{B}_2\text{O}_3, 8\text{H}_2\text{O}$
7 63	13 28	"
3 42	7 59	"
1 80	4 13	"
0 80	3 05	"
0 51	3 19	"
0 33	4 58	$\text{K}_2\text{O}, 5\text{B}_2\text{O}_3, 8\text{H}_2\text{O} + \text{B}(\text{OH})_3$
0 38	4 51	"
0 31	4 46	"
0 28	4 36	$\text{B}(\text{OH})_3$
	3 54	"

At 30° only the three potassium borates $\text{K}_2\text{O}, \text{B}_2\text{O}_3 + 2 5\text{H}_2\text{O}$, $\text{K}_2\text{O}, 2\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$ and $\text{K}_2\text{O}, 5\text{B}_2\text{O}_3 + 8\text{H}_2\text{O}$ exist in stable form (Dukelski, Z anorg 1906, 50 42)

Potassium metaborate, KBO_2

Sol in small amount of H_2O (Berthius, Pogg 34 568)

+ $1\frac{1}{2}\text{H}_2\text{O}$ Only stable hydrate (Dukelski, Z anorg 1906, 50 42)

+ $1\frac{1}{2}\text{H}_2\text{O}$ (Atterberg, Bull Soc () 22 350)

Potassium tetraborate, $\text{K}_2\text{B}_4\text{O}_7$

Very sol in H_2O

+ $4\text{H}_2\text{O}$ (Atterberg, Bull Soc () 22 350)

Only stable hydrate (Dukelski, l c)

+ $5\text{H}_2\text{O}$ Very sol in H_2O , more so than

$\text{K}_2\text{B}_5\text{O}_{10}$ or $\text{K}_2\text{B}_{12}\text{O}_{19}$

+ $6\text{H}_2\text{O}$ (Atterberg, l c)

Potassium hexaborate, $\text{K}_2\text{B}_6\text{O}_{10} + 5$, and $8\text{H}_2\text{O}$

Easily sol in H_2O

Does not exist (Dukelski, l c)

Potassium dekaborate, $\text{K}_2\text{B}_{10}\text{O}_{16} + 8\text{H}_2\text{O}$

Sol in H_2O (Rammelsberg)

Only hydrate (Dukelski)

Potassium dodekaborate, $\text{K}_2\text{B}_{12}\text{O}_{19} + 10\text{H}_2\text{O}$

Sl sol in cold, very sol in hot H_2O

(Laurent, A ch 67 215)

= $\text{K}_2\text{B}_{10}\text{O}_{16}$ (Rammelsberg)

Does not exist (Dukelski)

Potassium borate fluoride, $\text{KBO}_2, \text{KBF}_4$

Sol in H_2O (Schiff and Sestini, 228 72)

$\text{KBO}_2, 2\text{KF}$ Sol in little, decomposes by much H_2O Insol in H_2O (Schiff and Sestini, A 228 72)

Rubidium borate, RbB_4O_7

Anhydrous (Reischle, Z anorg 4 56)

+ $6\text{H}_2\text{O}$ Not deliquescent or efflorescent Sol in H_2O (Reissig, A 127 33)

Samarium borate, SmBO_3

Insol in H_2O , sol in $\text{HCl} + \text{Aq}$ (Cleve, Bull Soc (2) 43 1670)

Scandium borate, ScBO_3

Sol in dil acids (Crookes Phil Trans 1910, 210 A 364)

Silver borate, AgBO_2

Sl sol in H_2O By washing with H_2O the boric acid is dissolved out (Rose, Chem Centr bl 1853 205)

Sol with decomp in $\text{Na}_2\text{SO}_4 + \text{A}$ (Henschel), sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ if pptd old 1 l H_2O dissolves ca 6×10^{-4} g atoms at 25° (Abegg and Cox, Z phys C 1903, 46 11)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

$3\text{AgO}, 4\text{B}_2\text{O}_3$ (Rose, l c)

Sodium borates

Solubility of B_2O_3 in $Na_2O + Aq$ at 30°

Solution contains		Solid phase
% by wt Na_2O	% by wt B_2O_3	
42 00		$NaOH, H_2O$
40 85	2 71	"
41 37	5 10	"
38 85	5 55	$Na_2O, B_2O_3, 4H_2O$
34 44	3 73	"
29 39	2 51	"
28 61	2 38	"
27 78	2 44	"
26 13	2 75	"
25 08	2 98	"
23 00	3 82	"
16 61	13 69	"
21 58	4 63	$Na_2O, B_2O_3, 4H_2O + Na_2O, B_2O_3, 8H_2O$
20 58	4 69	$Na_2O, B_2O_3, 8H_2O$
18 31	4 97	"
15 32	6 21	"
13 25	8 18	"
12 39	9 12	"
8 85	10 49	$Na_2O, 2B_2O_3, 10H_2O$
5 81	6 94	"
4 00	4 76	"
1 88	2 41	"
1 38	5 16	"
1 84	7 36	"
2 02	7 79	"
2 40	9 48	"
4 08	17 20	$Na_2O, 2B_2O_3, 10H_2O + Na_2O, 5B_2O_3, 10H_2O$
		$Na_2O, 5B_2O_3, 10H_2O$
3 79	15 84	"
3 47	13 30	"
2 26	12 14	"
1 99	11 84	$Na_2O, 5B_2O_3, 10H_2O + B(OH)_3$
		$B(OH)_3$
1 86	11 78	"
1 81	11 18	"
0 64	6 11	"
	3 54	"

At 30° , only the four sodium borates $Na_2O, B_2O_3 + 4H_2O$, $Na_2O, B_2O_3 + 8H_2O$, $Na_2O, 2B_2O_3 + 10H_2O$, and $Na_2O, 5B_2O_3 + 10H_2O$ exist as stable phases

(Dukelski, Z anorg 1906, 50 46)

Sodium metaborate, $NaBO_3$

Anhydrous Easily sol in H_2O , with evolution of heat

+ H_2O Easily sol in H_2O (Benedikt)+ $2H_2O$ Easily sol in H_2O (Benedikt, B 7 703)+ $3H_2O$ Easily sol in H_2O (Berzelius)+ $4H_2O$ Slightly efflorescent Sol in hot, less sol in cold H_2O Melts at 57° in its crystal H_2O (Dukelski, Z anorg 50 42)+ $4\frac{1}{2}H_2O$ (Atterberg, Z anorg 1906, 48 370)+ $5\frac{1}{2}H_2O$ (Atterberg)

+ $8H_2O$ (Atterberg)
+ $4H_2O$ and + $8H_2O$ are the only hydrates formed (Dukelski)

System Na_2O, B_2O_3, H_2O at 60° investigated by Sborgi (Real Ac Linc 1915, (5) 24 I, 443)

Sodium tetraborate, $Na_2B_4O_7$ (Borax)100 g H_2O dissolve at 5° 10° 21° 5° 30° 37° 5°

1 3 1 6 2 8 3 9 5 6 g anhydrous salt

 45° 50° 54° 55° 56° 57°

8 1 10 5 13 3 14 2 15 0 16 0 g anhydrous salt

(Horn and van Wagener, Am Ch J 1903, 30 347)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sol in amyl alcohol in the presence of meta-arsenous acid and excess of H_3BO_3 (Auerbach, Z anorg 1903, 37 358)+ $4H_2O$ + $5H_2O$ 100 g H_2O dissolve at 65° 70° 80° 90° 100°

22 0 24 4 31 4 40 8 52 3 g anhydrous salt

(Horn and van Wagener, Am Ch J 1903, 30 347)

+ $6H_2O$ Grows opaque in the air (Bechi, Sill Am J (2) 17 129)+ $10H_2O$ Only stable hydrate (Dukelski, Z anorg 50 30) Efflorescent on surface in dry air Not efflorescent when free from Na_2CO_3 (Sims)

Sol in 12 pts cold and 2 pts hot H_2O Sat cold $Na_2B_4O_7 + Aq$ contains 9.23% and sat hot $Na_2B_4O_7 + Aq$ contains 33.33% $Na_2B_4O_7$ (Gmelin)

Sol in 20 pts cold and 6 pts boiling H_2O (Wallemus)Sol in 15 pts H_2O at 18.7° (Abt)100 pts H_2O at 1.5° dissolve 5 pts at 60° 40 pts at 100° 166 pts $Na_2B_4O_7 + 10H_2O$ (Ure's Dictionary)

100 pts sat $Na_2B_4O_7 + Aq$ at 105.5° contain 52.5 pts $Na_2B_4O_7$ or 100 pts H_2O dissolve 110.54 pts $Na_2B_4O_7$ or 1 pt $Na_2B_4O_7$ is sol in 0.9047 pt H_2O at 105.5° (Griffith Quar J Sci 18 90)

Solubility in 100 pts H_2O at t°

t	Pts $Na_2B_4O_7$	Pts $Na_2B_4O_7 + 10H_2O$	t	Pts $Na_2B_4O_7$	Pts $Na_2B_4O_7 + 10H_2O$
0	1 49	2 83	60	18 09	40 43
10	2 42	4 65	70	24 22	57 85
20	4 05	7 88	80	31 17	76 19
30	6 00	11 90	90	40 14	116 66
40	8 79	17 90	100	55 16	201 43
50	12 93	27 41			

(Poggiale, A ch (3) 8 46)

100 pts H_2O dissolve 14 pts $Na_2B_4O_7$ at 0° , and 55.3 pts at 100° (Mulder)

$Na_2B_4O_7 + Aq$ sat at 15° has sp gr = 1.0199, and contains 3.926 pts $Na_2B_4O_7$ to 100 pts H_2O (Michel and Krafft, A ch (3) 41 471)

$\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ sat at 17° has sp gr = 1.0208 (Stolba, J pr 97 503)

Sp gr of $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ at 15°

$\frac{\%}{\text{Na}_2\text{B}_4\text{O}_7}$	$\frac{\%}{\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}}$	Sp gr	$\frac{\%}{\text{Na}_2\text{B}_4\text{O}_7}$	$\frac{\%}{\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}}$	Sp gr
1	0.52	1.0049	4	2.11	1.0199
2	1.06	1.0099	5	2.64	1.0249
3	1.59	1.0149	6	3.17	1.0299

(Gerlach, Z anal 28 473)

Sp gr of $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ sat at $15^\circ = 1.032$ (Gerlach)

Sat $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ boils at 105.5° , and contains 110.5 pts $\text{Na}_2\text{B}_4\text{O}_7$ to 100 pts H_2O (Griffith)

Sat $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ forms a crust at 103° , and contains 60.14 pts $\text{Na}_2\text{B}_4\text{O}_7$ to 100 pts H_2O , highest temp observed, 104.3° (Gerlach, Z anal 26 427)

B-pt of $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ containing pts $\text{Na}_2\text{B}_4\text{O}_7$ to 100 pts H_2O

B pt	Pts $\text{Na}_2\text{B}_4\text{O}_7$	B pt	Pts $\text{Na}_2\text{B}_4\text{O}_7$
100.5	8.64	103.0	61.2
101.0	17.2	103.5	75.4
101.5	26.5	104.0	90.8
102.0	37.5	104.5	109.0
102.5	48.5	104.6	112.3

(Gerlach, Z anal 26 452)

M-pt of $\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$ is 75.5° (Tilden, Chem Soc 45 407)

Insol in alcohol

100 g alcohol (0.941 sp gr) dissolve 2.45 g at 15.5° (U S P)

Sol in alcoholic solution of NaCH_3CO (Stromeyer)

Sol in 14.7 pts glycerine of 1.225 sp gr (Vogel)

Sol in 1 pt glycerine (Schultze, Arch Pharm (3) 6 149)

100 g glycerine dissolve 60.3 g at 15.5° (U S P)

Min Thermal

Sodium borate, $\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$

Sol in 5-6 pts cold H_2O (Bolley A 68 122) Perhaps sodium hydrogen tetraborate $\text{Na}_2\text{HB}_4\text{O}_7 + 4\frac{1}{2}\text{H}_2\text{O}$

$\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$ Decomp by H_2O (Atterberg, Z anorg 48 370)

Stable (Dukelski, Z anorg 50 42)

+ $11\text{H}_2\text{O}$ (Lament, C R 29 5)

Sodium borate fluoride, $\text{NaBO}_2 \cdot 3\text{NaF} + 4\text{H}_2\text{O}$

Sol in H_2O

Bischoff (B 7 112) considers this salt to be a mixture

$\text{Na}_2\text{B}_4\text{O}_7, 12\text{NaF} + 22\text{H}_2\text{O}$ Can be separated into its constituents by H_2O (Berzelius, Berz J B 23 96)

Strontium borate, $\text{Sr}(\text{BO}_2)_2$

(Ditte, C R 77 788)

Easily hydrated by H_2O forming $\text{Sr}(\text{BO}_2)_2 \cdot 2\text{H}_2\text{O}$ Very sol in dil acetic acid (Ouvrard, C R 1906, 142 282)

Insol in acetone (Naumann, B 14, 37 4329)

+ $2\text{H}_2\text{O}$ (Ouvrard, l c)

+ $4\text{H}_2\text{O}$ (Ouvrard, l c)

+ $5\text{H}_2\text{O}$ 1 l H_2O dissolves 2.3 g at 10°

(Ditte, A ch 1883 (5) 30 253)

SrB_2O_7 Insol in H_2O , sol in dil acids

(Guertler, Z anorg, 1904, 40 243)

+ $4\text{H}_2\text{O}$ Sol in 130 pts boiling H_2O , 100 pts H_2O at 100° dissolve 7.7 pts (Ure, Dict)

Easily sol in cold NH_4 salts + Aq , sol in cold $\text{HNO}_3 + \text{Aq}$

$2\text{SrO} \cdot \text{B}_2\text{O}_3$ Easily decomp by H_2 forming B_2O_3 , SrO , $4\text{H}_2\text{O}$ Very sol in acids (Ouvrard, C R 1906, 142 282)

$3\text{SrO} \cdot \text{B}_2\text{O}_3$ Less easily attacked by H_2O than Ca comp Very sol in mineral acids Sl attacked by dil acetic acid (Ouvrard, C R 1901, 132 258)

$\text{SrB}_2\text{O}_{10}$ Very sl sol in H_2O , sol in acids (Laurent)

$\text{SrB}_2\text{O}_{10} + 7\text{H}_2\text{O}$ Ppt (Lament)

+ $12\text{H}_2\text{O}$ (Ditte)

$\text{Sr}_2\text{B}_4\text{O}_{13}$ Sol in cold mineral acids and acetic acid (Ditte, C R 77 785)

$2\text{SrO} \cdot 3\text{B}_2\text{O}_3$ Easily sol in acids (Ditte, l c)

Strontium borate bromide, $3\text{SrO} \cdot 5\text{B}_2\text{O}_3 \cdot \text{SrBr}_2$

As the chloride (Ouvrard, C R 1906, 142 283)

Strontium borate chloride, $3\text{SrO} \cdot 5\text{B}_2\text{O}_3 \cdot \text{SrCl}_2$

Sl attacked by cold H_2O not attacked by dilute acetic acid (Ouvrard, C R 1906 142 282)

Thallous borate, $\text{TlBO}_2 + \frac{1}{2}\text{H}_2\text{O}$

Decomp in the air (Buchtala J 1913 (2) 88 784)

TlBO_2 (Buchtala)

TlB_4O_7 Ppt Sol in boiling H_2O insol

in cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Crookes)

+ $2\text{H}_2\text{O}$ (Buchtala J pr 191 (2) 88 774)

$\text{TlB}_4\text{O}_{10} + 3\text{H}_2\text{O}$ (Buchtala)

$\text{TlB}_4\text{O}_{11} + 4\text{H}_2\text{O}$ (Buchtala)

$\text{TlB}_{10}\text{O}_{11} + 5\text{H}_2\text{O}$ (Buchtala)

$\text{TlB}_4\text{O}_{11} + 7\text{H}_2\text{O}$ (Buchtala)

Thorium borate (?)

Precipitate Insol in H_2O and $\text{LiBO}_2 + \text{Aq}$ (Berzelius)

Tin (stannous) borate (?)

Ppt (Wenzel)

Divanadyl borate

Insol in H_2O , sol in $\text{H}_3\text{BO}_3 + \text{Aq}$ (Berzelius)

Ytterbium borate, YbBO_3

Insol in conc HCl , sol in HF (Cleve, Z anorg 1902, **32** 148)

Yttrium borate

Precipitate (Berlin, Pogg **43** 105)

Zinc borate, $3\text{ZnO}, 2\text{B}_2\text{O}_3$

(Mallard, C R **105** 1260)

Decomp by H_2O , very sol in dil acids (Ouvrard, C R 1900, **130** 336)

$\text{ZnO}, 2\text{B}_2\text{O}_3 + 4\text{H}_2\text{O}$ Sol in H_2O with decomp (Ditte, A ch 1883, (5) **30** 256)

$3\text{ZnO}, 4\text{B}_2\text{O}_3 + \text{H}_2\text{O}$ Ppt (Holdermann, Arch Pharm 1904, **242** 567)

$\text{ZnO}, 4\text{B}_2\text{O}_3 + 10\text{H}_2\text{O}$ (Ditte, A ch 1883, (5) **30** 256)

$9\text{ZnO}, 4\text{B}_2\text{O}_3 + 9\text{H}_2\text{O}$ Sl sol in $\text{H}_3\text{BO}_3 + \text{Aq}$ (Rose, Pogg **88** 299)

$3\text{ZnO}, \text{B}_2\text{O}_3$ Insol in mineral acids (le Chatelier, C R **113** 1034)

Zinc borate ammonia, $\text{ZnB}_4\text{O}_7, 4\text{NH}_3 + 6\text{H}_2\text{O}$

Easily sol in NH_4OH , $\text{HC}_2\text{H}_3\text{O}_2$, H_2SO_4 , HCl , and $\text{HNO}_3 + \text{Aq}$ (Buchner, A **151** 234)

Zinc borate bromide, $6\text{ZnO}, 8\text{B}_2\text{O}_3, \text{ZnBr}_2$

(Rousseau and Allaire, C R **116** 1446)

Zinc borate chloride, $6\text{ZnO}, 8\text{B}_2\text{O}_3, \text{ZnCl}_2$

Insol in HCl (Rousseau, C R 1894, **118** 1256)

Zinc borate iodide, $6\text{ZnO}, 8\text{B}_2\text{O}_3, \text{ZnI}_2$

(Allaire, C R 1898, **127** 556)

Zirconium borate, (?)

Insol in H_2O

Perboric acid

See Perboric Acid

Boric phosphoric acid

See Phosphoboric acid

Boric tungstic acid

See Borotungstic acid

Boric acid sulphur trioxide

See Borosulphuric acid

Borimide, $\text{B}(\text{NH})_3$

Decomp by H_2O , insol in all indifferent solvents, sol in liquid $\text{NH}_3 + \text{S}$ to form a dark blue solution (Stock, B 1901, **34** 3044)

Borimide hydrochloride, $\text{B}_2(\text{NH})_3, 3\text{HCl}$

Decomp by H_2O , insol in all ordinary organic solvents (Stock, B 1901, **34** 3045)

Borofluorhydric acid, HBF_4

See Fluoboric acid

Borofluorides

See Fluoborides

Boromolybdic acid

Sol in H_2O Decomp by alcohol (Berzelius)

Boron, B

(a) *Amorphous* Somewhat sol in pure H_2O , when not ignited Salts and acids separate it out of aqueous solution Upon evaporation of H_2O solution a crust is formed, which is only partially sol in H_2O (Berzelius, Pogg **2** 113) Decomp by hot H_2SO_4 and cold moderately conc $\text{HNO}_3 + \text{Aq}$ Strongly ignited amorphous B is much less easily attacked by reagents than freshly pptd, and is insol in H_2O (Berzelius) Insol in caustic alkalis + Aq , also in alcohol and ether

Above boron was very impure (Moissan, C R **114** 392)

Pure B is not attacked by acids, but has a strong reducing action on $\text{KMnO}_4 + \text{Aq}$, $\text{FeCl}_3 + \text{Aq}$, etc (Moissan, C R **114** 617)

Does not melt at 1500° Readily sol in conc acids, as H_2SO_4 , HNO_3 , H_3PO_4 , very sl sol in hydric acids, decomp H_2O at red heat (Moissan, A ch 1895, (7) **6** 313-14)

Insol in liquid NH_3 (Gore, A ch 1898, **20** 827)

(b) *Crystallized* 1 Insol in H_2O , $\text{KOH} + \text{Aq}$ Very slightly and slowly by boiling conc H_2SO_4 Gradually so by conc HNO_3 Formula is Al_2B_{10} (Hampe, A **183** 75)

2 Very slightly attacked by conc HCl or H_2SO_4 , slowly but completely sol in conc HNO_3 , insol in $\text{KOH} + \text{Aq}$ Formula is $\text{C}_2\text{Al}_3\text{B}_{10}$ (Hampe)

$\text{C}_2\text{Al}_3\text{B}_{10}$ (*crystalline*) Insol in a solution of CrO_3 in H_2SO_4 Insol in hot conc HCl and H_2SO_4 Sol in hot conc HNO_3 (Biltz, B 1910, **43** 303)

Boron tribromide, BBr_3

Sol in H_2O or alcohol with decomp (Nickles, C R **60** 800)

Boron phosphorus bromide, $\text{BBBr}_3, \text{PBr}_3$

Decomp by H_2O

Sol in CS_2 and CHCl_3 Decomp by alcohol, ether, etc (Turle, C R **116** 1521)

$\text{BBBr}_3, \text{PBr}_3$ Sl sol in cold, easily in hot CS_2 (Turle)

Boron bromide ammonia, $\text{BBBr}_3, 4\text{NH}_3$

Decomp by H_2O and alkalis (Besson, C R **114** 542)

Boron bromide phosphine, $\text{BBBr}_3, \text{PH}_3$

Violently decomp by H_2O (Besson, C R **113** 78)

Boron bromide phosphorus trichloride, $2\text{BBr}_3, \text{PCl}_3$

Decomp by H_2O Sol in BBr_3 , PCl_3 , CS_2 , and CHCl_3 Insol in petroleum ether (Tarble, C R 1901, 132 84)

Boron bromide phosphorus pentachloride, $2\text{BBr}_3, \text{PCl}_5$

Sol in BBr_3 and CS_2 , decomp by H_2O , insol in light petroleum (Tarble, C R 1901, 132 85)

Boron bromide phosphorus diiodide, $2\text{BBr}_3, \text{P}_2\text{I}_4$

Sol in BBr_3 , CS_2 , CHCl_3 , insol in light petroleum, decomp by H_2O (Tarble, C R 1901, 132 205)

Boron bromide phosphoryl chloride, $\text{BBr}_3, \text{POCl}_3$

Very easily decomp (Oddo and Tealdi, Gazz ch it 1903, 33 (2) 431)

Boron bromoiodide, BBr_2I

Decomp violently by H_2O (Besson, C R 112 100)

BBrI (Besson, C R 112 100)

Boron bromosulphide, $\text{B}_2\text{S}_3, \text{BBr}_3$

Decomp by H_2O (Stock, B 1901, 34 3040)

Boron carbide, B_6C

Very stable, insol in HF and in HNO_3 , sol in KOH at red heat (Moissan, Bull Soc 1894, (3) 11 1101)

Insol in acids, sol in fused alkali (Moissan, C R 1894, 118 559)

BC or B_6C Insol in all the usual solvents (Mullhuser, Z anorg 5 92)

Boron trichloride, BCl_3

Rapidly absorbed by H_2O and alcohol with decomposition

Boron nitrosyl chloride, $\text{BCl}_3, \text{NOCl}$

Decomp violently by H_2O (Geuther, J pr (2) 8 551)

Boron phosphoryl chloride, $\text{BCl}_3, \text{POCl}_3$

Decomp immediately by H_2O (Gustavson, Zeit Chem 1870 521)

Boron chloride ammonia, $2\text{BCl}_3, 3\text{NH}_3$

Decomp by H_2O (Berzelius, Pogg 2 147)

Boron chloride phosphine, $\text{BCl}_3, \text{PH}_3$

Decomp by H_2O (Besson, C R 110 516)

Boron chlorosulphide, $\text{B}_2\text{S}_3, \text{BCl}_3$

Decomp by H_2O (Stock, B 1901, 34 3040)

Boron trifluoride, BF_3

H_2O absorbs 700 vols BF_3 gas to form a

liquid of 1.77 sp gr On boiling, $\frac{1}{3}$ of it is given off, and a residue boiling at 16° with composition $\text{BF}_3 + 2\text{H}_2\text{O}$ or $\text{H}_2\text{O}_2 + 3\text{HF}$, is left (J Davy, A ch 86 178)

1 ccm H_2O absorbs at 0° and 762 mm pressure 1.057 ccm BF_3

1 vol conc H_2SO_4 of 1.85 sp gr absorbs 50 vols BF_3

Absorbed by alcohol with decomp

Cold oil of turpentine absorbs $\frac{6}{100}$ of BF_3

Boron fluoride ammonia, BF_3, NH_3 , $\text{BF}_3, 2\text{NH}_3$, and $\text{BF}_3, 3\text{NH}_3$

Decomp by H_2O

Boron fluoride cyanhydric acid, BF_3, HCN

Very unstable (Paton, C R 113 5)

Boron fluoride phosphine, $2\text{BF}_3, \text{PH}_3$

Very unstable at ordinary temp Decomp by H_2O (Besson, C R 110 80)

Boron hydride, BH_3

Not obtained free from H_2Si Sol in H_2O (Jones, Chem Soc 35 41)

See Cycloborane

B_4H_{10} B-pt $16-17^\circ$ at 760 mm

Very unstable Takes fire spontaneously in the air

Decomp by H_2O , dil HCl , and conc HNO_3 with explosive violence

Absorbed by $\text{NaOH} + \text{Aq}$

Decomp by alcohol Sol in dry benzene (Stock, B 1912, 45 3562)

B_6H_{12} B-pt 100° at atmospheric pressure

Decomp by H_2O With aqueous solutions, hydrogen is evolved (Stock, B 1913, 45 3565)

B_3H_6 Insol in HCl Sol in aqueous $\text{NaOH} + \text{Aq}$ (Winkler, B 1890, 23 778)

$\text{B}_{10}\text{H}_{14}$ M-pt 99.5° , not attacked by cold or boiling H_2O Sol in dil $\text{NaOH} + \text{Aq}$

Sol in alcohol, ether, benzene, in CS_2 (Stock, B 1913, 46 3360)

Boron iodide, BI_3

Very hygroscopic, and instantly decomp by H_2O or alcohol Very sol in CS_2

C_6H_6 less sol in PCl_3 , AsCl_3 , and in many organic liquids (Moissan, C R 112 717)

Boron iodide ammonia, $\text{BI}_3, 5\text{NH}_3$

Decomp by H_2O (Besson, C R 112 542)

Boron iodophosphide, BI_3P

Very hygroscopic, decomp by H_2O Not attacked by cold conc H_2SO_4 , even if ming,

but on heating decomposition takes place Very sol in CS_2 Insol in benzene PCl_3 , or CCl_4 (Moissan, C R 113 624)

BIP Less hygroscopic than BI_3 , but otherwise the properties are similar (Moissan, C R 113 624)

Boron nitride, BN

Insol in H_2O , conc HNO_3 , conc HCl +Aq, or conc solutions of alkalis

Decomp by hot conc H_2SO_4 or HF (Wohler, A 74 70)

Boron trioxide, B_2O_3

Deliquescent Sol in H_2O with a large increase in temp (Ditte, C R 85 1069)

1 pt dissolves—

at 18 75°	in 47 01 pts	H_2O
" 25°	" 27 75 "	"
" 37 5°	" 18 73 "	"
" 50°	" 15 13 "	"
" 62 5°	" 9 29 "	"
" 75°	" 7 28 "	"
" 87 5°	" 5 58 "	"
" 100°	" 4 74 "	"

Or 100 pts H_2O dissolve—

at 18 75°	2 13 pts	B_2O_3
" 25°	3 60 "	"
" 37 5°	4 24 "	"
" 50°	6 61 "	"
" 62 5°	10 76 "	"
" 75°	13 73 "	"
" 87 5°	17 92 "	"
" 100°	21 09 "	"

(Brandes and Firnhaber, Arch Pharm 7 50)

1 litre H_2O dissolves—

at 0°	11 00 g	B_2O_3
" 12°	16 50 "	"
" 20°	22 49 "	"
" 40°	39 50 "	"
" 62°	64 50 "	"
" 80°	95 00 "	"
" 102°	164 50 "	"

(Ditte, C R 85 1069)

Sat H O solution boils at 100° (Brandes and Firnhaber)

Sat H O solution boils at 103 3° (Griffiths, Quar J Sci 18 90)

Sol in acetic acid, hot conc HCl +Aq, HNO_3 , and H_2SO_4 . From the three latter it separates on cooling or dilution with H O

Solubility in Na_2O +Aq at 30

See Borates, sodium

Solubility in K_2O +Aq at 30°

See Borates, potassium

Insol in hot glacial acetic acid (Holt, Chem Soc 1911, 100 (2) 720)

Insol in alcohol (Graham)

Sol in alcohol (Berzelius, Ebdmen)

Sol in oils

See also Boric acid

Boron trioxide potassium fluoride, $B_2O_3, 2KF$

Gradually sol in H_2O Decomp by much H_2O Insol in alcohol (Schiff and Sestini, A 228 82)

Boron oxychloride, $BOCl$

(Gustavson, Zeit Chem 1870 521)

$BOCl_3$ Slowly decomp by H_2O (Councler, J pr (2) 18 399)

Oxychlorides of either the above formulæ do not exist, the true formula for boron oxychloride is $B_3O_{11}Cl_2$ (Lorenz, A 247 226)

Boron phosphide, BP

Insol in H_2O Sol in conc boiling alkalis +Aq with decomp Decomp by HNO_3 +Aq (Besson, C R 113 78)

Insol in PCl_3 , $AsCl_3$, $SbCl_3$, CCl_4 , and in fact in all known solvents

Not attacked by boiling H_2O , conc HCl , or HI +Aq Sol in conc HNO_3 with decomp on heating Not attacked by cold H_2SO_4 (Moissan, C R 113 726)

B_3P_3 Not attacked by boiling conc HNO_3 +Aq Insol in all solvents (Moissan)

Boron phosphodiode

See Boron iodophosphide

Boron selenide, B_2Se_3

Violently decomp by H_2O (Sabatier, C R 112 1000)

Boron trisulphide, B_2S_3

Decomp with violence with H_2O Combines with alcohol and ether (Fremy, A ch (3) 38 312)

Insol in most solvents, but sl sol in PCl_3 without decomp, more sol in SCl_2 , but does not crystallize from the solution (Moissan, C R 115 203)

Boron trisulphide ammonia, $B_2S_3, 6NH_3$

Ppt (Stock, B 1901, 34 3042)

Boron pentasulphide, B_2S_5

Decomp by H_2O and alcohol (Moissan, C R 115 271)

Borosulphuric acid, $BOHSO_4+SO_3$

Decomp by H O (Schultz-Sellac, B 4 12)

$B(HSO_4)_3$ Very deliquescent Easily sol in fuming H_2SO_4 (D'Arcy, Chem Soc 55 155)

$SO_3(O BO)_2$ Hygroscopic Deliquescent Sol in H O with decomp Decomp by cold alcohols (Pictet, Bull Soc 1908, (4) 3 1121)

$(SO_3)_2B_2O_3$ Hygroscopic Deliquescent Sol in H_2O with decomp Decomp by cold alcohols (Pictet, Bull Soc 1908, (4) 3 1121)

Boronotungstic acid, $H_4B_2W_9O_{32}+22H_2O=9WO_3, B_2O_3, 2H_2O+22H_2O$

Sol in less than $\frac{1}{10}$ pt H_2O , and as easily sol in alcohol and ether Sp gr of aqueous solution is somewhat under 3 (Klein, A ch (5) 28 370)

Aluminum boronotungstate, $Al_4(B_2W_9O_{32})_3+65H_2O$

Extremely sol in H_2O (Klein)

Ammonium —, $(NH_4)_4B_2W_9O_{32}+18H_2O$

Quickly effloresces (Klein)

Barium boronotungstate, $\text{Ba}_2\text{B}_2\text{W}_9\text{O}_{32} + 19\text{H}_2\text{O}$

Sol in 4 pts cold, and less than $\frac{1}{2}$ pt hot H_2O (Klein)

Cadmium —, $\text{Cd}_2\text{B}_2\text{W}_9\text{O}_{32} + 18\text{H}_2\text{O}$

Deliquescent

100 pts of salt dissolve in less than 8 pts H_2O at 19° Sp gr of solution is 3.28 (Klein)

Sp gr of sat solution at $15.6^\circ/4^\circ = 3.2887$, at $16.2^\circ/4^\circ = 3.2868$ (Kahlbaum, Z anorg 1902, 29 229)

Calcium —, $\text{Ca}_2\text{B}_2\text{W}_9\text{O}_{32} + 15\text{H}_2\text{O}$

Sol in $\frac{1}{10}$ pt H_2O Solution has sp gr = 3.10 (Klein)

Cerium —, $\text{Ce}_4(\text{B}_2\text{W}_9\text{O}_{32})_3 + 57\text{H}_2\text{O}$

Very sol in H_2O , sp gr of solution is over 3

Chromium —, $\text{Cr}_4(\text{B}_2\text{W}_9\text{O}_{32})_3 + 74\text{H}_2\text{O}$

Very sol in H_2O , sp gr of solution is 2.80 (Klein)

Cobalt —, $\text{Co}_2\text{B}_2\text{W}_9\text{O}_{32} + 18\text{H}_2\text{O}$

Very sol in H_2O , sp gr of solution sat at $19^\circ = 3.36$ (Klein)

100 pts H_2O dissolve 306.8 pts anhydrous salt at 16.2° , 288 pts at 18.5° , 299.7 pts at 19.6° , 286 pts at 21.4°

Sp gr of solution sat at $19.2^\circ/4^\circ = 3.1369$ (Kahlbaum, Z anorg 1902, 29 218)

Copper —, $\text{Cu}_2\text{B}_2\text{W}_9\text{O}_{32} + 19\text{H}_2\text{O}$

25 pts H_2O dissolve 100 pts salt Sp gr of solution = 2.6 (Klein)

Lead —, $\text{Pb}_2\text{B}_2\text{W}_9\text{O}_{32} + 11\text{H}_2\text{O}$

Sl sol in cold easily sol in hot H_2O (Klein)

Lithium —, (?)

Very sol in H_2O Sp gr of solution is about 3

Magnesium —, $\text{Mg}_2\text{B}_2\text{W}_9\text{O}_{32} + 22\text{H}_2\text{O}$

Very sol in H_2O (Klein)

Manganese —, $\text{Mn}_2\text{B}_2\text{W}_9\text{O}_{32} + 17\text{H}_2\text{O}$

100 pts dissolve in 15 pts H_2O Sp gr of solution at $19^\circ = 3.15$ (Klein)

Mercurous —, $3\text{Hg}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 9\text{WO}_3 + 14\text{H}_2\text{O}$ (?)

Precipitate

Insol in H_2O (Klein)

Sol in 20,000 pts dil cold and 1000 pts boiling HNO_3 + Aq of 1.42 sp gr

Nickel —, $\text{Ni}_2\text{B}_2\text{W}_9\text{O}_{32} + 18\text{H}_2\text{O}$

Very sol in H_2O Sp gr of sat solution at $19^\circ = 3.32$

100 pts H_2O dissolve 261.6 pts at 21.2° Sp gr $15.7^\circ/4^\circ$ of solution = 2.2959 (Kahlbaum, Z anorg 1902, 29 218)

Potassium boronotungstate, $\text{K}_4\text{B}_2\text{W}_9\text{O}_{32} + 13\text{H}_2\text{O}$

5 pts salt dissolve in 8 pts H_2O at 9° to form a solution of 1.38 sp gr The saturation at 100° has sp gr of over 2 (Klein)

Silver —, $\text{Ag}_4\text{B}_2\text{W}_9\text{O}_{32} + 14\text{H}_2\text{O}$

Very sl sol in H_2O

Sodium —, $\text{Na}_2\text{H}_2\text{B}_2\text{W}_9\text{O}_{32} + 23\text{H}_2\text{O}$

Very sol in H_2O Solution sat at 1° contains 84 pts salt to 16 pts H_2O (Klein)

$\text{Na}_4\text{B}_2\text{W}_9\text{O}_{32} + 12\text{H}_2\text{O}$ Sol in less than $\frac{1}{3}$ pt H_2O

Thallium —, $\text{Tl}_2\text{B}_2\text{W}_9\text{O}_{32} + 5\text{H}_2\text{O}$

Sl sol in hot H_2O and nearly insol in cold H_2O (Klein)

Uranyl —, $(\text{UO}_2)_3(\text{B}_2\text{W}_9\text{O}_{32})_2 + 80\text{H}_2\text{O}$

Very sol in H_2O (Klein)

Sp gr of solution = 3.1

Zinc —, $\text{Zn}_2\text{B}_2\text{W}_9\text{O}_{32} + 2\text{H}_2\text{O}$

Very sol in H_2O Sp gr of solution is 3.15 (Klein)

Borodecitungstic acid

Barium borodecitungstate, $\text{Ba}_2\text{B}_2\text{W}_{11}\text{O}_{48} + 20\text{H}_2\text{O}$

Sol in H_2O (Klein, C R 99 35)

Borodecitungstic acid, $\text{H}_8\text{B}_2\text{W}_{11}\text{O}_{48} = 4\text{H}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 12\text{WO}_3$

Known only in solution, which decomposes into boronotungstic acid and tungstic acid, when evaporated to a certain concentration (Klein, C R 99 35)

Barium potassium borodecitungstate, $3\text{BaO} \cdot \text{K}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 12\text{WO}_3 + 28\text{H}_2\text{O}$

Potassium —, $\text{K}_8\text{B}_2\text{W}_{11}\text{O}_{48} + 21\text{H}_2\text{O}$

Sol in H_2O (Klein)

$2\text{K}_2\text{O} \cdot 12\text{WO}_3 \cdot \text{B}_2\text{O}_3 + 18\text{H}_2\text{O}$ Sol in H_2O (Klein)

Borotungstic acid, $\text{H}_2\text{B}_2\text{W}_{11}\text{O}_{48} = 6\text{H}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 14\text{WO}_3$

Has not been obtained in the free state (Klein, A ch (5) 28 353)

Barium borotungstic acid, $\text{Ba}_2\text{B}_2\text{W}_{11}\text{O}_{48} = 3\text{BaO} \cdot \text{B}_2\text{O}_3 \cdot 14\text{WO}_3 + 5\text{H}_2\text{O}$

Sl sol in H_2O (Klein)

Barium sodium —, $3\frac{1}{2}\text{BaO} \cdot 1\frac{1}{2}\text{Na}_2\text{O} \cdot 5\text{H}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 14\text{WO}_3 + 29\text{H}_2\text{O}$

Potassium —, $3\text{K}_2\text{O} \cdot \text{H}_2\text{O} \cdot \text{B}_2\text{O}_3 \cdot 14\text{WO}_3 + 22\text{H}_2\text{O}$

Sol in H_2O (Klein)

Silver —, $\text{Ag}_2\text{H}_2\text{B}_2\text{W}_{11}\text{O}_{48} + 7\text{H}_2\text{O}$

Nearly insol in cold H_2O (Klein)

Sodium —, $\text{Na}_4\text{H}_8\text{B}_2\text{W}_{11}\text{O}_{48} + 29\text{H}_2\text{O}$

Sol in H_2O (Klein)

Sodium strontium boroguanatodecatungstate, $3\frac{1}{2}\text{SrO}$, $1\frac{1}{2}\text{Na}_2\text{O}$, B_2O_3 , $14\text{WO}_3 + 29\text{H}_2\text{O}$
Decomp by H_2O (Klein)

Boroundevigintitungstic acid

Barium boroundevigintitungstic acid, 4BaO , B_2O_3 , $19\text{WO}_3 + 30\text{H}_2\text{O}$
Can be cryst from H_2O (Ebenhusen, Dissert 1905)

Boroguanatodecatungstic acid, B_2O_3 , $24\text{WO}_3 + 66\text{H}_2\text{O}$
Deliquescent Somewhat more sol in H_2O than B_2O_3 , $28\text{WO}_3 + 62\text{H}_2\text{O}$ Also more stable (Copaux, C R 1908, 147 975)

Barium boroguanatodecatungstic acid, 5BaO , B_2O_3 , $24\text{WO}_3 + 54\text{H}_2\text{O}$
100 pts H_2O dissolve 50 pts salt (Copaux, A ch 1909, (8) 17 217)
 6BaO , B_2O_3 , $24\text{WO}_3 + 58\text{H}_2\text{O}$ (Copaux, l c)

Cadmium —, 5CdO , B_2O_3 , $24\text{WO}_3 + 51\text{H}_2\text{O}$
Extremely sol in H_2O (Copaux, l c)

Calcium —, 5CaO , B_2O_3 , $24\text{WO}_3 + 44\text{H}_2\text{O}$
Very sol in H_2O (Copaux, l c)

Lithium —, $15\text{Li}_2\text{O}$, B_2O_3 , $24\text{WO}_3 + 38\text{H}_2\text{O}$ (Copaux, l c)

Magnesium —, 5MgO , B_2O_3 , $24\text{WO}_3 + 42\text{H}_2\text{O}$
Very sol in H_2O (Copaux, l c)

Mercurous —, $9\text{Hg}_2\text{O}$, B_2O_3 , $24\text{WO}_3 + 25\text{H}_2\text{O}$ (Copaux, l c)

Potassium —, $5\text{K}_2\text{O}$, B_2O_3 , $24\text{WO}_3 + 36\text{H}_2\text{O}$ (Copaux, l c)

Sodium —, $5\text{Na}_2\text{O}$, B_2O_3 , $24\text{WO}_3 + 5\text{H}_2\text{O}$
As NH_4 salt (Copaux, l c)

Boroguanatodecatungstic acid

Potassium boroguanatodecatungstic acid, $5\text{K}_2\text{O}$, B_2O_3 , $25\text{WO}_3 + 34\text{H}_2\text{O}$ (Ebenhusen, Dissert 1905)

Boroduodecagintitungstic acid, B_2O_3 , $28\text{WO}_3 + 62\text{H}_2\text{O}$
Decomp in boiling aqueous solution (Copaux, C R 1908, 147 975)

Potassium boroduodecagintitungstic acid, $6\text{K}_2\text{O}$, B_2O_3 , $28\text{WO}_3 + 42\text{H}_2\text{O}$
Decomp by boiling alkalis (Copaux, A ch 1909 (8) 17 217)

Borovanadic acid
Sol in H_2O Easily decomp (Guyard, Bull Soc (2) 25 354)

Metabromantimonic acid, $\text{HSbBr}_6 + 3\text{H}_2\text{O}$
Very hygroscopic Loses Br_2 in the air
Decomp by H_2O with separation of antimonic acid (Weinland, B 1903, 36 256)

Ammonium metabromantimonate, $\text{NH}_4\text{SbBr}_6 + \text{H}_2\text{O}$
Loses Br_2 in the air Decomp by H_2O (Weinland, l c)

Iron (ferric) metabromantimonate, $\text{Fe}(\text{SbBr}_6)_3 + 14\text{H}_2\text{O}$
Very hygroscopic Decomp by H_2O (Weinland, l c)

Lithium metabromantimonate, $\text{LiSbBr}_6 + 4\text{H}_2\text{O}$
Very hygroscopic Loses Br_2 in the air
Decomp by H_2O (Weinland, l c)

Nickel metabromantimonate, $\text{Ni}(\text{SbBr}_6)_2 + 12\text{H}_2\text{O}$
Hygroscopic Decomp by H_2O (Weinland, l c)

Potassium metabromantimonate, $\text{KSbBr}_6 + \text{H}_2\text{O}$
Loses Br_2 in the air Decomp by H_2O (Weinland, l c)

Bromarsenious acid
See Arsenyl bromide

Bromauric acid, $\text{HAuBr}_4 + 3\text{H}_2\text{O}$
(Lengfeld, Am Ch J 1901, 26 329)
 $+ 5\text{H}_2\text{O}$ Very sol in H_2O (Thomser pr (2) 13 337)
 $+ 6\text{H}_2\text{O}$ Sol in ether and CHCl_3 without decomp (Lengfeld, Am Ch J 1901, 26 329)

Ammonium bromaurate, NH_4AuBr_4
Ppt (Gutbier, Z anorg 1914, 85 358)

Barium bromaurate
Not deliquescent Sol in H_2O (v Bonsdorff, Pogg 17 261)

Cæsium bromaurate, CsAuBr_4
Sl sol in H_2O or alcohol Insol in ether (Wells and Wheeler, Sill Am J 144 157)
Ppt (Gutbier, Z anorg 1914, 85 360)

Cerium bromaurate, $\text{CeAuBr}_6 + 8\text{H}_2\text{O}$
Sol in H_2O (Jolin, Bull Soc (2) 21 533)

Didymium bromaurate, $\text{DyAuBr}_6 + 9\text{H}_2\text{O}$
Very deliquescent Sol in H_2O (Cleve)

Lanthanum bromaurate, $\text{LaAuBr}_6 + 9\text{H}_2\text{O}$
Sol in H_2O (Cleve)

Magnesium bromaurate
Deliquescent in moist air (v Bonsdorff)

Manganese bromaurate
Deliquescent (v Bonsdorff)

Potassium bromaurate, KAuBr₄

Sl sol in H₂O. More sol in cold alcohol than in H₂O (v Bonsdorff).
 +2H₂O. Sol in 5.12 pts H₂O at 15°, 1.56 pts at 40°, and 0.48 pt at 67°. Decomp by ether. Sl sol in KBr + Aq (Schottlander, A 217 314).

+5H₂O Efflorescent (v Bonsdorff)

Rubidium bromaurate, RbAuBr₄

As caesium bromaurate

Ppt (Gutbier, Z anorg 1914, 85 359)

Samarium bromaurate, SmAuBr₆ + 10H₂O

Very deliquescent (Cleve, Bull Soc (2) 43 165)

Sodium bromaurate, NaAuBr₄

Slowly sol in H₂O (v Bonsdorff)

Zinc bromaurate, Zn(AuBr₄)₂

Very deliquescent (v Bonsdorff)

Bromauricyanhydric acid

Not known in free state

Barium bromauricyanide, Ba[Au(CN)₂Br]₂ + 10H₂O

Very sol in hot or cold H₂O, also in alcohol (Lindbom, Lund Univ Arsk 12 No 6)

Cadmium bromauricyanide, Cd[Au(CN)₂Br]₂ + 6H₂O

Very sol in hot or cold H₂O, but solution is unstable (Lindbom)

Calcium bromauricyanide, Ca[Au(CN)₂Br]₂ + 10H₂O

Extremely sol in H₂O and alcohol (Lindbom)

Cobalt bromauricyanide, Co[Au(CN)₂Br]₂ + 9H₂O

Moderately sol in H₂O. Less sol than other bromauricyanides (Lindbom)

Potassium bromauricyanide, KAu(CN)₂Br + 3H₂O

Sol in H₂O and alcohol

Sodium bromauricyanide, NaAu(CN)₂Br + 2H₂O

Very sol in H₂O or alcohol

Strontium bromauricyanide, Sr[Au(CN)₂Br] + 2H₂O

Very sol in H₂O or alcohol

Zinc bromauricyanide, Zn[Au(CN)₂Br] + 8H₂O

Easily sol in cold or hot H₂O

Bromhydric acid, HBr

Very sol in H₂O

The most concentrated HBr + Aq has a sp gr of 1.78, and contains 82.02% HBr (Champion and Pellat, C R 70 620). This, or a weak acid on heating leaves a residue which

distils unchanged at 125–125.5° under 765 mm pressure, and contains 48.17% HBr (Topsoe), at 126° under 758 mm pressure, and contains 46.83% HBr (Bineau), and has sp gr = 1.486 at 20° (Bineau), sp gr = 1.3 at 20° (Champion and Pellat), sp gr = 1.1 at 20° (Topsoe).

According to Roscoe (A 116 214) an acid of constant composition, obtained by boiling a stronger or a weaker acid, if distilled under 752–76° mm pressure, contains 47.38–47.6% HBr, and boils at 126° at 760 mm pressure, but the composition is dependent on the pressure, as, for example, under 1952 mm pressure, the residue boils at 153°, and contains 46.3% HBr (Roscoe).

By conducting dry air through HBr + Aq an acid is obtained containing 51.65% HBr if at 16°, and 49.35% HBr if at 100° (Roscoe). 1 vol H₂O dissolves 600 vols HBr at 10° (Berthelot, C R 76 679).

1 pt H₂O at t° and 760 mm pressure dissolves pts HBr

t°	Pts HBr	t°	Pts HBr	t°	Pts HBr
–25	2 550	–5	2 280	+50	715
–20	2 473	0	2 212	+75	505
–15	2 390	+10	2 103	+100	300
–10	2 335	+25	1 930		

(Roozeboom, R t c 4 107)

Absorption by 1 pt H₂O at t° and p p ssure in mm

t° = –25°

p	1 ts HBr	p	1 ts HBr
760	2 550	100	0.56
300	2 263	1	7.5
140	2 120	0.5	10

t° = –20°

p	Pts HBr	p	1 ts HBr
760	2 473	130	0.56
375	2 267	20	5.50
180	2 119		

t° = –15°

p	1 ts HBr	p	1 ts HBr
760	2 390	175	0.56
470	2 266	102	9.80
250	2 119		

t° = –11.3°

p	1 ts HBr	p	1 ts HBr
760	2 350	310	115
570	2 265	216	0.55

$t^{\circ} = -5^{\circ}$

p	Pts HBr	p	Pts HBr
760	2 280	430	2 117
730	2 264	298	2 055

 $t^{\circ} = 0^{\circ}$

p	Pts HBr	p	Pts HBr
760	2 212	380	2 054
540	2 116	5	1 085

(Roozeboom, R t c 4 107)

Sp gr of HBr+Aq

Sp gr	% HBr	Temp	Sp gr	% HBr	Temp
1 055	7 67	14°	1 335	36 67	13°
1 075	10 19	14°	1 349	37 86	13°
1 089	11 94	14°	1 368	39 13	13°
1 097	12 96	14°	1 419	43 12	13°
1 118	15 37	14°	1 431	43 99	13°
1 131	16 92	14°	1 438	44 62	13°
1 164	20 65	14°	1 451	45 45	14°
1 200	24 35	13°	1 460	46 09	13°
1 232	27 62	13°	1 485	47 87	14°
1 253	29 68	13°	1 490	48 17	14°
1 302	33 84	13°			

(Topsoe, B 3 404)

Sp gr of HBr+Aq at 14°

% HBr	Sp gr	% HBr	Sp gr	% HBr	Sp gr
1	1 007	18	1 140	35	1 314
2	1 014	19	1 149	36	1 326
3	1 021	20	1 158	37	1 338
4	1 028	21	1 167	38	1 351
5	1 035	22	1 176	39	1 363
6	1 043	23	1 186	40	1 376
7	1 050	24	1 196	41	1 389
8	1 058	25	1 206	42	1 403
9	1 065	26	1 215	43	1 417
10	1 073	27	1 225	44	1 431
11	1 081	28	1 235	45	1 445
12	1 089	29	1 246	46	1 459
13	1 097	30	1 257	47	1 473
14	1 106	31	1 268	48	1 487
15	1 114	32	1 279	49	1 502
16	1 122	33	1 290		
17	1 131	34	1 302		

(Topsoe calculated by Gerlach, Z anal 27 116)

Sp gr of HBr+Aq at 15°

% HBr	Sp gr	% HBr	Sp gr	% HBr	Sp gr
5	1 038	25	1 204	45	1 435
10	1 077	30	1 252	50	1 515
15	1 177	35	1 305		
20	1 159	40	1 365		

Only a 'moderate degree of accuracy' is claimed for this table (Wright, C N 23 242)

Sp gr of HBr+Aq at 15°

% HBr	Sp gr	% HBr	Sp gr	% HBr	Sp gr
1	1 0082	18	1 145	35	1 314
2	1 0155	19	1 154	36	1 326
3	1 0230	20	1 163	37	1 338
4	1 0305	21	1 172	38	1 350
5	1 038	22	1 181	39	1 362
6	1 046	23	1 190	40	1 375
7	1 053	24	1 200	41	1 388
8	1 061	25	1 209	42	1 401
9	1 069	26	1 219	43	1 415
10	1 077	27	1 229	44	1 429
11	1 085	28	1 239	45	1 444
12	1 093	29	1 249	46	1 459
13	1 102	30	1 260	47	1 474
14	1 110	31	1 270	48	1 490
15	1 119	32	1 281	49	1 496
16	1 127	33	1 292	50	1 513
17	1 136	34	1 303		

(Biel, C C 1882 143)

Absorbed by alcohol with formation of C_2H_5Br

The composition of the hydrates formed by HBr at different dilutions is calculated from determinations of the lowering of the fr pt produced by HBr and of the conductivity and sp gr of HBr+Aq (Jones, Am Ch J 1905, 34 326)

+H₂O (Roozeboom, R t c 5 363)+2H₂O (Berthelot, A ch (5) 14 369)

(Pickering Chem Soc 1894, 64 (2) 232)

Mpt -11 2° (Pickering, l c)

+3H₂O Mpt -48 0° (Pickering)+4H₂O Mpt -55 8° (Pickering)+5H₂O (Pickering)**Bromhydric cyanhydric acid, 3HBr, 2HCN**Decomp by H₂O and alcohol

Insol in ether (Gautier, A ch (4) 17 141)

Bromic acid, HBrO₃

Known only in aqueous solution

Solution evaporated on water bath decomposes when it contains 4 26% HBrO₃. In vacuo, in acid containing 50 59% HBrO₃, corresponding to formula HBrO₃+7H₂O can be obtainedNot decomp by dil HNO₃, or H₂SO₄+Aq. Conc H₂SO₄ decomposesAlcohol and ether are quickly oxidized by HBrO₃**Bromates**Most of the bromates are very sol in H₂O, a few are sl sol, but none are insol, the least sol being AgBrO₃ and Hg (BrO₃)₂**Aluminum bromate, Al(BrO₃)₃**

Deliquescent (Rammelsberg, Pogg 55 63)

+9H₂O Mpt 62 3° Less hygroscopic

than $\text{Al}(\text{ClO}_3)_2$ (Dobrosserdow, C C 1907 I, 1723)

Ammonium bromate, NH_4BrO_3

Decomposes spontaneously, sol in H_2O (Rammelsberg, Pogg 52 85)

Barium bromate, $\text{Ba}(\text{BrO}_3)_2$

Solubility of $\text{Ba}(\text{BrO}_3)_2$ in H_2O 100 g sat $\text{Ba}(\text{BrO}_3)_2 + \text{Aq}$ at t° contain g anhydrous $\text{Ba}(\text{BrO}_3)_2$

t°	grams $\text{Ba}(\text{BrO}_3)_2$	t°	grams $\text{Ba}(\text{BrO}_3)_2$
Eutectic point			
-0.034° ± 0.002°	0.280	50°	1.72
0°	0.286	60°	2.271
+10°	0.439	70°	2.922
20°	0.652	80°	3.521
25°	0.788	90°	4.26
30°	0.95	98.7°	5.256
40°	1.31	*99.65°	5.39

*99.65° is bpt at 740 mm = 100.39° at 760 mm

(Anschutz, Z phys Ch 1906, 56 240)

100 g sat $\text{Ba}(\text{BrO}_3)_2 + \text{Aq}$ contain 0.793 g $\text{Ba}(\text{BrO}_3)_2$ at 25° Sp gr of the solution at 25°/4° = 1.0038 (Harkins J Am Chem Soc 1911, 33 1815)

Solubility of $\text{Ba}(\text{BrO}_3)_2$ in salts + Aq at 25° C = concentration of salt in salt + Aq in milliequivalents per l

d_1 = Sp gr at 25°/4° of salt + Aq

S = solubility of $\text{Ba}(\text{BrO}_3)_2$ in salt + Aq expressed in milliequivalents per l

d_2 = sp gr at 25°/4° of $\text{Ba}(\text{BrO}_3)_2 + \text{salt} + \text{Aq}$

Salt	C	d_1	S	d
None			40.18	1.0038
KNO_3	25.018	0.9985	43.86	1.0059
	50.032	1.0030	47.03	1.0081
	99.970	1.0033	52.13	1.0120
$\text{Ba}(\text{NO}_3)_2$	25.018	1.0003	36.77	1.0059
	50.039	1.0025	34.74	1.0083
	99.97	1.0073	32.63	1.0132
	199.95	1.0183	30.95	1.0233
KBrO_3	24.988	1.0001	26.53	1.0046
	49.971	1.0031	17.37	1.0062
	99.85	1.0093	8.76	1.0109
$\text{Mg}(\text{NO}_3)_2$	100.0		52.57	1.0114

(Harkins, J Am Chem Soc 1911 33 1815)

+ H_2O Sol in 130 pts cold, and 24 pts boiling H_2O (Rammelsberg, Pogg 52 81)

Decomp by H_2SO_4 , or $\text{HCl} + \text{Aq}$

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Bismuth bromate

Known only in solution, which decomposes on evaporation (Rammelsberg, Pogg 55)

Cadmium bromate, $\text{Cd}(\text{BrO}_3)_2 + \text{H}_2\text{O}$

Sol in 0.8 pt cold H_2O (Rammelsberg, Pogg 55 74)

+ $2\text{H}_2\text{O}$ (Topsoe, J B 1872, 164)

Cadmium bromate ammonia, $\text{Cd}(\text{BrO}_3)_2 \cdot 3\text{NH}_3$

Decomp by H_2O (Rammelsberg, Pogg 55 74)

$\text{Cd}(\text{BrO}_3)_2 \cdot 4\text{NH}_3$ Ppt (Ephraïm B 1915, 48 51)

Calcium bromate, $\text{Ca}(\text{BrO}_3)_2 + \text{H}_2\text{O}$

Sol in 1.1 pts cold H_2O (Rammelsberg, Pogg 52 98)

Cerous bromate, $\text{Ce}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Easily sol in H_2O (Rammelsberg, Pogg 55 63)

Mpt 49°, very sol in H_2O with decomp (James, J Am Chem Soc 1909, 31 91)

Cobaltous bromate, $\text{Co}(\text{BrO}_3)_2 + 6\text{H}_2\text{O}$

Sol in 2.2 pts cold H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 55 71)

Cupric bromate, basic, $6\text{CuO} \cdot \text{Br}_2\text{O}_7 + 1 \cdot \text{H}_2\text{O}$

Ppt (Rammelsberg, Pogg 55 78)

Cupric bromate, $\text{Cu}(\text{BrO}_3)_2 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Rammelsberg, Pogg 52 92)

Cupric bromate ammonia, $\text{Cu}(\text{BrO}_3)_2 \cdot \text{NH}_3$

Completely sol in a little H_2O , but decomp by dilution

Insol in alcohol (Rammelsberg, Pogg 52 92)

Didymium bromate, $\text{Dy}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Sol in H_2O (Maignan)

Dysprosium bromate, $\text{Dy}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Mpt 75° Easily sol in H_2O Difficultly sol in alcohol (Luttsch, B 1911 44 275)

Erbium bromate, $\text{Er}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Very sol in alcohol and H_2O

Glucinum bromate

Deliquescent

Iron (ferrous) bromate, $\text{Fe}(\text{BrO}_3)_2$

Sol in H_2O , but solution decomposes very easily

Iron (ferric) bromate, $\text{Fe}(\text{BrO}_3)_3$

Partially sol in H_2O with separation of a more basic salt Sol in $\text{HBrO}_4 + \text{Aq}$ (Rammelsberg, Pogg 55 68)

Lanthanum bromate, $\text{La}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Sol in 3.12 pts H_2O at 15° (Maignan, Ann Min (5) 15 274)

Mpt 37.5° in its water of crystallization 416 pts are sol in 100 pts H_2O at 25° (James, J Am Chem Soc 1909, 31 13)

Lead bromate, basic, 3PbO , $\text{Pb}(\text{BrO}_3)_2 + 2\text{H}_2\text{O}$

Ppt (Stromholm, Z anorg 1904, **38** 441)

Lead bromate, $\text{Pb}(\text{BrO}_3)_2$

Sl sol in H_2O 13.37 x 10^{-1}g are contained in 1 liter of sat solution at 20° (Bottger, Z phys Ch 1903, **46** 603)

+ H_2O Sol in 75 pts cold H_2O (Rammelsberg, Pogg **52** 96)

Lithium bromate, LiBrO_3

Very deliquescent, and sol in H_2O (Rammelsberg, Pogg A **55** 63)

Not deliquescent (Potililtzin, B **23** 545 R)

Sp gr of solution sat at $18^\circ = 1.833$, and contains 60.4% LiBrO_3 (Mylius, B 1897, **30** 1718)

+ H_2O Not deliquescent (Potililtzin)

Magnesium bromate, $\text{Mg}(\text{BrO}_3)_2 + 6\text{H}_2\text{O}$

Efflorescent Sol in 1.4 pts cold H_2O at 15° Melts in its water of crystallization when heated (Rammelsberg, Pogg **52** 89)

Mercurous bromate, basic, $2\text{Hg}_2\text{O}$, Br_2O_5

Insol in warm H_2O Sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg **55** 79)

Mercurous bromate, $\text{Hg}_2(\text{BrO}_3)_2$

Decomp by H_2O into basic salt Difficultly sol in $\text{HNO}_3 + \text{Aq}$, easily sol in $\text{HCl} + \text{Aq}$ (Rammelsberg)

Mercuric bromate, basic, 2HgO , $\text{Br}_2\text{O}_5 + \text{H}_2\text{O}$

Slowly decomp by cold, quickly by hot H_2O into oxide and an acid salt

Easily sol in dil acids (Topsoe, W A B **66**, **2** 2)

Mercuric bromate, $\text{HgBrO}_3 + 2\text{H}_2\text{O}$

Sol in 650 pts cold, and 64 pts boiling H_2O Sl sol in $\text{HNO}_3 + \text{Aq}$ Easily sol in $\text{HCl} + \text{Aq}$ (Rammelsberg, Pogg **55** 79)

Mercuric bromate ammonia

Sol with decomp in $\text{HCl} + \text{Aq}$ (Storer's Dict)

Neodymium bromate, $\text{Nd}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Mpt 66.7° 146 pts are sol in 100 pts H_2O at 25° (James, J Am Chem Soc 1909, **31** 915)

Nickel bromate, $\text{Ni}(\text{BrO}_3)_2 + 6\text{H}_2\text{O}$

Sol in 3.58 pts cold H_2O (Rammelsberg, Pogg **55** 69)

Nickel bromate ammonia, $\text{Ni}(\text{BrO}_3)_2, 2\text{NH}_3$

Sol in H_2O , with decomposition of the major portion Insol in alcohol (Rammelsberg, l c)

$\text{Ni}(\text{BrO}_3)_2, 6\text{NH}_3$ Ppt (Ephraim, B 1915, **48** 50)

Potassium bromate, KBrO_3

100 pts H_2O dissolve 6.58 pts KBrO_3 at 15° (Rammelsberg) 100 pts H_2O dissolve 5.83 pts KBrO_3 at 17.1° (Pohl W A B **6**

595), at 0° , 3.11 pts, at 20° , 6.92 pts, at 40° , 13.24 pts, at 60° , 22.76 pts, at 80° , 33.90 pts, at 100° 49.75 pts KBrO_3 Sat solution boils at 104° (Kremers, Pogg **97** 5)

1 l H_2O at 25° dissolves 0.4715 moles KBrO_3 (Geffcken, Z phys Ch 1904, **49** 296)

1 l H_2O dissolves 0.478 mol KBrO_3 at 25° (Rothmund, Z phys Ch 1909, **69** 539)

Sp gr of $\text{KBrO}_3 + \text{Aq}$ at 19.5°

% KBrO_3	1	2	3	4	5
Sp gr	1.009	1.016	1.024	1.031	1.039

% KBrO_3	6	7	8	9	10
Sp gr	1.046	1.054	1.062	1.070	1.079

(Gerlach, Z anal **8** 290)

Solubility of KBrO_3 in salts + Aq at 25°

Salt	Moles of KBrO_3 sol in 1 liter of				
	5-N solution	N solution	2-N solution	3-N solution	4-N solution
NaNO_3	0.5745	0.6497	0.7680	0.9026	1.031
NaCl	0.5220	0.5616	0.6042	0.6244	0.640

(Geffcken, Z phys Ch 1904, **49** 296)

Easily sol in liquid HF (Franklin, Z anorg 1905, **46** 2)

Sl sol in alcohol (Rammelsberg)

Insol in absolute alcohol

Solubility in organic compds + Aq at 25°

Solvent	Mol KBrO_3 sol in 1 litre
Water	0.478
0.5-N Methyl alcohol	0.444
" Ethyl alcohol	0.421
" Propyl alcohol	0.409
" Tert amyl alcohol	0.383
" Acetone	0.425
" Ether	0.395
" Formaldehyde	0.397
" Glycol	0.448
" Glycerine	0.451
" Mannitol	0.451
" Glucose	0.463
" Sucrose	0.431
" Urea	0.477
" Dimethyl pyrone	0.478
" Ammonia	0.445
" Diethylamine	0.384
" Pyridine	0.415
" Piperidine	0.396
" Urethane	0.433
" Formamide	0.473
" Acetamide	0.445
" Glyceroll	0.501
" Acetic acid	0.456
" Phenol	0.426
" Methylal	0.405
" Methyl acetate	0.420

(Rothmund, Z phys Ch 1909, **69** 539)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Praseodymium bromate, $\text{Pr}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Mpt 56.5° 190 pts are sol in 100 pts H_2O at 25° (James, J Am Chem Soc 1909, 31 914)

Samarium bromate, $\text{Sm}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Mpt 75° 114 pts are sol in 100 pts H_2O at 25° Very sl sol in alcohol (James, J Am Chem Soc 1909, 31 915)

Scandium bromate

(Crookes, Roy Soc Proc 1908, 80, A, 518)

Silver bromate, AgBrO_3

1 pt H_2O dissolves 0.00810 pt AgBrO_3 at 24.5° (Noyes, Z phys Ch 6 246)

Sol in 595.3 pts H_2O at 25°

Sol in 320.4 pts $\text{HNO}_3 + \text{Aq}$ (sp gr 1.21) at 25°

Sol in 2.2 pts $\text{NH}_4\text{OH} + \text{Aq}$ (sp gr 0.96) at 25° (Longi, Gazz ch it 13 87)

1 l H_2O dissolves 1.71 g AgBrO_3 at 27° (Whitby, Z anorg 1910, 67 108)

Sl sol in H_2O 1.59 x 10^{-4} g are contained in 1 liter of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

Insol in HNO_3 (Lowig) Easily sol in

ate ammonia, $\text{AgBrO}_3, 2\text{NH}_3$

in air or by H_2O (Rammelsberg 52 94)

bromate, NaBrO_3

100 pts H_2O at 15° (Rammelsberg)

100 pts H_2O dissolve at—

0° 20° 40° 60° 80° 100°

27.54 34.48 50.25 62.57 75.90 9 pts NaBrO_3 (Kremers, Pogg 94 271)

Easily forms supersaturated solutions

Sat solution boils at 109° (Kremers)

$\text{NaBrO}_3 + \text{Aq}$ containing 10.10% NaBrO_3 has sp gr 20°/20° = 1.0818

$\text{NaBrO}_3 + \text{Aq}$ containing 11.09% NaBrO_3 has sp gr 20°/20° = 1.0900

(Le Blanc and Rohland, Z phys Ch 1896 19 278)

Sp gr of $\text{NaBrO}_3 + \text{Aq}$ at 19.5°

% NaBrO_3	5	10	15
Sp gr	1.041	1.083	1.129

% NaBrO_3	20	25	30
Sp gr	1.178	1.231	1.289

(Kremers, Pogg 97 5, calculated by Gerlach, Z anal 8 290)

Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sodium bromate bromide, $3\text{NaBrO}_3, 2\text{NaBr} + 3\text{H}_2\text{O}$

Decomp by H_2O or alcohol (Fritzsche)

Strontium bromate, $\text{Sr}(\text{BrO}_3)_2 + \text{H}_2\text{O}$

Sol in 3 pts H_2O (Rammelsberg, Pogg 52 84), less sol in H_2O than $\text{SrBr}_2 + 6\text{H}_2\text{O}$ (Lowig)

Thallous bromate, TlBrO_3

Sl sol in hot H_2O , easily sol in $\text{HNO}_3 + \text{Aq}$ (Oettinger)

Easily sol in H_2O and dil acids (Ditte, A ch (6) 21 145)

Terbium bromate, $\text{Tb}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

Not deliquescent (Potratz, C N 1905, 92, 3)

Thallous bromate, TlBrO_3

1 l H_2O at 39.75° dissolves 2.216 x 10^{-6} g mol (Noyes and Abbott, Z phys Ch 1895, 16 130)

Sl sol in H_2O 3.46 x 10^{-1} gram are contained in 1 liter of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

Thallic bromate, $\text{Tl}(\text{BrO}_3)_3 + 3\text{H}_2\text{O}$

Very hygroscopic Easily decomp by H_2O (Gewecke, Z anorg 1912, 75 275)

Thulium bromate, $\text{Tm}_2(\text{BrO}_3)_6 + 18\text{H}_2\text{O}$

Pptd from sat aqueous solution by 95% alcohol

NH_4OH is the best precipitant (Juncs, J Am Chem Soc 1911, 33 1342)

Tin (stannous) bromate (?)

Insol in H_2O , sol in $\text{HCl} + \text{Aq}$

Uranyl bromate, $4\text{UO}_3, 3\text{Br}_2\text{O}_5 + 16\text{H}_2\text{O}$

Sol in H_2O (Rammelsberg)

Yttrium bromate, $\text{Y}(\text{BrO}_3)_3 + 9\text{H}_2\text{O}$

More easily sol in H_2O than $\text{Y}(\text{IO}_3)_3$ Sl sol in alcohol Insol in ether (Clay)

Mpt 74° 168 pts are sol in 100 pts H_2O at 25°

Sl sol in alcohol (Juncs, J Am Chem Soc 1909, 31 916)

Zinc bromate, $\text{Zn}(\text{BrO}_3)_2 + 6\text{H}_2\text{O}$

Sol in 1 pt cold H_2O (Rammelsberg, Pogg 52 90)

Zinc bromate ammonia, $\text{Zn}(\text{BrO}_3)_2 \cdot 2\text{NH}_3 + 3\text{H}_2\text{O}$

Decomp by H_2O and alcohol Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 52 90)

$\text{Zn}(\text{BrO}_3)_2, 4\text{NH}_3$ Ppt (L. phi uni, B 1915, 48 51)

Perbromic acid

See **Perbromic acid**

Bromides

Most bromides are sol in H_2O , many in alcohol, and some in ether

$AgBr$ and Hg_2Br_2 are insol in H_2O or acids, $PbBr_2$ and $TlBr$ are sl sol therein Cu_2Br_2 is insol in H_2O , sol in acids

See under each element

Bromine, Br.

1 pt Br dissolves at 15° in 33 pts H_2O (Lowig, Pogg **14** 485)

1 pt Br dissolves at 15° in 31 pts H_2O (Dancer, Chem Soc **15** 477)

Solubility of Br in 100 pts H_2O at t°

t	Pts Br	t°	Pts Br	t°	Pts Br
5	3 600	15	3 226	25	3 167
10	3 327	20	3 208	30	3 126

(Dancer, *l c*)

A sat aqueous solution of Br contains 4.05% Br at 0° , 3.80% Br at 3° , 3.33% Br at 10° (Roozeboom, R t c **3** 29, 59, 73, 84)

1 l H_2O dissolves 34 g Br at 25° (Jakowkin, Z phys Ch **1896**, **20** 25)

1 pt is sol in 30 pts H_2O (Dietze, Chem Soc **1899**, **76** (2) 150)

100 pts H_2O dissolve at
 0° 10 34° 19 96° 30 17° 40 03° 49 85°
 4 167 3 740 3 578 3 437 3 446 3 522
 pts bromine

Liquid bromine as such is insol in H_2O , only the vapor dissolves (Winkler, Ch Z **1899**, **23** 688)

1 l H_2O dissolves 33.95 g Br_2 at 25° (Mö-Lauchlan, Z phys Ch **1903**, **44** 617)

**Solubility of bromine vapor in H_2O at t°
 α = coefficient of absorption**

t	α	t	α
0	60.5	42	8.6
2	54.1	44	7.9
4	48.3	46	7.4
6	43.3	48	6.9
8	38.9	50	6.5
10	35.1	52	6.1
12	31.5	54	5.8
14	28.4	56	5.4
16	25.7	58	5.1
18	23.4	60	4.9
20	21.3	62	4.6
22	19.4	64	4.4
24	17.7	66	4.2
26	16.3	68	4.0
28	15.0	70	3.8
30	13.8	72	3.6
32	12.7	74	3.4
34	11.7	76	3.3
36	10.9	78	3.1
38	10.1	80	3.0
40	9.4		

(Winkler, Ch Z **1899**, **23** 688)

**Solubility of bromine vapor
(Mean of many determinations)**

Temp	Pressure	Absorption coefficient
0 0	56-13mm	60 53
9 94°	89-16	35 22
20 46	138-9	20 87
30 38	179-12	13 65
40 31	229-26	9 22
50 25	274-53	6 50
60 04	314-46	4 84
69 98	154-54	3 82
80 22	396-74	2 94

**Solubility of liquid bromine
(The mean of many determinations)**

Temp	0°	10 34°	19 96	30 17°	40 03°	49 85°
Pts H_2O that dissolve 1 pt Br_2	24 0	26 74	27 94	29 10	29 02	28 38

Much less Br_2 is sol in ice cold H_2O in the presence of bromine hydrate

**Solubility in presence of bromine hydrate
(The mean of many determinations)**

Temp	0°	5 12°
Pts H_2O that dissolve 1 pt Br_2	42 39	26 26

(Winkler, Ch Z **1899**, **23** 688-689)

Solubility of Br_2 in H_2O at $25^\circ = 0.21$ mols in 1 l (Bray, J Am Chem Soc **1910**, **32** 398)

Sp gr of $Br_2 + Aq$ containing pts Br in 1000 pts solution

Pts Br	Sp gr	Pts Br	Sp gr
10 72	1 00901	18 74-19 06	1 01491
10 68	1 00931	19 52-20 09	1 01585
12 05	1 00995	20 89-21 55	1 01807
12 21	1 01223	31 02-31 69	1 02367

(Stessor, N Edin Phil J **7** 287)

Sp gr of $Br + Aq$ at 32.5°

% Br by weight	Sp gr
0 7214	0 999814
1 1172	1 002520
1 6448	1 006100
1 9956	1 008870
2 5960	1 013200

(Joseph, Chem Soc **1915**, **107** 3)

Sol in conc HCl , HBr , conc solutions of bromides, and in liquid SO (Sestini, Zeit Chem **1868** 718)

Much more sol in $HCl + Aq$ than in H_2O
 100 cem $HCl + Aq$ of 1.153 sp gr dissolve 36.4 g Br at 12°

More sol in $BrCl_3$ and $BaCl_2 + Aq$ than in H_2O (Berthelot, C R **100** 761)

Bromine is not more sol in $\text{KBr} + \text{Aq}$ than in H_2O (?) (Balard)

$\text{KBr} + \text{Aq}$ containing 1 pt KBr to 6 pts H_2O takes up as much Br as it already contains, when this solution is heated the dissolved Br is separated 1 pt $\text{KBr} + 1$ pt H_2O takes up twice as much Br as it already contains, much heat being evolved This solution loses Br on exposure to the air or when heated (Lowig)

Solubility of Br_2 in $\text{KBr} + \text{Aq}$

g Mols KBr per l	g at Br dissolved per l at 18°	g at Br dissolved per l at 26°
0 00	0 4448	0 4282
0 01	0 4634	0 4490
0 02	0 4823	0 4671
0 03	0 5049	0 4925
0 04	0 5243	0 5101
0 05	0 5431	0 5301
0 06	0 5668	0 5530
0 07	0 5895	0 5636
0 08	0 6059	0 5920
0 09	0 6301	0 5981
0 1	0 6533	0 6488
0 2	0 8718	0 8591
0 3	1 0549	1 0787
0 4	1 3124	1 2704
0 5	1 5436	1 4731
0 6	1 7712	1 6717
0 7	2 0006	1 9197
	2 2354	2 1029
	2 4851	2 3349

The above figures indicate that below a concentration of 0.1 g mol KBr per l just enough Br is dissolved to form KBr_3 , while above that concentration somewhat larger amounts of Br are dissolved, which is greater at the lower temp

(Worley, Chem Soc 1905, 87 1109)

Solubility of Br_2 in $\text{NaBr} + \text{Aq}$ at 25°

g NaBr per l	g atoms Br_2 per l	Sp gr
92 6	2 479	1 213
160 5	4 345	1 372
205 8	6 195	1 515
255 8	8 575	1 678
319 7	13 65	1 997
359 0	16 04	2 137
	19 23	2 327
408 3	20 85	2 420

(Bell, J Am Chem Soc 1912, 34 14)

Solubility in salts + Aq Solubility in 1 liter $\text{K}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{K}_2\text{SO}_4 + \text{Aq}$	g Bromine
1-N	25 14
$1/2$ -N	29 44
$1/4$ -N	31 46
$1/8$ -N	32 70
$1/16$ -N	33 10

(Jakowkin, Z phys Ch 1896, 20, 26)

Solubility in 1 liter $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{Na}_2\text{SO}_4 + \text{Aq}$	g Bromine
1-N	25 07
$1/2$ -N	29 20
$1/4$ -N	31 33
$1/8$ -N	32 94
$1/16$ -N	33 26

(Jakowkin, l c)

Solubility in 1 liter $\text{NaNO}_3 + \text{Aq}$ at 25°

$\text{NaNO}_3 + \text{Aq}$	g Bromine
1-N	28 80
$1/2$ -N	31 35
$1/4$ -N	32 62
$1/8$ -N	33 33
$1/16$ -N	33 74

(Jakowkin, l c)

Solubility in salts + Aq at 25°

Salt + Aq	g Br_2 sol in 1 liter
$1/2$ -N Na_2SO_4	23 90
$1/2$ -N K_2SO_4	24 80
$1/2$ -N $(\text{NH}_4)_2\text{SO}_4$	77 7
N NaNO_3	28 00
N KNO_3	28 95
N NH_4NO_3	55 15
N NaCl	55 90
N KCl	57 40
N NH_4Cl	82 2

(McLauchlan, Z phys Ch 1903, 44 617)

Solubility in $\text{HgBr}_2 + \text{Aq}$ at 25°

10 ccm of the solution contain —

Millimols Br_2	Millimols Hg
2 125	0
2 204	0 0560
2 216	0 0793
2 226	0 1284
2 231	0 2120

(Hetz and Paul, Z inorg 1914 85 215)

1 l N $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ dissolves 340.5 g Br_2 at 25° (McLauchlan Z phys Ch 1903, 44 617)

Miscible in all proportions with liquid NO (Frankland, Chem Soc 1901, 79 1361)

More sol in alcohol than in H_2O , miscible with ether, CS_2 , CHCl_3 (Sestini, Zeit Chem 1868 718)

Somewhat soluble in glycerine (Pelouze) Sol in benzene (Munsfield), insol in benzene (Moride, A ch (3) 39 452) Sol in warm chloral, bromal and iodol (Lowig, Pogg 14 485) Sol in SCl (Solly) and SBr Sol in conc HCl , $\text{H}_2\text{O} + \text{Aq}$ (Balard) Sol in aqueous solution of potassium, sodium, or calcium acetates (Chouros)

Solubility in CS₂100 g of the sat solution contain at
-95° -110 5° -116°45 4 39 0 36 9 g Br₂
(Arcetowski, Z anorg 1896, 11 274)Cryst from CS₂ at -90° in fine needles
(Arcetowski, Z anorg 1895, 10 25)Sp gr of Br₂+CCl₄ at 32 5°

% Br ₂ by weight	Sp gr
1 5449	1 58014
1 6454	1 58080
1 7990	1 58168
2 6676	1 58812
3 5833	1 59526

(Joseph, Chem Soc 1915, 107 3)

Sp gr of Br₂+nitrobenzene at 32 5°

% Br ₂ by weight	Sp gr
1 5643	1 20225
3 2323	1 21449
4 6462	1 22518
6 1826	1 23603

(Joseph, Chem Soc 1915, 107 3)

Very sol in benzonitrile (Naumann, B
1914, 47 1369)Sol in acetone (Eidmann, C C 1899,
II, 1014, Naumann, B 1904, 37 4328)Partition of Br₂ between water and other
solventsW=millimols Bromine in 10 ccm of the
aqueous layerG=millimols Bromine in 10 ccm of the
other layer

Other solvent	G	W	G/W
CCl ₄	1 949	0 0853	22 73
	7 008	0 3085	22 71
	12 171	0 5300	23 13
	39 880	1 3132	30 32
	54 574	1 5560	35 01
75% by vol CCl ₄ +25% by vol CS ₂	3 567	0 0985	37 06
	7 304	0 1910	38 15
	10 833	0 2900	37 36
	13 922	0 3720	37 42
	17 230	0 4580	37 62
	25 637	0 6580	38 96
	40 625	0 9940	40 88
	54 035	1 2080	44 73
50% by vol CCl ₄ + 50% by vol CS ₂	3 592	0 0784	45 82
	6 820	0 1487	46 85
	10 148	0 2206	46 01
	13 866	0 3065	45 24
	16 616	0 3688	45 05
	42 975	0 8086	53 15
	55 965	0 9960	56 19
25% by vol CCl ₄ +75% by vol CS ₂	5 753	0 0884	65 05
	10 902	0 1682	64 82
	26 724	0 4970	65 65
	41 314	0 6331	65 26
	55 526	0 8520	65 17

Partition of Br₂, etc —*Continued*

Other solvent	G	W	G/W
CS ₂	7 750	0 1015	76 35
	10 600	0 1387	76 44
	14 696	0 1910	76 98
	17 999	0 2352	76 54
	26 345	0 3467	75 99
	40 625	0 5194	78 21
	57 038	0 7160	79 66

(Herz, Z Elektrochem, 1910, 16 871)

Partition coefficient for bromine between CS₂
and H₂O at 25°C

A = concentration of the water layer

C = concentration of the CS₂ layer

A	C	N=C/A
7 545	691 9	91 71
4 109	338 6	82 41
2 660	217 4	81 72
2 544	207 7	81 66
1 740	140 38	80 67
1 2878	103 7	80 51
0 8073	64 44	79 83
0 5046	39 64	78 38

Partition coefficient for bromine between
CHBr₃ and H₂O at 25°C

A = concentration of the water layer

C = concentration of the CHBr₃ layer

A	C	N=C/A
5 424	373 6	68 88
3 838	264 7	68 80
2 368	161 5	68 19
1 348	90 17	66 90
0 766	50 49	65 84
0 366	23 62	64 85

Partition coefficient for bromine between CCl₄
and H₂O at 25°C

A = concentration of the water layer

C = concentration of the CCl₄ layer

A	C	N=C/A
14 42	545 2	37 82
10 80	372 2	34 44
7 901	252 8	32 01
7 163	225 8	31 52
6 803	218 5	32 12
5 651	172 6	30 54
3 216	94 84	29 48
2 054	58 36	28 41
1 266	35 92	28 37
0 7711	21 53	27 92
0 5761	15 72	27 26
0 4476	12 09	27 02
0 3803	10 27	27 00
0 2478	6 691	27 00

(Jakowkin, Z phys Ch 1895, 18 588)

Partition of bromine between CCl_4 and salts + Aq

A = concentration of Br in H_2O layer

C = concentration of Br in CCl_4 layer

Partition of Br_2 between CCl_4 and NaNO_3 + Aq at 25°

NaNO_3 + Aq	A	C
1-N	7 905	316 7
$\frac{1}{2}$ -N	8 763	319 5
$\frac{1}{4}$ -N	9 033	315 7
$\frac{1}{8}$ -N	9 200	316 7
$\frac{1}{16}$ -N	9 399	319 3

(Jakowkin, Z phys Ch 1896, 20, 25)

Partition of Br_2 between CCl_4 and K_2SO_4 + Aq at 25°

K SO_4 + Aq	A	C
1-N	5 982	255 4
$\frac{1}{2}$ -N	6 843	253 4
$\frac{1}{4}$ -N	7 354	252 8
$\frac{1}{8}$ -N	7 585	250 3
$\frac{1}{16}$ -N	7 498	242 3

(Jakowkin, l c)

Partition of Br_2 between CCl_4 and Na_2SO_4 + Aq at 25°

Na SO_4 + Aq	A	C
	5 934	254 6
	6 838	253 4
	7 402	254 4
N	7 609	252 8
$\frac{1}{16}$ -N	7 713	251 2

(Jakowkin, l c)

Crystallizes at 4° with $10\text{H}_2\text{O}$

Bromine chloride, BrCl

Sol in H_2O , CS_2 , ether, etc

Bromine fluoride, BrF_3

Fumes in the air Decomp by H_2O (Lcbeau, C R 1905, 141 1019)

Bromine oxides

No oxides of bromine are known in the free state See hypobromous, bromic, and perbromic acids

Bromuric acid

Ammonium bromurate, $(\text{NH}_4)_2\text{IrBr}_6$

Less sol in cold H_2O than the K salt (Birnbbaum, Zeit Chem 1865 22)

Very sol in cold H_2O (Gutbier, B 1909, 42 3910)

Cæsium bromurate, Cs_2IrBr_6

Sol in H_2O (Gutbier, B 1909, 42 3911)

Potassium bromurate, K_2IrBr_6

Moderately sol in cold, more easily in hot H_2O

Insol in alcohol or ether
Sol in cold H_2O and in HBr + Aq (Gutbier, B 1909, 42 3910)

Rubidium bromurate, Rb_2IrBr_6

Very sol in cold H_2O Sol in hot dil HBr + Aq (Gutbier, B 1909, 42 3911)

Sodium bromurate

Deliquescent Easily sol in H_2O , alcohol, or ether

Bromuridous acid, $\text{H}_6\text{Ir}_2\text{Br}_{12} + 6\text{H}_2\text{O}$

Easily sol in H_2O , alcohol, or ether (Birnbbaum, 1864)

Ammonium bromurite, $(\text{NH}_4)_6\text{Ir}_2\text{Br}_{12} + \text{H}_2\text{O}$

Difficultly sol in H_2O (Birnbbaum)

Potassium bromurite, $\text{K}_6\text{Ir}_2\text{Br}_{12} + 6\text{H}_2\text{O}$

Efflorescent Sol in H_2O

Silver bromurite, $\text{Ag}_6\text{Ir}_2\text{Br}_{12}$

Ppt Insol in H_2O or acids

Sodium bromurite, $\text{Na}_6\text{Ir}_2\text{Br}_{12} + 24\text{H}_2\text{O}$

Efflorescent Very sol in H_2O

Bromocarbonatoplatin diamine carbonate, $\text{CO}_3[\text{Pt}(\text{N}_2\text{H}_4)_2]_2(\text{CO}_3)_2 + 4\text{H}_2\text{O}$

Ppt

Bromocarbonatoplatin diamine carbonate

bromoplatin diamine nitrate,

$\text{CO}_3[\text{Pt}(\text{N}_2\text{H}_4)_2]_2(\text{CCl}_3)_2$, 2B1 Pt(N H₆)
 $(\text{NO}_3)_2$

Bromochloroplatin diamine chloride,

$\text{Br Cl Pt}(\text{N H}_6)_2\text{Cl}$

Very sl sol in H_2O (Cl v c)

— chlorobromide, $\text{Br Cl Pt}(\text{N H}_6)_2\text{Cl}$

Very sl sol in H_2O

Bromochlororoplatinic acid

Potassium bromochloroplatinate, K PtCl Br

(Pitkin, J Am Chem Soc 2 408)

Mixture (Herty J Am Chem Soc 1896, 18 136)

$\text{K}_2\text{PtCl}_4\text{Br}_2$ Sl sol in cold H_2O much more sol in hot H_2O (Pitkin)

Mixture (Herty)

$\text{K}_2\text{PtCl}_4\text{Br}_3$ As above

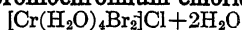
$\text{K PtCl}_2\text{Br}_4$ (Pigeon, A ch 1894, (7) 2 488)

K PtCl Br (Pitkin)

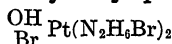
Bromochromic acid

Potassium bromochromate, KCrO_4Br

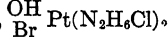
$\text{CrO}_4(\text{Br})\text{OK}$
Decomp by H_2O (Heintze, J pr (2) 4 225)

Dibromochromium chloride,

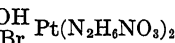
Ppt Nearly insol in fuming HCl (Blomstrum, B 1907, 40 2918)

Bromohydroxyloplatin diamine bromide,

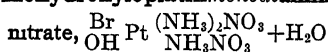
Very sl sol in H_2O (Cleve)

— chloride,

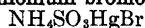
Sol in H_2O (Cleve)

— nitrate,

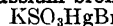
Very sl sol in cold, moderately sol in hot H_2O (Cleve)

Bromohydroxyloplatin monodiamine

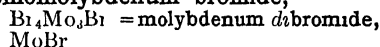
Easily sol in H_2O (Cleve)

Bromomercurosulphurous acid**Ammonium bromomercurosulphate,**

Sol in H_2O (Barth, Z phys Ch 9 215)

Potassium bromomercurosulphate,

As above (B)

Bromomolybdenum bromide,

Insol in H_2O or acids, or even in boiling aqua regia. Easily sol in dilute, decomp by conc alkalis + Aq (Blomstrand, J pr 82 436)

Bromomolybdenum chloride, $\text{Br}_4\text{Mo}_3\text{Cl} + 3\text{H}_2\text{O}$

Insol in acids (Blomstrand)

Bromomolybdenum chromate, $\text{Br}_4\text{Mo}_3\text{CrO}_4 + 2\text{H}_2\text{O}$

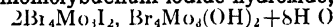
Insol in dil acids. Sol in hot conc HCl + Aq. Insol in alkali chromates + Aq (Atterberg)

Bromomolybdenum fluoride, $\text{Br}_4\text{Mo}_3\text{F} + 3\text{H}_2\text{O}$

Insol in H_2O (Atterberg)

Bromomolybdenum hydroxide, $\text{Br}_4\text{Mo}_3(\text{OH})$

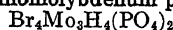
Completely sol in alkalis if not heated over 90° (Atterberg)

**Bromomolybdenum iodide hydroxide,**

Precipitate (Blomstrand, J pr 77 92)

Bromomolybdenum molybdate, $\text{Br}_4\text{Mo}_3\text{MoO}_4$

Precipitate (Atterberg)

Bromomolybdenum phosphate,

Precipitate Insol in H_2O (Atterberg)

Bromomolybdenum sulphate, $\text{Br}_4\text{Mo}_3\text{SO}_4 + 3\text{H}_2\text{O}$

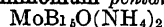
Precipitate Sl sol in boiling H_2SO_4 (Atterberg)

Dibromomolybdous acid, $\text{MoOBr}_2(\text{OH}) + 1\frac{1}{2}\text{H}_2\text{O}$

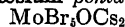
Sol in H_2O Very hygroscopic (Weinland, Z anorg 1905, 44 86)

Tetrabromomolybdous acid, $\text{MoBr}_4(\text{OH}) + 2\text{H}_2\text{O}$

Sol in H_2O Hygroscopic (Weinland, l c)

Diammonium pentabromomolybdate,

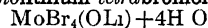
Hygroscopic Sol in H_2O (Weinland, l c)

Dicæsium pentabromomolybdate,

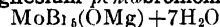
Hygroscopic Sol in H_2O (Weinland, l c)

Calcium tetrabromomolybdate, $(\text{MoBr}_4\text{O})_2\text{Ca} + 7\text{H}_2\text{O}$

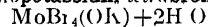
Hygroscopic Sol in H_2O (Weinland, l c)

Monolithium tetrabromomolybdate,

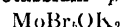
Hygroscopic Sol in H_2O (Weinland, l c)

Magnesium pentabromomolybdate,

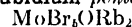
Hygroscopic Sol in H_2O (Weinland, l c)

Monopotassium tetrabromomolybdate,

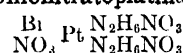
Hygroscopic Sol in H_2O (Weinland, l c)

Dipotassium pentabromomolybdate,

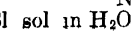
Hygroscopic Sol in H_2O (Weinland, l c)

Dirubidium pentabromomolybdate,

Hygroscopic Sol in H_2O (Weinland, l c)

Bromonitratoplatin diamine nitrate,

Decomp by H_2O (Cleve)

— sulphate,

Sl sol in H_2O

Partition of bromine between CCl_4 and salts + Aq

A = concentration of Br_2 in H_2O layer

C = concentration of Br in CCl_4 layer

Partition of Br_2 between CCl_4 and NaNO_3 + Aq at 25°

NaNO_3 + Aq	A	C
1-N	7 905	316 7
$1/2$ -N	8 763	319 5
$1/4$ -N	9 033	315 7
$1/8$ -N	9 200	316 7
$1/16$ -N	9 399	319 3

(Jakowkin, *Z phys Ch* 1896, 20, 25)

Partition of Br_2 between CCl_4 and K_2SO_4 + Aq at 25°

K_2SO_4 + Aq	A	C
1-N	5 982	255 4
$1/2$ -N	6 843	253 4
$1/4$ -N	7 354	252 8
$1/8$ -N	7 585	250 3
$1/16$ -N	7 498	242 3

(Jakowkin, *l c*)

Partition of Br_2 between CCl_4 and Na_2SO_4 + Aq at 25°

Na_2SO_4 + Aq	A	C
1-N	5 934	254 6
$1/2$ -N	6 838	253 4
$1/4$ -N	7 402	254 4
$1/8$ -N	7 609	252 8
$1/16$ -N	7 713	251 2

(Jakowkin, *l c*)

Crystallizes at 4° with $10\text{H}_2\text{O}$

Bromine chloride, BrCl

Sol in H_2O , CS_2 , ether, etc

Bromine fluoride, BrF_3

Fumes in the air. Decomp by H_2O (Lebeau *C R* 1905, 141 1019)

Bromine oxides

No oxides of bromine are known in the free state. See hypobromous, bromic, and perbromic acids

Bromuric acid

Ammonium bromurate, $(\text{NH}_4)_2\text{IrBr}_6$

Less sol in cold H_2O than the K salt (Burnbaum, *Zeit Chem* 1865 22)

Very sol in cold H_2O (Gutbier, *B* 1909, 42 3910)

Cæsium bromurate, Cs IrBr_6

Sol in H_2O (Gutbier, *B* 1909, 42 3911)

Potassium bromurate, K_2IrBr_6

Moderately sol in cold, more easily in hot H_2O

Insol in alcohol or ether
Sol in cold H_2O and in HBr + Aq (Gutbier, *B* 1909, 42 3910)

Rubidium bromurate, Rb_2IrBr_6

Very sol in cold H_2O Sol in hot H_2O
 HBr + Aq (Gutbier, *B* 1909, 42 3911)

Sodium bromurate

Deliquescent Easily sol in H_2O , alcohol, or ether

Bromuric acid, $\text{H}_2\text{IrBr}_6 + 6\text{H}_2\text{O}$

Easily sol in H_2O , alcohol, or ether (Burnbaum, 1864)

Ammonium bromurate, $(\text{NH}_4)_2\text{IrBr}_6 + \text{H}_2\text{O}$

Difficultly sol in H_2O (Burnbaum)

Potassium bromurate, $\text{K}_2\text{IrBr}_6 + 6\text{H}_2\text{O}$

Efflorescent Sol in H_2O

Silver bromurate, Ag_3IrBr_6

Ppt Insol in H_2O or acids

Sodium bromurate, $\text{Na}_6\text{IrBr}_6 + 24\text{H}_2\text{O}$

Efflorescent Very sol in H_2O

Bromocarbonatoplatindiamine carbonate, $\text{CO}_3[\text{Pt}(\text{N}_2\text{H}_5)_2]_2(\text{CO}_3)_2 + 4\text{H}_2\text{O}$

Ppt

Bromocarbonatoplatindiamine carbonate, bromoplatindiamine nitrate,

$\text{CO}_3[\text{Pt}(\text{N}_2\text{H}_5)_2]_2(\text{CO}_3)_2, 2\text{Br}_2\text{Pt}(\text{N}_2\text{H}_5)_2(\text{NO}_3)_2$

Bromochloroplatindiamine chloride,

$\text{Br Pt}(\text{N}_2\text{H}_5)_2\text{Cl}$

Very sl sol in H_2O (Clay)

— chlorobromide, $\text{Cl Pt}(\text{N}_2\text{H}_5)_2\text{Br}$

Very sl sol in H_2O

Bromochloroplatinic acid

Potassium bromochloroplatinate, K PtClBr_4

(Pitkin *J Am Chem Soc* 2 408)

Mixture (Herty *J Am Chem Soc* 1906, 18 136)

$\text{K}_2\text{PtCl}_4\text{Br}_2$ Sl sol in cold H_2O and more sol in hot H_2O (Pitkin)

Mixture (Herty)

$\text{K PtCl}_3\text{Br}_2$ As above

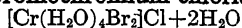
K PtClBr_4 (Pigou, *Ch* 1894, (2) 488)

K PtClBr_4 (Pitkin)

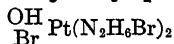
Bromochromic acid

Potassium bromochromate, KCrO_4Br = $\text{CrO}_2(\text{Br})\text{OK}$

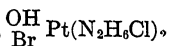
Decomp by H_2O (Hammett, *J pr* (1) 4 225)

***Di*bromochromium chloride,**

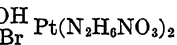
Ppt Nearly insol in fuming HCl (Blomstrand, B 1907, 40 2918)

Bromohydroxyloplatin*di*amine bromide,

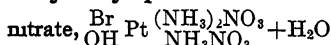
Very sl sol in H₂O (Cleve)

— chloride,

Sol in H₂O (Cleve)

— nitrate,

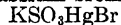
Very sl sol in cold, moderately sol in hot H₂O (Cleve)

Bromohydroxyloplatin*mono*di*ami*ne

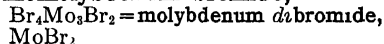
Easily sol in H₂O (Cleve)

Bromomercurosulphurous acid**Ammonium bromomercurosulphate,**

Sol in H₂O (Barth, Z phys Ch 9 215)

Potassium bromomercurosulphate,

As above (B)

Bromomolybdenum bromide,

Insol in H₂O or acids, or even in boiling aqua regia Easily sol in dilute, decomp by conc alkalis + Aq (Blomstrand, J pr 82 436)

Bromomolybdenum chloride, Br₄Mo₃Cl₂ + 3H O

Insol in acids (Blomstrand)

Bromomolybdenum chromate, Br₄Mo₃CrO₄ + 2H O

Insol in dil acids Sol in hot conc HCl + Aq Insol in alk di chromates + Aq (Atterberg)

Bromomolybdenum fluoride, Br₄Mo₃F₂ + 3H₂O

Insol in H₂O (Atterberg)

Bromomolybdenum hydroxide, Br₄Mo₃(OH)₂

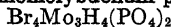
Completely sol in alkalis if not heated over 90° (Atterberg)

**Bromomolybdenum iodide hydroxide,**

Precipitate (Blomstrand, J pr 77 92)

Bromomolybdenum molybdate, Br₄Mo₃MoO₄

Precipitate (Atterberg)

Bromomolybdenum phosphate,

Precipitate Insol in H₂O (Atterberg)

Bromomolybdenum sulphate, Br₄Mo₃SO₄ + 3H₂O

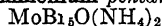
Precipitate Sl sol in boiling H₂SO₄ (Atterberg)

***Di*bromomolybdous acid, MoOBr (OH) + 1½H₂O**

Sol in H₂O Very hygroscopic (Weinland, Z anorg 1905, 44 86)

***Tetra*bromomolybdous acid, MoBr₄(OH) + 2H₂O**

Sol in H₂O Hygroscopic (Weinland, l c)

Diammonium pentabromomolybdate,

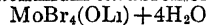
Hygroscopic Sol in H₂O (Weinland, l c)

Dicæsium pentabromomolybdate,

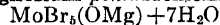
Hygroscopic Sol in H O (Weinland, l c)

***Calcium tetrabromomolybdate,* (MoBr₄O)₂Ca + 7H₂O**

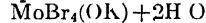
Hygroscopic Sol in H₂O (Weinland, l c)

Monolithium tetrabromomolybdate,

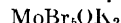
Hygroscopic Sol in H₂O (Weinland, l c)

Magnesium pentabromomolybdate,

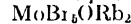
Hygroscopic Sol in H O (Weinland, l c)

Monopotassium tetrabromomolybdate,

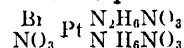
Hygroscopic Sol in H O (Weinland, l c)

Dipotassium pentabromomolybdate,

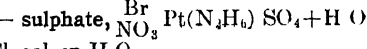
Hygroscopic Sol in H O (Weinland, l c)

Dirubidium pentabromomolybdate,

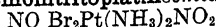
Hygroscopic Sol in H O (Weinland, l c)

Bromonitratoplatin*di*amine nitrate,

Decomp by H O (Cleve)

— sulphate,

Sl sol in H₂O

Bromonitritoplatin*semidiamine* nitrite,

Sl sol in H_2O (Blomstrand)

Bromonitrous acid**Platinum silver bromonitrite, $\text{PtAg}_2\text{Br}_2(\text{NO}_2)_4$**

Ppt (Miolati, Gazz ch it 1900, 30 588)

Bromopalladic acid**Ammonium bromopalladate, $(\text{NH}_4)_2\text{PdBr}_6$**

Difficultly sol in cold H_2O Decomp by hot H_2O and by hot conc H_2SO_4 (Gutbier, B 1905, 38 1907)

Cæsium bromopalladate, Cs_2PdBr_6

Difficultly sol in cold H_2O Decomp by hot H_2O or by hot conc H_2SO_4 (Gutbier, l c)

Potassium bromopalladate, K_2PdBr_6

Difficultly sol in cold H_2O Decomp by hot H_2O or by hot conc H_2SO_4 (Gutbier, l c)

Rubidium bromopalladate, Rb_2PdBr_6

Insol in cold H_2O Decomp by hot H_2O or by hot conc H_2SO_4 (Gutbier, l c)

Bromopalladious acid**Ammonium bromopalladite, $(\text{NH}_4)_2\text{PdBr}_4$**

Very stable Sol in H_2O (Smith, Z anorg 1894, 6 381)

Very sol in cold H_2O

Can be cryst from a very small amount of hot H_2O (Gutbier, B 1905, 38 2387)

Barium bromopalladite

Not deliquescent Sol in H_2O (v Bonsdorff)

Cæsium bromopalladite, Cs_2PdBr_4

Very sol in H_2O (Gutbier, B 1905, 38 2388)

Manganese bromopalladite, MnPdBr_4

Sol in H_2O and alcohol (v Bonsdorff)
+7 H_2O Very sol in H_2O (Smith, Z anorg 1894, 6 382)

Potassium bromopalladite, K_2PdBr_4

Easily sol in H_2O (Joannis, C R 95 295)

Very stable Sol in H_2O (Smith, Z anorg 1894, 6 381)
+2 H_2O Unstable in the air (Smith, l c)

Rubidium bromopalladite, Rb_2PdBr_4

Can be cryst from a very small amount of hot H_2O (Gutbier, B 1905, 38 2388)

Sodium bromopalladite, $\text{Na}_2\text{PdBr}_4 + 4\frac{1}{2}\text{H}_2\text{O}$

Very deliquescent Sol in H_2O (Smith, l c)

Strontium bromopalladite, $\text{SrPdBr}_4 + 6\text{H}_2\text{O}$

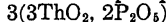
Stable in the air Very sol in H_2O (Smit, l c)

Zinc bromopalladite

Sol in H_2O (v Bonsdorff)

Bromophosphatoplatin*diamine* phosphate, $\text{BrPt}(\text{N}_2\text{H}_5)_2 + 2\text{H}_2\text{O}$ 

Sl sol in H_2O (Cleve)

Bromophosphoric acid**Thorium bromophosphate, ThBr_4** 

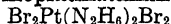
Insol in most acids and in fused alk carbonates Decomp by long boiling w conc H_2SO_4 (Colani, C R 1909, 149 20)

Bromoplatinamine bromide,

Sl sol in H_2C (Cleve, Sv V A H 10, 31)

— nitrite, $\text{Br}_2\text{Pt}(\text{NH}_3\text{NO}_2)_2$

Very sl sol in H_2O (Cleve)

Bromoplatin*diamine* bromide,

Only sl sol in hot H_2O (Cleve)

— chloride, $\text{Br}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{Cl}_2$

Very sl sol in H_2O (Cleve)

— dichromate, $\text{Br}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{Cr}_2\text{O}_7$

Sl sol in H_2O

— nitrate, $\text{Br}_2\text{Pt}(\text{N}_2\text{H}_5\text{NO}_3)_2$

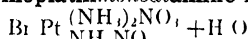
Sl sol in cold, rather easily sol in hot H_2O (Cleve)

— phosphate, $\text{Br}_2\text{Pt}[\text{N}_2\text{H}_5\text{PO}_2(\text{OH})] + 2\text{H}_2\text{O}$

Rather easily sol in hot H_2O (Cleve)

— sulphate, $\text{Br}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{SO}_4$

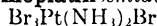
Very sl sol in H_2O

Bromoplatin*monodiamine* nitrate,

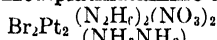
Easily sol in H_2O

— sulphate, $\text{Br}_2\text{Pt}(\text{NH}_3)_2\text{SO}_4 + \text{H}_2\text{O}$

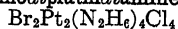
Moderately sol in H_2O (Cleve)

Bromoplatin*semidiamine* bromide,

Sl sol in cold H_2O (Cleve)

Bromodiplatin*diamine* anhydronitrate

Sol in $\text{HNO}_3 + \text{Aq}$

Bromodiplatinumamine chloride,

Ppt (Cleve)

— **nitrate**, $\text{Br}_2\text{Pt}_2(\text{N}_2\text{H}_4)_4(\text{NO}_3)_4 + 2\text{H}_2\text{O}$ Moderately sol in hot H_2O — **sulphate**, $\text{Br}_2\text{Pt}_2(\text{N}_2\text{H}_4)_4(\text{SO}_4)_2 + 2\text{H}_2\text{O}$

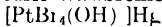
Ppt (Cleve)

Bromoplatinic acid, $\text{H}_2\text{PtBr}_6 + 9\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O , alcohol, ether, chloroform, or acetic acid (Topsoe, J B 1868 273)**Ammonium bromoplatinate**, $(\text{NH}_4)_2\text{PtBr}_6$ Sol in 200 pts H_2O at 15° (Topsoe)100 pts $(\text{NH}_4)_2\text{PtBr}_6 + \text{Aq}$ sat at 20° contain 0.59 ppt dry salt (Halberstadt, B 17 2965)**Barium bromoplatinate**, $\text{BaPtBr}_6 + 10\text{H}_2\text{O}$ Sl deliquescent Very sol in H_2O **Cæsium bromoplatinate**, Cs_2PtBr_6 Sl sol in dil $\text{HBr} + \text{Aq}$ (Obermaier, Dissert)**Calcium bromoplatinate**, $\text{CaPtBr}_6 + 12\text{H}_2\text{O}$ Sl deliquescent Very sol in H_2O **Cobalt bromoplatinate**, $\text{CoPtBr}_6 + 12\text{H}_2\text{O}$

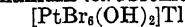
Deliquescent

Copper bromoplatinate, $\text{CuPtBr}_6 + 8\text{H}_2\text{O}$ Very deliquescent, sol in H_2O **Lead bromoplatinate**, PbPtBr_6 Easily sol in H_2O , but decomp by large amount**Lead tetrabromoplatinate**, $[\text{PtBr}_4(\text{OH})_2]\text{Pb} \cdot \text{PbOH}$ Insol in H_2O (Miolati, C C 1900, II 810)**Magnesium bromoplatinate**, $\text{MgPtBr}_6 + 12\text{H}_2\text{O}$

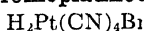
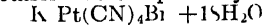
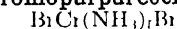
Not deliquescent

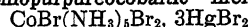
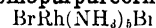
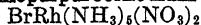
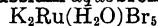
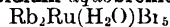
Manganese bromoplatinate, $\text{MnPtBr}_6 + 6\text{H}_2\text{O}$ Sol in H_2O $+ 12\text{H}_2\text{O}$ Sol in H_2O **Mercuric tetrabromoplatinate**,Insol in H_2O (Miolati, C C 1900, II 810)**Nickel bromoplatinate**, $\text{NiPtBr}_6 + 12\text{H}_2\text{O}$

Deliquescent

Potassium bromoplatinate, K_2PtBr_6 Sl sol in H_2O Insol in alcohol (v Bunsdorff, Pogg 19 344)Sol in 10 pts boiling H_2O (Pitkin, C N 41 218)100 pts $\text{K}_2\text{PtBr}_6 + \text{Aq}$ sat at 20° contain 2.02 pts dry salt (Halberstadt, B 17 2962)**Praseodymium bromoplatinate**, $\text{PrBr}_3 \cdot \text{PtBr}_3 + 10\text{H}_2\text{O}$ Deliquescent, very sol in H_2O , sol in HBr (Von Schule, Z anorg 1898, 18 353)**Rubidium bromoplatinate**, Rb_2PtBr_6 Sl sol in dil $\text{HBr} + \text{Aq}$ (Obermaier Dissert)**Silver bromoplatinate**, Ag_2PtBr_6 Insol in H_2O (Miolati, C C 1900, II 810)**Silver tetrabromoplatinate**, $[\text{PtBr}_4(\text{OH})_2]\text{Ag}_2$ Ppt, insol in H_2O (Miolati, l c)**Sodium bromoplatinate**, $\text{Na}_2\text{PtBr}_6 + 6\text{H}_2\text{O}$ Easily sol in H_2O and alcohol**Strontium bromoplatinate**, $\text{SrPtBr}_6 + 10\text{H}_2\text{O}$ Sl deliquescent Very sol in H_2O **Thallium tetrabromoplatinate**,Insol in H_2O (Miolati, C C 1900, II 810)**Ytterbium bromoplatinate**, $\text{YbBr}_3 \cdot 3\text{H}_2\text{PtBr}_6 + 30\text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 138)

Zinc bromoplatinate, $\text{ZnPtBr}_6 + 12\text{H}_2\text{O}$ Sol in H_2O **Bromoplatinocyanhydric acid**,See **Perbromoplatinocyanhydric acid****Potassium bromoplatinocyanide**, $5\text{K}_2\text{Pt}(\text{CN})_4$ Sol in H_2O **Bromoplatinous acid****Potassium bromoplatinite**, $\text{K}_2\text{PtBr}_4 + 2\text{H}_2\text{O}$ Extremely sol in H_2O (Billmann und Anderson, B 1903, 36 1566)**Bromopurpleochromium bromide**,Less sol in H_2O than chloropurpleochromium chloride (Jorgensen, J pr 12) 25 53)— **bromoplatinate**, $\text{BrCr}(\text{NH}_4)_2\text{PtBr}_6$ (Jorgensen, l c)— **chloride**, $\text{BrCr}(\text{NH}_4)_2\text{Cl}_2$ More sol in H_2O than the bromide (Jorgensen, l c)

Bromopurpleochromium chromate,Precipitate (Jorgensen, *l c*)**— nitrate, $\text{BrCr}(\text{NH}_3)_5(\text{NO}_3)_2$** More sol than bromide and less than chloride (Jorgensen, *l c*)**Bromopurpleocobaltic bromide,**Sol in 530 pts H_2O at 16° Insol in alcohol, NH_4Br , KBr , or $\text{HBr} + \text{Aq}$ More sol in hot H_2O containing a little HBr (Jorgensen, *J pr* (2) **19** 49)**Bromopurpleocobaltic mercuric bromide,**More sol in H_2O than the corresponding HgCl_2 salt (*J*)**— bromoplatinate**Very sl sol in cold H_2O (*J*)**— chloride, $\text{CoBr}(\text{NH}_3)_5\text{Cl}_2$** Difficultly sol in cold H_2O , but much more easily than the bromide Insol in dil $\text{HCl} + \text{Aq}$, and in alcohol**— mercuric chloride, $\text{CoBr}(\text{NH}_3)_5\text{Cl}$** Sl sol in H_2O **— chloroplatinate**Nearly or quite insol in H_2O (*J*)**— chromate, $\text{CoBr}(\text{NH}_3)_5\text{CrO}_4$** Nearly insol in H_2O **— dithionate, $\text{CoBr}(\text{NH}_3)_5\text{S}_2\text{O}_6$** Nearly insol in H_2O **— fluosilicate, $\text{CoBr}(\text{NH}_3)_5\text{SiF}_6$** Very sl sol in cold H_2O , insol in alcohol**— nitrate, $\text{CoBr}(\text{NH}_3)_5(\text{NO}_3)_2$** More sol in H_2O than the bromide, but less than the chloride Wholly insol in dil $\text{HNO}_3 + \text{Aq}$ or alcohol**— oxalate, $\text{CoBr}(\text{NH}_3)_5\text{C}_2\text{O}_4$** Nearly insol in H_2O **— sulphate, $\text{CoBr}(\text{NH}_3)_5\text{SO}_4$** Can be crystallized from very dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Insol in alcohol
 $+ 6\text{H}_2\text{O}$ Efflorescent**Bromopurpleorhodium bromide,**Much less easily sol in H_2O than the chloro chloride Insol in dil $\text{HBr} + \text{Aq}$ and alcohol (Jorgensen, *J pr* (2) **27** 433)**— bromoplatinate, $\text{BrRh}(\text{NH}_3)_5\text{PtBr}_4$** Almost insol in H_2O **— fluosilicate, $\text{BrRh}(\text{NH}_3)_5\text{SiF}_6$** Sl sol in H_2O Sol in boiling $\text{NaOH} + \text{Aq}$ as roseo salt**Bromopurpleorhodium nitrate,**Sl sol in H_2O , but much more sol than bromide**Bromorhodos acid****Ammonium bromorhodite, $(\text{NH}_4)_2\text{RhBr}_5$** Sol in H_2O (Goloubkine, *Chem f c* 1911, **100** (2) 45)Sol in H_2O (Gutbier, *B* 1908, **41** 215)**Barium bromorhodite, BaRhBr_5** Sol in H_2O (Goloubkine, *l c*)**Cæsium bromorhodite, Cs_2RhBr_5** Difficultly sol in H_2O (Gutbier, *l c*)**Potassium bromorhodite, K_2RhBr_5** Very sol in H_2O (Goloubkine, *l c*)Sol in H_2O (Gutbier, *l c*)**Rubidium bromorhodite, Rb_2RhBr_5** Sol in H_2O (Goloubkine, *l c*)Difficultly sol in H_2O (Gutbier, *l c*)**Sodium bromorhodite, Na_2RhBr_5** Very sol in H_2O (Goloubkine, *l c*)**Bromoruthenic acid****Potassium bromoruthenate, K_2RuBr_6** Very sol in H_2O (Howe, *J Am Cl m Soc* 1904, **26** 946)**Potassium aquobromoruthenate,**Ppt (Howe, *l c*)**Rubidium bromoruthenate, Rb_2RuBr_6** Sol in H_2O (Howe, *l c*)**Rubidium aquobromoruthenate,**Ppt (Howe, *l c*)**Bromoruthenious acid****Cæsium bromoruthenite, $\text{Cs}_2\text{RuBr}_6 + \text{H}_2\text{O}$** Ppt (Howe, *J Am Chem Soc* 1904, **26** 945)**Potassium bromoruthenite, K_2RuBr_6** Very sol in H_2O with decomp Very sol in dil HBr (Howe, *l c*)**Rubidium bromoruthenite, $\text{Rb}_2\text{RuBr}_6 + \text{H}_2\text{O}$** Sol in dil HBr (Howe, *l c*)**Bromoselenic acid****Ammonium bromoselenate, $(\text{NH}_4)_2\text{SeBr}_4$** Sol in H_2O with decomp (Muthmann and Schuler, *B* **26** 1008)**Cæsium bromoselenate, Cs_2SeBr_4** Sl sol in H_2O (Fischer, *J Am Chem Soc* 1898, **20** 571)**Potassium bromoselenate, K_2SeBr_4** As NH_4 salt (M and S)

Rubidium bromoselenate, Rb_2SeBr_6 Less sol in H_2O than K salt (Lenher, *l c*)**Bromopyroselenious acid****Ammonium bromopyroselenite, $\text{NH}_4\text{Br}, 2\text{SeO}_2 + 2\text{H}_2\text{O}$** More easily sol in H_2O than corresponding Cl compound (Muthmann and Schafer, B 1893, 26 1014)**Potassium bromopyroselenite, $\text{KBr}, 2\text{SeO}_2 + 2\text{H}_2\text{O}$** Sol in H_2O (Muthmann and Schafer, B 26 1008)**Bromosmic acid****Ammonium bromosmate, $(\text{NH}_4)_2\text{OsBr}_6$** Only sl sol in H_2O (Rosenheim, Z anorg 1899, 21 135)**Cæsium bromosmate, Cs_2OsBr_6** Nearly insol in H_2O and dil HBr (Gutbier, B 1913, 46 2103)**Potassium bromosmate, K_2OsBr_6** Only sl sol in H_2O (Rosenheim, *l c*)**Rubidium bromosmate, Rb_2OsBr_6** Difficultly sol in H_2O and in dil HBr (Gutbier, *l c*)**Silver bromosmate, Ag_2OsBr_6** Ppt insol in H_2O (Rosenheim, *l c*)**Sodium bromosmate, $\text{Na}_2\text{OsBr}_6 + 4\text{H}_2\text{O}$** Sol in H_2O (Rosenheim, *l c*)**Bromostannic acid, $\text{H}_2\text{SnBr}_6 + 8\text{H}_2\text{O}$** Very deliquescent Sol in H_2O (Seubert, B 20 794)**Ammonium bromostannate, $(\text{NH}_4)_2\text{SnBr}_6$** Very deliquescent, and sol in H_2O (Raymann and Preis, A 223 323)**Cæsium bromostannate**Sol in H_2O (Raymann and Preis)**Calcium bromostannate, $\text{CaSnBr}_6 + 6\text{H}_2\text{O}$** Very deliquescent Sol in H_2O (Raymann and Preis)**Cobalt bromostannate, $\text{CoSnBr}_6 + 10\text{H}_2\text{O}$**

Deliquescent (Raymann and Preis)

Ferrous bromostannate, $\text{FeSnBr}_6 + 6\text{H}_2\text{O}$

Deliquescent (Raymann and Preis)

Lithium bromostannate, $\text{Li}_2\text{SnBr}_6 + 6\text{H}_2\text{O}$

Extremely deliquescent (Lewin, C R 113 541)

Magnesium bromostannate, $\text{MgSnBr}_6 + 10\text{H}_2\text{O}$

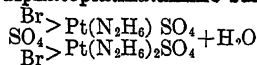
Deliquescent (Raymann and Preis)

Manganous bromostannate, $\text{MnSnBr}_6 + 6\text{H}_2\text{O}$

Deliquescent (Raymann and Preis)

Nickel bromostannate, $\text{NiSnBr}_6 + 8\text{H}_2\text{O}$

Deliquescent (Raymann and Preis)

Potassium bromostannate, K_2SnBr_6 Sol in H_2O (Topsoe)**Rubidium bromostannate**Sol in H_2O (Raymann and Preis)**Sodium bromostannate, $\text{Na}_2\text{SnBr}_6 + 6\text{H}_2\text{O}$** Not deliquescent, but extremely sol in H_2O (Seubert, B 20 796)**Strontium bromostannate, $\text{SrSnBr}_6 + 6\text{H}_2\text{O}$** Very hygroscopic, and sol in H_2O (Raymann and Preis)**Bromosulphatoplatindiamine sulphate,**Rather easily sol in hot H_2O **Bromosulphobismuthous acid****Cuprous bromosulphobismuthite, $2\text{Cu}_3\text{S}, \text{Bi}_2\text{S}_3, 2\text{BiSBr}$** Stable in the air and insol in H_2O at ord temp Partially decomp by boiling H_2O Decomp by mineral acids with the evolution of H_2S (Ducatte, C R 1902, 134 1212)**Lead bromosulphobismuthite, $\text{PbS}, \text{Bi}_2\text{S}_3, 2\text{BiSBr}$** Insol in H_2O Decomp by boiling H_2O Decomp by dil mineral acids with evolution of H_2S (Ducatte, *l c*)**Bromotantalum bromide, $(\text{Ta}_6\text{Bi}_{10})\text{Br} + 7\text{H}_2\text{O}$** Stable in the air when in the solid state Sol in H_2O without decomp Sol in propyl alcohol (Chapin, J Am Chem Soc 1910, 32 328)**Bromotantalum chloride, $(\text{Ta}_6\text{Bi}_{12})\text{Cl} + 7\text{H}_2\text{O}$** (Chapin, *l c*)**Bromotantalum hydroxide, $(\text{Ta}_6\text{Bi}_{11})(\text{OH})_2 + 10\text{H}_2\text{O}$** Sl sol in HCl Stable in the air below 100° Sol in alcohol Insol in ether (Chapin, *l c*)**Bromotantalum iodide, $(\text{Ta}_6\text{Bi}_{11})\text{I} + 7\text{H}_2\text{O}$** (Chapin, *l c*)**Bromotelluric acid****Ammonium bromotellurate, $(\text{NH}_4)_2\text{TeBr}_6$** Less sol in H_2O than K salt (Muthmann and Schmidt, B 1893, 26 1011)

Cæsium bromotellurate, Cs₂TeBr₆

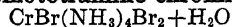
Decomp by H₂O
 100 pts HBr+Aq (sp gr 1.49) dissolve
 0.02 pt at 22°
 100 pts HBr+Aq (sp gr 1.08) dissolve
 0.13 pt at 22°
 Insol in alcohol (Wheeler, Sill Am J 145 267)

Potassium bromotellurate, K₂TeBr₆+3H₂O

Sol in little, decomp by much H₂O (v Hauer)
 Contains 2H₂O (Wheeler, Sill Am J 145 267)
 Efflorescent
 100 pts HBr+Aq (sp gr 1.49) dissolve
 6.57 pts at 22°
 100 pts HBr+Aq (sp gr 1.08) dissolve
 62.90 pts at 22°
Anhydrous Stable on air (Wheeler)

Rubidium bromotellurate, Rb₂TeBr₆

Sol in a little hot H₂O, but H₂TeO₃ separates on cooling
 100 pts HBr+Aq (sp gr 1.49) dissolve
 0.25 pt at 22°
 100 pts HBr+Aq (sp gr 1.08) dissolve
 3.88 pts at 22° (Wheeler)

Bromotetramine chromium bromide,

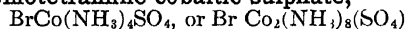
Easily sol in H₂O (Cleve)

— chloride, CrBr(NH₃)₄Cl + H₂O

Sol in H₂O (Cleve)

— sulphate, CrBr(NH₃)₄SO₄ + H₂O

Easily sol in H₂O (Cleve)

Bromotetramine cobaltic sulphate,

Sol in H₂O (Vortmann and Blasberg, B 22 2652)

Cadmium, Cd

Not attacked by H₂O Sol in HCl, or dil H₂SO₄+Aq, but more easily in HNO₃+Aq Sol in HC₂H₃O + Aq

Chemically pure Cd like Zn is almost insol in dil acids, with the exception of HNO₃ (Weeren, B 1891, 24 1798)

Sol in HClO₄+Aq without evolution of H₂ (Hendrixson, J Am Chem Soc 1904, 26 756)

Cadmium is sol in molten CdCl₂ and can be recryst therefrom (Auerbach, Z anorg 1901, 28 42)

From 4 g Cd in 32 g molten CdCl₂ at 650° 2.197 g were dissolved in ½ li (Helfenstein, Z anorg 1900, 23 295)

Moderately quickly sol in K₂S₂O₈+Aq More slowly sol in (NH₄)₂S₂O₈+Aq (Icvi, Gazz ch it 1908, 38 (1) 583)

Sol in (NH₄)₂S₂O₈+Aq without evolution of gas (Turrentine, J phys Chem 1907, 11 627)

Sol in sulphostannates+Aq (Storch, 1883, 16 2015)

½ ccm oleic acid dissolves 0.0293 g Cd in 6 days (Gates, J phys Chem 1911, 15 14)

Not attacked by sugar solution (König and Berg, C R 102 1170)

Cadmium amalgam, Cd₂Hg,

Stable from 0°-44° Can be cryst from Hg without decomp if temp does not exceed 44° (Kerp Z anorg 1900, 25 68)

Cadmium amide, Cd(NH₂)₂

Decomp by H₂O (Bohart, J phys Chem 1915, 19 543)

Cadmium arsenide, Cd₃As

(Descamps, C R 86 1022)

Cd₃As₂ Sol in dil cold HNO₃ Attacked by aqua regia (Granger, C R 1904, 8 575)

Cadmium azoimide, Cd(N₃)₂

Ppt (Curtius, J pr 1898, (2) 58 294)

Cadmium subbromide, Cd₄Br₇

Decomp by H₂O (Morse and Jones, J Ch J 1890, 12 490)

Cadmium bromide, CdBr₂

Deliquescent Very sol in H₂O

Solubility in H₂O at t°

t°	% CdBr	t	% CdBr
-4	32.0	48	60
-1	34.7	71	61
+1	36.3	104	61
2	36.0	155	63
9	41.9	170	65
14	46.0	215	69
25	52.6	232	70
35	59.6	245	71

Solid phase above 100° is CdBr₂ + 1½ H₂O (Fittid, Ch 1894 (7) 2 541)

See also under CdBr₂+H₂O and CdBr₂+4H₂O

Sp gr of CdBr₂+Aq at 19.5° containing
 5 10 15 20 25 % CdBr₂
 1.043 1.090 1.141 1.199 1.260
 30 35 40 45 50 % CdBr₂
 1.326 1.400 1.481 1.578 1.680
 (Kramers calculated by Gerlach Z anorg 8 280)

CdBr₂+Aq containing 18.06% CdBr₂ is sp gr 20°/20° = 1.1378

CdBr₂+Aq containing 21.39% CdBr₂ is sp gr 20°/20° = 1.1666

(F. Blanc and Rohlund, Z phys Ch 96, 19 252)

Sp gr of CdBr₂+Aq containing 35.17% CdBr₂ = 1.4231 at 19.4°/4° (Hüllrich W Ann 1899, 68 27)

Sp gr of $\text{CdBr}_2 + \text{Aq}$ at $18^\circ/4^\circ$

% CdBr_2	33 289	23 973	20 552	11 983
Sp gr	1 384	1 252	1 209	1 112
% CdBr_2	6 543	3 734	1 927	
Sp gr	1 106	1 030	1 017	

(de Muynck, W Ann 1894, 53 561)

Sp gr of $\text{CdBr}_2 + \text{Aq}$ at 18°

% CdBr_2	1	5	10	15	20
Sp gr	1 0072	1 0431	1 0907	1 1432	1 1991
% CdBr_2	25	30	35	40	43
Sp gr	1 2605	1 3296	1 4052	1 4915	1 5467

(Grotman, W Ann 1883, 18 193)

Sp gr of $\text{CdBr}_2 + \text{Aq}$

% CdBr_2	t°	Sp gr at t°	Sp gr at 18
0 0324	17 90	0 99901	0 99900
	22 75	0 99702	
0 0748	17 23	0 99949	0 99935
	21 50	0 99863	
0 154	17 67	1 00008	1 00002
	23 10	0 99896	
0 253	17 23	1 00119	0 00100
	22 95	0 99986	
0 506	18 07	0 00308	1 00310
	22 65	1 00212	
1 013	18 00		1 00750

(Wershofen, Z phys Ch 1890, 5 493)

Sp gr of $\text{CdBr}_2 + \text{Aq}$ at 20°

Normality of $\text{CdBr}_2 + \text{Aq}$	% CdBr	Sp gr
2 774	46 574	1 6198
1 997	37 53	1 4469
0 973	22 53	1 2293
0 5138	12 46	1 1211

(Förchheimer, Z phys Ch 1900, 34 29)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84, 27)

Sol in $\text{HCl} + \text{Aq}$, $\text{HC}_2\text{H}_3\text{O}_2$, alcohol, or ether (Berthelot, A ch 44 387)

Sol in 0.94 pt H_2O , 3.4 pts abs alcohol, 250 pts ether, and 16 pts alcohol-ether (1:1) (Eder, Dingl 221 89)

An CdBr_2 is sol in acetone (Krug and M Frooy)

1 g CdBr_2 is sol in 64.5 g acetone at 18° Sp gr of sat solution $18^\circ/4^\circ = 0.8073$ (Naumann, B 1904, 37 4337)

Sol in acetone (Fidmann, C C 1899, II 1014)

Insol in mustard oil (Mathews, J phys Chem 1905, 9, 647)

Difficultly sol in methyl acetate (Naumann, B 1909, 42, 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sol in chinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

100 g benzonitrile dissolve 0.857 g CdBr_2 at 18° (Naumann, B 1914, 47 1370)

Mol weight determined in piperidine (Ferchland, Z anorg 1897, 15, 17)

+ H_2O Solubility in H_2O

100 g of the sat solution contain at
 35° 40° 45° 60° 80° 100°
 60 29 60 65 60 75 61 10 61 29 61 63 g CdBr_2
 (Dietz, Z anorg 1899, 20 261)

+ $1\frac{1}{2}\text{H}_2\text{O}$ (Étard, A ch 1894, (7) 2 541)

+ $4\text{H}_2\text{O}$ Efflorescent (Rammelsberg, Pogg 55 241)

Solubility in H_2O

100 g of the sat solution contain at
 0° 18° 30° 38°
 37 92 48 90 56 90 61 84 g CdBr_2

Sp gr of sat solution at $18^\circ = 1.683$
 (Dietz, Z anorg 1899, 20 261)

100 g sat solution of $\text{CdBr}_2 + 4\text{H}_2\text{O}$ in absolute alcohol contain 20.93 g CdBr_2 at 15°

100 g sat solution of $\text{CdBr}_2 + 4\text{H}_2\text{O}$ in absolute ether contain 0.4 g CdBr_2 at 15° (Eder, Dingl 221 89)

Cadmium hydrogen bromide

Decomp by H_2O (Berthelot, C R 91 1024)

Cadmium caesium bromide, $\text{CdBr}_2, \text{CsBr}$

Easily sol in H_2O (Wells and Walden, Z anorg 5 270)

$\text{CdBr}_2, 2\text{CsBr}$ Decomp by H_2O into above comp (W and W)

$\text{CdBr}_2, 3\text{CsBr}$ Decomp by H_2O into $\text{CdBr}_2, \text{CsBr}$ (W and W)

Cadmium potassium bromide, $\text{CdBr}_2, \text{KBr} + \frac{1}{2}\text{H}_2\text{O}$

Sol in 0.79 pt H_2O at 15° , pptd by alcohol and ether (Eder, Dingl 221 89)

+ H_2O Sol in H_2O without decomp from $0.4^\circ - 112.5^\circ$ (Rimbach, B 1905, 38, 1554)

100 pts of the solution contain at
 0.4° 15.8° 50° 112.5°
 53.75 58.68 68.25 78.10 pts of the salt

$\text{CdBr}_2, 4\text{KBr}$ Sol in 1.40 pts H_2O at 15° , pptd by alcohol and ether (Eder, Dingl 221 89)

Cannot be prepared in a pure state as it is decomp by H_2O below 160° (Rimbach, B 1905, 38 1560)

Cadmium rubidium bromide, $\text{CdBr}_2, \text{RbBr}$

Sol in H_2O without decomp from 0.4° to 107.5°

100 pts of the solution contain at
 0.4° 14.5° 49.2° 107.5°
 32.65 41.87 58.54 75.77 pts of the salt

(Rimbach, B 1905, 38 1556)

$\text{CdBr}_2, 4\text{RbBr}$ Sol in H_2O without decomp from 0.5° to 114.5°

100 pts of the solution contain at
 0.5° 13.5° 51.5° 114.5°
 47.95 55.17 68.82 79.04 pts of the salt

(Rimbach, B 1905, 38 1561)

Cadmium sodium bromide, CdBr_2 , $\text{NaBr} + 2\frac{1}{2}\text{H}_2\text{O}$

Sol at 15° in 104 pts H_2O , 37 pts abs alcohol, and 190 pts ether (sp gr 0.729) (Eder, Dingl **221** 89)

3CdBr_2 , $2\text{NaBr} + 6\text{H}_2\text{O}$ Stable in conc solutions and decomp only by great dilution (Jones and Knight, Am Ch J 1899, **22** 134)

Cadmium bromide ammonia, $\text{CdBr}_2 \cdot 2\text{NH}_3$

Can be crystallized out of warm $\text{NH}_4\text{OH} + \text{Aq}$ (Croft, Phil Mag **21** 356)

$\text{CdBr}_2 \cdot 3\text{NH}_3$ (Tassily, C R 1897, **124** 1022)

$\text{CdBr}_2 \cdot 4\text{NH}_3$ Decomp by H_2O (Croft)

Cadmium bromide cupric oxide, CdBr_2 , $3\text{CuO} + 3\text{H}_2\text{O}$ (Mailhe, A ch 1902, (7) 27 383)

Cadmium bromide hydrazine, $\text{CdBr}_2 \cdot 2\text{N}_2\text{H}_4$

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, **60** 280)

Cadmium bromide hydroxylamine, $\text{CdBr}_2 \cdot 2\text{NH}_2\text{OH}$

Sol in hot H_2O with formation of a basic salt Sol in dil acids Insol in alcohol and ether (Adams, Am Ch J 1902, **28** 218)

Cadmium subchloride, Cd_4Cl_7

Decomp by H_2O and by acids (Morse and Jones, Am Ch J 1890, **12** 490)

Cadmium chloride, CdCl_2

Sol at 20° 40° 60° 80° 100°
in 0.71 0.72 0.72 0.70 0.67 pts H_2O
(Kremers Pogg **103** 57)

Sat $\text{CdCl}_2 + \text{Aq}$ contains % CdCl_2 at t°

t°	% CdCl_2	t°	% CdCl_2
-7	43.5	120	63.0
+1	47.6	150	64.8
6	49.7	165	68.2
7	51.3	170	68.4
10	51.6	180	70.1
19	52.7	190	71.9
25	52.9	200	72.0
61	57.9	235	76.0
82	58.8	270	77.7

(Étard, A ch 1894, (7) **2** 536)

100 mol H_2O dissolve at

19.3° 29.7° 40.1° 54.5°

10.94 12.74 13.15 13.16 mol CdCl_2

(Sudhaus, Miner Jahrb Ber-Bd 1914, **37** 19)

See also under $\text{CdCl} + \text{H}_2\text{O}$, $\text{CdCl} + 2\frac{1}{2}\text{H}_2\text{O}$, and $\text{CdCl} + 4\text{H}_2\text{O}$

Sp gr of $\text{CdCl}_2 + \text{Aq}$ containing pts CdCl_2 to 100 pts H_2O

13 26.9 41 pts CdCl_2 ,

1.1068 1.2106 1.3100

55.8 72.5 114.2 pts CdCl_2

1.4060 1.5060 1.7266

(Kremers, Pogg **103** 57)

$\text{CdCl}_2 + \text{Aq}$ containing 8.91% CdCl_2 as
sp gr $20^\circ/20^\circ = 1.0715$ (Le Blanc
Rohland, Z phys Ch 1896, **19** 282)

Sp gr of $\text{CdCl}_2 + \text{Aq}$ at room temp containing

% CdCl_2 11.09 16.30 24.786

Sp gr 1.1093 1.1813 1.3199

(Wagner, W Ann 1883, **18** 266)

Sp gr of $\text{CdCl}_2 + \text{Aq}$ at $18^\circ/4^\circ$

% CdCl_2 57.524 41.547 29.977

Sp gr 1.852 1.515 1.330

% CdCl_2 21.431 14.761

Sp gr 1.210 1.142

(de Mynck, W Ann 1894, **53** 561)

Sp gr of $\text{CdCl}_2 + \text{Aq}$ at 18°

% CdCl_2 1 5 10 5

Sp gr 1.0063 1.0436 1.0919 1.443

% CdCl_2 20 25 30 5

Sp gr 1.2007 1.2620 1.3305 1.075

% CdCl_2 40 45 50

Sp gr 1.4878 1.5775 1.6799

(Grotrian, W Ann 1883, **18** 193)

Sp gr of $\text{CdCl}_2 + \text{Aq}$ at 25°

Concentration of $\text{CdCl}_2 + \text{Aq}$ Sp gr

1-normal 1.077

$\frac{1}{2}$ - " 1.039

$\frac{1}{4}$ - " 1.019

$\frac{1}{8}$ - " 1.009

(Wagner, Z phys Ch 1890, **5** 36)

Sp gr of $\text{CdCl} + \text{Aq}$

% CdCl	t°	Sp gr at t	Sp gr at 15°
0.0503	17.59	0.99920	0.3910
	24.27	0.99781	
0.0999	17.70	0.99964	0.9955
	22.06	0.99533	
0.200	15.31	1.00038	1.0044
	24.00	0.99920	
0.399	16.86	1.00239	1.022
	24.21	1.00083	
0.599	17.49	1.00406	1.039
	25.12	1.00238	
0.769	17.58	1.00550	1.057
	21.76	1.00496	
0.997	17.55	1.00754	1.075
	19.65	1.00713	

(Weishofen, Z phys Ch 1890, **5** 4)

Sp gr of $\text{CdCl} + \text{Aq}$ at t

t	Specific gravity of $\text{CdCl} + \text{Aq}$	% CdCl in solution	$\frac{K}{4}$
20.5	3.80	44.42	5645
"	2.61	34.22	3941
"	1.76	25.90	2435
"	1.29	19.91	1977
"	0.93	14.88	1404
"	0.52	8.84	0801

(Oppenheimer, Z phys Ch 1898, **27** 454)

Sp gr of $\text{CdCl}_2 + \text{Aq}$ at t°

t°	Concentration of $\text{CdCl}_2 + \text{Aq}$	Sp gr
22	1 pt CdCl_2 in 1 3458 pts H_2O	1 6128
18 7	1 " " " 2 7005 " "	1 2896
17 2	1 " " " 53 988 " "	1 0155
16	1 " " " 54 18 " "	1 0152
17	1 " " " 57 479 " "	1 0136
22	1 " " " 77 232 " "	1 0076

(Hittorf, Z phys Ch 1902, 39 628)

Solubility in $\text{KCl} + \text{Aq}$ at t°

t°	100 g H_2O dissolve		Solid phase
	g CdCl_2	g KCl	
19 3	111 30		$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O}$
	59 59	6 70	$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O} + \text{CdCl}_2$ $\text{KCl} + \text{H}_2\text{O}$
	26 98	11 09	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
	11 61	30 04	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O} + \text{CdCl}_2$ 4KCl
29 7	1 44	34 76	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
		33 94	
	129 65		$\text{CdCl}_2 + 3\frac{1}{2}\text{H}_2\text{O}$
	97 62	0 70	$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O}$
	65 23	7 08	$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O} + \text{CdCl}_2$ $\text{KCl} + \text{H}_2\text{O}$
	47 12	9 89	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
	32 67	13 06	
	24 26	16 10	
	15 99	25 97	
	15 47	33 58	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O} + \text{CdCl}_2$ 4KCl
40 1	2 42	37 66	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
		37 21	
	133 85		$\text{CdCl}_2 + \text{H}_2\text{O}$
	92 15	2 70	$\text{CdCl}_2 + \text{H}_2\text{O} + \text{CdCl}_2$ $\text{KCl} + \text{H}_2\text{O}$
	51 90	11 50	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
	37 91	15 21	
	24 15	21 73	
	18 97	35 51	
	19 92	57 61	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O} + \text{CdCl}_2$ 4KCl
	2 98	40 15	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
54 5		40 36	
	133 90		$\text{CdCl}_2 + \text{H}_2\text{O}$
	102 15	2 32	$\text{CdCl}_2 + \text{H}_2\text{O} + \text{CdCl}_2$ $\text{KCl} + \text{H}_2\text{O}$
	44 01	18 39	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
	26 13	43 78	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O} + \text{CdCl}_2$ 4KCl
	4 20	45 52	$\text{CdCl}_2 \text{ KCl} + \text{H}_2\text{O}$
		43 00	

Solubility in $\text{NaCl} + \text{Aq}$ at t°

t°	100 g H_2O dissolve		Solid phase
	g CdCl_2	g NaCl	
19 3	111 30		$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O}$
	116 64	7 52	$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O} + \text{CdCl}_2$ $2\text{NaCl} + 3\text{H}_2\text{O}$
	85 15	12 19	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O}$
	40 01	25 67	
	5 96	36 76	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O} +$ NaCl
		35 84	NaCl
	129 65		$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O}$
	132 67	9 63	$\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O} + \text{CdCl}_2$ $2\text{NaCl} + 3\text{H}_2\text{O}$
	123 54	10 10	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O}$
	106 16	12 92	
29 7	91 10	15 41	
	43 74	27 46	
	9 43	37 54	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O} +$ NaCl
		35 88	NaCl
	133 85		$\text{CdCl}_2 + \text{H}_2\text{O}$
	137 03	15 14	$\text{CdCl}_2 + \text{H}_2\text{O} + \text{CdCl}_2$ $2\text{NaCl} + 3\text{H}_2\text{O}$
	48 17	29 50	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O}$
	13 31	38 16	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O} +$ NaCl
		36 18	NaCl
	133 90		$\text{CdCl}_2 + \text{H}_2\text{O}$
40 1	140 42	19 10	$\text{CdCl}_2 + \text{H}_2\text{O} + \text{CdCl}_2$ $2\text{NaCl} + 3\text{H}_2\text{O}$
	52 76	32 97	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O}$
	22 53	39 07	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O} +$ NaCl
		36 82	NaCl
	133 90		$\text{CdCl}_2 + \text{H}_2\text{O}$
	140 42	19 10	$\text{CdCl}_2 + \text{H}_2\text{O} + \text{CdCl}_2$ $2\text{NaCl} + 3\text{H}_2\text{O}$
	52 76	32 97	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O}$
	22 53	39 07	$\text{CdCl}_2 \text{ 2NaCl} + 3\text{H}_2\text{O} +$ NaCl
		36 82	NaCl

At 34.5° , $\text{CdCl}_2 + 2\frac{1}{2}\text{H}_2\text{O} \rightarrow \text{CdCl}_2 \cdot \text{H}_2\text{O}$ and
(Sudhaus, Minck Jährl Beil-Bd 1914, 37 28)

Insol in SbCl_3 (Klemensiewicz, C A 1909, 269)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Insol or sl sol in (ethyl alcohol, furfural, acetophenone, ethyl monochloracetate, ethyl cyanacetate, ethyl oxalate, ethyl nitrate, amyl nitrate, o-nitrotoluene, picric acid, and quinoline. Sol in ethyl alcohol, hydrazine (Lincoln, J phys Chem 1899, 3 461)

Insol in anhydrous ether (Hump, Ch Z 1887, II, 847)

Rapidly sol in alcohol

100 pts absolute methyl alcohol dissolve 1 52 pts CdCl_2 at 15.5°

100 pts absolute ethyl alcohol dissolve 1 52 pts CdCl_2 at 15.5° (de Bruyn, Z phys Ch 10 783)

100 g $\text{CdCl}_2 + \text{CH}_3\text{OH}$ contain 1 5 g CdCl_2

(Sudhaus, Minck Jährl Beil-Bd 1914, 37 34)

at the critical temp (Centnerszwer, Z phys Ch 1910, **72** 437)

Somewhat sol in acetone (Krug and M'Elroy)

Sol in acetone, insol in methylal (Eidmann, C C **1899**, II, 1014)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Sol in ethyl acetate (Naumann, B 1904, **37** 3601)

Difficultly sol in ethylacetate (Naumann, B 1910, **43** 314)

Sol in urethane (Castoro, Z anorg 1899, **20** 61)

At 18°, 100 g benzonitrile dissolve 0.06332 g CdCl₂ (Naumann, B 1914, **47**, 1370)

Insol in toluene (Baxter and Hines, Am Ch J 1904, **31** 222)

Sol in chinolin (Beckmann and Gabel, Z anorg 1906, **51** 236)

+H₂O Solubility in H₂O

100 g of the sat solution contain at

10° 20° 40° 60°

57.47 57.35 57.51 57.77

80° 100°

58.41 59.52 g CdCl₂

110° is bpt of the sat solution

(Dietz, Z anorg 1899, **20** 257)

+2½H₂O Solubility in H₂O

100 g of the sat solution contain at

-10° 0° 18° 30° 36°

44.35 47.37 52.53 56.27 57.91 g CdCl₂

Sp gr of sat solution = 1.741

(Dietz, Z anorg 1899, **20** 257)

+4H₂O Solubility in H₂O

100 g of the sat solution contain at

-9° 0° +10° +15°

43.58 49.39 55.58 59.12 g CdCl

(Dietz, Z anorg 1899 **20** 257)

+5H₂O (Worobieff, Z anorg 1898, **18** 386)

Cadmium hydrogen chloride, CdCl₂, 2HCl+7H₂O

Decomp in air (Berthelot, C R **91** 1024)

Cadmium caesium chloride, CdCl₂, 2CsCl

Easily sol in H₂O and dil HCl+aq, insol in conc HCl+aq (Godeffroy, B **8** 9)

Nearly insol in CsCl+aq (Wells and Walden, Z anorg **5** 266)

CdCl, CsCl Sl sol in H₂O, nearly insol in CdCl₂+aq (Wells and Walden)

Cadmium calcium chloride, 2CdCl, CaCl₂+7H₂O

Rather deliquescent, and very sol in H₂O. When ignited is only sl sol in H₂O with evolution of heat (v Hauer, J pr **63** 432)

CdCl₂, 2CaCl₂+12H₂O Very deliquescent (v Hauer)

Cadmium cobaltous chloride, 2CdCl₂, CoCl+12H₂O

Deliquescent Sol in H₂O (v Hauer, W A B **17** 331)

Cadmium cupric chloride, CdCl, CuCl+4H₂O

Sol in H₂O (v Hauer, W A B **17** 331)

Cadmium hydrazine chloride, CdCl₂, N₂H₄HCl

Unstable in the air when moist Very so in H₂O, sl sol in alcohol, sol in NH₃+Ac (Curtius, J pr 1894, (2) **50** 334)

CdCl₂, 2N₂H₄HCl+4H₂O Very sol in H₂O, sl sol in alcohol (Curtius, J pr 189 (2) **50** 335)

Cadmium iron (ferrous) chloride, 2CdCl FeCl₂+12H₂O

Sol in H₂O (v Hauer, W A B **17** 331)

Cadmium lithium chloride, CdCl, LiCl-3½H₂O

Very deliquescent Decomp by solution in H₂O, but not in alcohol (Chassevant, ch (6) **30** 39)

Cadmium magnesium chloride, 2CdCl, MgCl₂+12H₂O

Deliquescent in moist, stable in dry air. Easily sol in H₂O with absorption of heat. Much more sol in hot than in cold H₂O (Hauer)

Solubility in H₂O at t°

t	G. CdMgCl in 100 g solution	G. Cd MgCl in 100 g H ₂ O
24	45.61	53.86
26.5	49.69	98.77
45.5	53.51	115.10
67.2	58.14	138.90
121.8	65.48	189.69

(Rumbach, B 1897, **30** 3684)

CdCl, 2MgCl+12H₂O Very deliquescent (v Hauer)

Cadmium manganese chloride, 2CdCl, MnCl₂+12H₂O

Deliquescent in moist, efflorescent in air Sol in H₂O (v Hauer)

Cadmium nickel chloride, CdCl, 2NiCl 12H₂O

Sol in H₂O (v Hauer, W A B **20** 411)
2CdCl₂, NiCl+12H₂O Sol in H₂O (Hauer)

Cadmium potassium chloride, CdCl, KCl ½H₂O

Sol in H₂O without decomp (v Hauer)

+H₂O 100 mol H₂O dissolve at
19° 3' 29° 7' 40° 1' 54° 5'
2 65 3 21 3 72 4 33 mol CdCl₂, KCl+H₂O
(Sudhaus, Miner Jahrb Beil-Bd 1914, **37**
26)

Solubility in H₂O at t°

t°	G CdKCl ₃ in 100 g solution	G CdKCl ₃ in 100 g H ₂ O
2 6	21 87	27 99
15 9	26 60	36 4
41 5	35 66	55 34
60 6	40 67	68 55
105 1	51 67	106 91

(Rimbach, B 1897, **30** 3079)

CdCl₂, 2KCl 100 pts H₂O at 15° dis-
solve 33 45 pts Sl sol in alcohol (Croft,
Phil Mag (3) **21** 356)

Solubility in salts + Aq at 16°

CdCl₂, 2KCl is sol without decomp in the
following salt solutions at 16°

Salt	Mols salt in 100 mole H ₂ O	In 1 litre of the solution mole			Sp gr of the solution
		CdCl	KCl	RCl	
LiCl	9 3	0 166	0 663	4 483	1 1380
CaCl	3 8	0 270	1 080	1 887	1 2333
KCl	2 375	0 507	3 195		1 214

(Rimbach, B 1905, **38** 1568,)

CdCl₂, 4KCl More sol in H₂O than
CdCl₂, KCl (v Hauer)

100 g H₂O dissolve at

19° 3' 29° 7' 40° 1' 54° 5'
41 65 49 05 57 5, 69 91 g CdCl₂ 4KCl
(Sudhaus, Miner Jahrb Beil-Bd 1914, **37**
24)

Solubility in H₂O at t°

t	100 pt. solution contain pts		
	Cl	Cl	K
1 0	5 61	9 84	8 31
2 6	5 66	14 02	11 52
50 2	9 10	18 09	13 60
105 8	11 97	23 08	17 10
109 0	11 91	23 15	17 22

(Rimbach, B 1897 **30** 3080)

Decomp by H₂O

Can be recryst without decomp from LiCl,
CaCl₂ or MgCl₂ + Aq (Rimbach, B 1905
38 1565)

The salt is sol without decomp in HCl + Aq
containing 19 8 mole HCl per 100 mole H₂O
at 16°

1 l of the solution contains 0 033 mole
CdCl₂, 0 132 mole KCl and 8 828 mole HCl
sp gr of the solution = 1 1403 (Rimbach,
B 1905, **38** 1568)

Cadmium rubidium chloride, CdCl₂, 2RbCl
Sol in H₂O and HCl + Aq (Godeffroy, B
8 9)
CdCl₂, RbCl Solubility in H₂O at t°
100 pts by wt of the solution contain pts
by wt RbCl, CdCl₂

t°	Pts RbCl CdCl
1 2	12 97
14 5	16 80
41 4	25 31
57 6	30 83
103 9	46 62

CdCl₂, RbCl is sol in H₂O without decomp
from 0-104° (Rimbach, B 1902, **35** 1303)

CdCl₂, 4RbCl

Solubility of CdCl₂, 4RbCl and CdCl₂, RbCl
in H₂O at t°

t°	In 100 pts by wt of the solution			Composition of the solid phase	
	Pts by wt Cd	Pts by wt Cl	Pts by wt Rb	Mol % mono salt	Mol-% tetra salt
0 7	0 65	6 52	14 73	30	70
8 8	1 07	7 37	16 13	24	76
13 8	1 32	7 86	16 93	16	84
42 4	3 21	11 35	22 45	14	86
59 0	4 61	13 41	25 31	33	67
108 4	8 94	18 57	31 15		

(Rimbach, B 1902, **35** 1305)

Decomp by H₂O between 0° and 108°
(Rimbach, B 1905, **38** 1571)

Sol in conc HCl without decomp (Rim-
bach, B 1905, **38** 1571)

Not sol in CaCl₂ + Aq and LiCl + Aq with-
out decomp (Rimbach, B 1905, **38** 1571)

Cadmium sodium chloride, CdCl₂, 2NaCl +
3H₂O

Sol in 1 4 pts H₂O at 16° (Croft)

100 mol H₂O dissolve at

19° 3' 29° 7' 40° 1' 54° 5'
3 93 4 29 4 73 5 18 mol CdCl₂,
2NaCl + 3H₂O

Stable between 19 and 55°

(Sudhaus, Miner Jahrb Beil-Bd 1914, **37**
25)

Sl sol in alcohol or wood alcohol (Croft)

Cadmium strontium chloride, 2CdCl₂, SrCl₂ +
7H₂O

Sol in H₂O (v Hauer)

Cadmium chloride ammonia, CdCl₂, 2NH₃

Nearly insol in H₂O (v Hauer)

CdCl₂, 3NH₃ + 1/2 H₂O

CdCl₂, 4NH₃ + 1/2 H₂O

CdCl₂, 5NH₃ (Andr, C R **104** 908)

CdCl₂, 6NH₃ Difficultly sol in cold H₂O
(Schuler, A **87** 34)

Cadmium chloride cupric oxide, $\text{CdCl}_2, 3\text{CuO} + 3\text{H}_2\text{O}$

Not decomp by H_2O (Mailhe, A ch 1902, (7) 27 378 and 174)

Cadmium chloride hydrazine, $\text{CdCl}_2, 2\text{N}_2\text{H}_4$

Insol in H_2O
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 279)

+ H_2O Insol in H_2O , easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Curtius, J pr 1894, (2) 50 345)

Cadmium chloride hydroxylamine, $\text{CdCl}_2, 2\text{NH}_2\text{OH}$

Sl sol in cold, somewhat more in warm H_2O Very sol in hydroxylamine + Aq Very sl sol in alcohol and other organic solvents (Crismer, Bull Soc (3) 3 116)

Aq solution sat at 20° contains about 1% (Antonoff, C C 1905, II 810)

Cadmium fluoride, CdF_2

Difficultly sol in H_2O Easily sol in $\text{HF} + \text{Aq}$ (Berzelius, Pogg 1 26)

Very sol in H_2O , insol in 95% alcohol, sol in HCl , H_2SO_4 , or $\text{HNO}_3 + \text{Aq}$ with evolution of HF (Poulenc, C R 116 582)

1 l H_2O dissolves 0.289 mol CdF_2 at 25°, or 100 cc sat aqueous solution contains 4.36 g CdF_2 at 25° (Jaeger, Z anorg 1901, 27 35)

1 l of 1.08-N HF dissolves 0.372 mol CdF_2 at 25° (Jaeger, Z anorg 1901, 27 35)
Insol in liq NH_3 (Gore, Am Ch J 1898, 20 827)

Cadmium ceric fluoride, $\text{CdF}_2, 2\text{CeF}_4 + 7\text{H}_2\text{O}$

Ppt Decomp by H_2O (Rimbach, A 1909, 368 106)

Cadmium columbium fluoride

See Fluocolumbate, cadmium

Cadmium molybdenyl fluoride

See Fluoxymolybdate, cadmium

Cadmium silicon fluoride

See Fluosilicate, cadmium

Cadmium stannic fluoride

See Fluostannate, cadmium

Cadmium titanium fluoride

See Fluotitanate, cadmium

Cadmium zirconium fluoride

See Fluozirconate, cadmium

Cadmous hydroxide, CdOH

Insol in H_2O Decomp by acids into cadmic salt (Morse and Jones, Am Ch J 12 488)

Cadmium hydroxide, CdO_2H_2

Insol in H_2O

1 l $\text{CdO}_2\text{H}_2 + \text{Aq}$ contains 0.0026 g CdO_2H_2

at 25° (Bodlander, Z phys Ch 1898, 7 66)

Solubility in $\text{H}_2\text{O} = 2.6 \times 10^{-4}$ (Herz, Z anorg 1900, 24 126)

Sol in acids, very sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in KOH , NaOH , Na_2CO_3 , K_2CO_3 , and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$

Easily sol in $(\text{NH}_4)_2\text{SO}_4$, NH_4Cl , NH_4NO_3 , and NH_4 succinate + Aq (Wittstein)

Freshly pptd CdO_2H_2 is sol in all haloids + Aq (Bersch, Z phys Ch 1891 8 392)

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ increases with increase in concentration of NH_4OH (Eder, B 1903, 36 3401)

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ at 25°

NH_3 norm	g CdO per l
0.5	0.24
1.0	0.62
1.8	1.33
4.6	4.92

(Bonsdorff, Z anorg 1904, 41 187)

Insol in ethyl, and methyl amine + Aq (Wurtz)

Very sl sol in $\text{HCN} + \text{Aq}$ even when freshly pptd (Schuler, A 87 48)

Not pptd in presence of Na citrate (Spilner), and many non-volatile organic substances (Rose)

Cadmium iodide, CdI_2

Sol in 113 pts H_2O at 15° (Eder, D gl 221 89)

Sol at 20° 40° 60° 80° 100°
in 108 100 93 86 75 pts 100

(Kremer Pogg 103 57)

Sat $\text{CdI}_2 + \text{Aq}$ contains at

—4°	+2°	+10°	13°	24°	32
42.4	43.7	45.2	44.8	46.5	47.4, C I
54°	64°	76°	94°	95°	135°
49.5	50.1	52.4	55.1	54.7	62.9, C I
140°	165	185°	202°	202°	255°
63.1	68.1	70.7	73.4	73.2	84.5, C I

(Friedl A ch 1894 (7) 2 545)

Solubility in H_2O

100 g of the sat solution contain at

0°	15°	50°	75°	100°
44.39	46.02	49.35	52.65	56.08 g C I

(Dittz Z anorg 1899, 20 262)

Sp gr of $\text{CdI}_2 + \text{Aq}$ containing pts CdI_2 to 100 pts H_2O

21.4	43.7	88.5 pts CdI_2
1.1681	1.328	1.6139

(Kremer Pogg 111 60)

Sp gr of $\text{CdI}_2 + \text{Aq}$ at 19.5° containing
 5 10 15 20 25 % CdI_2 ,
 1 044 1 088 1 138 1 194 1 253
 30 35 40 45 50 % CdI_2
 1 319 1 395 1 476 1 575 1 680
 (Kremers, calculated by Gerlach, Z anal
 8 285)

Sp gr of $\text{CdI}_2 + \text{Aq}$ at 18°
 % CdI_2 1 5 10 15 20
 Sp gr 1 0071 1 0425 1 0883 1 1392 1 1943
 % CdI_2 25 30 35 40 45
 Sp gr 1 2550 1 3228 1 4000 1 4816 1 5741
 (Grottrian, W Ann 1883, 18 193)

Sp gr of $\text{CdI}_2 + \text{Aq}$

g CdI per l	Sp gr	g CdI_2 per l	Sp gr
98 85	1 08	289 5	1 237
197 7	1 162	400	1 328

(Barbier and Roux, Bull Soc 1890, (3) 3 425)

Sp gr of $\text{CdI}_2 + \text{Aq}$

% CdI_2	t°	Sp gr at t°	Sp gr at 18°
0 0429	17 68	0 99915	0 99908
	22 88	0 99807	
0 100	17 55	0 99965	0 99956
	22 91	0 99363	
0 204	17 76	1 00052	1 0005
	22 79	0 99948	
0 399	17 40	0 00223	1 0021
	24 30	1 00082	
0 600	18 00		1 0038
0 800	17 44	1 00564	1 0056
	23 11	1 00442	
1 00	18 00		1 0072

(Wershofen, Z phys Ch 1890, 5 493)

Sp gr $\text{CdI}_2 + \text{Aq}$ at 18.4° containing
 31 123 13 677 9 559 % CdI_2
 1 338 1 125 1 086

(de Mynck, W Ann 1894, 53 561)

$\text{CdI} + \text{Aq}$ at 18.4° 10.97% CdI_2 has sp
 gr $20^\circ/20^\circ = 0.9952$

$\text{CdI} + \text{Aq}$ containing 16.53% CdI has sp
 gr $20^\circ/20^\circ = 1.1562$
 (Le Blanc and Rohland, Z phys Ch 1896,
 19 282)

Sp gr of $\text{CdI}_2 + \text{Aq}$ at 20°

Normality of $\text{CdI} + \text{Aq}$	% CdI_2	Sp gr
1 924	44 53	1 5807
0 951	27 07	1 2837
0 447	14 40	1 1355
0 211	7 26	1 0630

(Forchheimer, Z phys Ch 1900, 34 29)

$\text{CdI}_2 + \text{Aq}$ containing 1 pt CdI_2 in 2 2891
 pts H_2O at 17° has sp gr = 1 3341 (Hit-
 torf, Z phys Ch 1902, 39 628)

Sol in sat $\text{HI} + \text{Aq}$

Sol in warm $\text{NH}_4\text{OH} + \text{Aq}$

Insol in liquid NH_3 (Gore, Am Ch J
 1898, 20 827)

Sl sol in liquid NH_3 (Franklin, Am Ch
 J 1898, 20 827)

Sol in S_2Cl_2 (Walden, Z anorg 1900, 25
 217)

Difficultly sol in POCl_3 (Walden, Z
 anorg 1900, 25 212)

Nearly insol in AsBr_3 (Walden, Z anorg
 1902, 29 374)

Sol in SO_2Cl_2 (Walden, Z anorg 1900,
 25 215)

Sol in 15 pts alcohol (Vogel, N Rep
 Pharm 12 393)

Sol in 0.98 pt abs alcohol (Eder, Dingl
 221 89)

Sp gr of $\text{CdI}_2 + \text{alcohol}$

% CdI_2 Sp gr $20^\circ/20^\circ$

0 0 7949

7 28 0 8470

(Le Blanc and Rohland, Z phys Ch 1896,
 19 284)

Sol in 5.2 mols methyl, 7 mols ethyl, and
 9.8 mols propyl alcohol at 20° (Timofejew,
 C R 112 1224)

Sol in 3.6 pts ether (Eder, l c)

Sol in 2.0 pts alcohol-ether (1 1) (Eder,
 l c)

Very sl sol in anhydrous abs
 (Hampe, Ch Z 1887, 11 847)

100 g of sat solution in abs ether con-
 0.143 g CdI_2 at 12° (Tyrer, Proc Che
 Soc 1911, 27 142)

Solubility in ether + Aq at 12°

% H_2O in ether	% CdI	% H_2O in ether	% CdI	% H_2O in ether	% CdI_2
0 0	0 143	0 50	3 36	1 00	7 30
0 10	0 78	0 70	4 77	1 10	8 27
0 30	2 07	0 90	6 46	1 14	8 68

(Tyrer, Proc Chem Soc 27 142)

Solubility in benzene at $16^\circ = 0.01\%$

" 35° = 0.02%

Solubility in ethyl ether at $0^\circ = 0.03\%$

" 15.5° = 0.04%

" 20.3° = 0.05%

(Imbuge, Am J Sci 1895 (3) 49 52)

Sol in acetone (Fidmann, C C 1899, II
 1014)

1 g CdI_2 is sol in 4 g acetone at 18°
 Sp gr of sat solution $18^\circ/4^\circ = 0.994$ (Nau-
 mann, B 1904, 37 4338)

Sp gr of $\text{CdI}_2 + \text{acetone}$

CdI	Sp gr $20^\circ/20^\circ$
0	0 7998
12 02	0 8929

(Le Blanc and Rohland, Z phys Ch 1896,
 19 284)

Sol in chinolin (Beckmann and Gabel, Z anorg 1906, **51** 236)

100 g benzonitrile dissolve 1.6295 g CdI_2 at 18° (Naumann, B 1914, **47** 1370)

Insol in methylene iodide (Retgers, Z anorg **3** 343)

Sl sol in ethylamine (Shinn, J phys Chem 1907, **11** 538)

Insol in CS_2 (Arcetowski, Z anorg 1849, **6** 257)

Solubility in methyl acetate = 0.7–1.5%, 2.1% at bpt (Schroder and Steiner, J pr 1909, (2) **79** 49)

Sol in methyl acetate (Naumann, B 1909, **42** 3790)

1 pt is sol in 54.3 pts ethyl acetate at 18° . The sat solution has $D_{18^\circ/4^\circ} = 0.9145$ (Naumann, B 1910, **43** 318)

Insol in mustard oil (Mathews, J phys Chem 1905, **9** 647)

Mol weight determined in piperidine, pyridine, methyl and ethyl sulphide (Werner, Z anorg 1897, **15** 17)

Cadmium hydrogen iodide, $\text{CdI}_2 \cdot \text{HI} + 3\text{H}_2\text{O}$

Decomp in air (Dobroserdow, C C 1900, II 527)

Cadmium caesium iodide, $\text{CdI}_2, \text{CsI} + \text{H}_2\text{O}$

n H_2O without decomp (Wells and Z anorg **5** 271)

2CsI As above
3CsI Decomp by H_2O into the salt

Cadmium hydrazine iodide, $\text{CdI}_2 \cdot 2\text{N}_2\text{H}_4\text{HI}$

Sol in H_2O (Ferratin, C A 1912 1612)

Cadmium mercuric iodide

Very sol in H_2O (Berthelot, J Pharm **14** 613)

$\text{CdI}_2 \cdot 3\text{HgI}_2$ Sol in H_2O . Can be recrystallized in alcohol (Clarke and Koble, Am Ch J **5** 235)

Cadmium potassium iodide, $\text{CdI}_2, \text{KI} + \text{H}_2\text{O}$

Sol in 0.94 pt H_2O at 15° (Eder, Dingl **221** 89)

$\text{CdI}_2, 2\text{KI} + 2\text{H}_2\text{O}$ Deliquescent. Externally sol in H_2O . Sol at 15° in 0.73 pt H_2O . Sl sol in alcohol and wood spirit, but less than CdI_2 (Croft)

Sol at 15° in 1.4 pts absolute alcohol, 24.5 pts ether (0.729 sp gr), and 4.5 pts alcohol ether (1.1) (Eder, l c)

Sp gr of $\text{K CdI}_4 + \text{Aq}$ at 18°

% K CdI_4	1	5	10	15	20
Sp gr	1.0065	1.0384	1.0808	1.1269	1.1770

% K CdI_4	25	30	35	40	45
Sp gr	1.2313	1.2890	1.3557	1.4282	1.5065

(Grotrian, W Ann 1883, **18** 193)

Sp gr of $\text{K}_2\text{CdI}_4 + \text{Aq}$

% K_2CdI_4	t°	Sp gr at t°	Sp gr at 18°
0.0328	18		0.99
0.0596	18		0.99
0.0804	18		0.99
0.100	17.12	0.99962	0.99
	21.82	0.99872	
0.250	18		1.00
0.500	18		1.00
1.003	17.32	1.0068	1.00
	20.63	1.0061	

(Wershofen, Z phys Ch 1890, **5** 493)

Sol in ethyl acetate (Naumann, B 1914, **37** 3601)

Cadmium sodium iodide, $\text{CdI}_2, 2\text{NaI} + 6\text{H}_2\text{O}$

Deliquescent (Croft)

Sol at 15° in 0.63 pt H_2O , 0.86 pt alcohol, and 10.1 pts ether (sp gr 0.7) (Eder, Dingl **221** 89)

Cadmium strontium iodide, $\text{CdI}_2, \text{SrI}_2 + 8\text{H}_2\text{O}$

Deliquesces in moist, effloresces in dry, sol in H_2O (Croft)

Cadmium iodide ammonia, $\text{CdI}_2, 2\text{NH}_3$

Decomp by H_2O (Rammelsberg)

$\text{CdI}_2, 4\text{NH}_3$ (Dawson and McCrae, Ch Soc 1900, **77** 1246)

$\text{CdI}_2, 6\text{NH}_3$ Decomp by H_2O , sol in warm, less sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg)

Cadmium iodide hydrazine, $\text{CdI}_2, 2\text{N}_2\text{H}_4$

Easily sol in warm $\text{NH}_4\text{OH} + \text{Aq}$ (Hinz, Z anorg 1908, **60** 281)

Cadmium iodide hydroxylamine, $\text{CdI}_2, 3\text{NH}_2\text{OH}$

Sol in H_2O and alcohol. Insol in ether (Adams, Am Ch J 1902, **28** 215)

Cadmium iodide selenide, $\text{CdI}_2, 3\text{CdSe}$

Easily decomp (Fonczes-Dixon, C R 1900 **131** 897)

Cadmium iodosulphide, $\text{CdI}_2, 2\text{CdS}$

Ppt (Naumann, B 1904 **37** 4338)

Cadmium suboxide, Cd_2O

Decomp by H_2O , acids and $\text{NH}_4\text{O} + \text{Aq}$ (Finnert, Z anorg 1901, **27** 433)

CdO Properties as cadmium hydroxide (Morse and Jones)

Cadmium oxide, CdO

Insol in H_2O . Sol in acids. Sol in $\text{NH}_4\text{OH} + \text{Aq}$. Insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$. Easily sol in $\text{NH}_4\text{Cl} + \text{Aq}$, less in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett, 1837)

Insol in KOH, NaOH, K_2CO_3 , and Na_2CO_3
+Aq

See also Cadmium hydroxide

Solubility in (calcium succate+sugar)+
Aq

1 l solution containing 418.6 g sugar and
34.3 g CaO dissolves 0.22 g CdO

1 l solution containing 174.4 g sugar and
14.1 g CaO dissolves 0.48 g CdO

(Bodenbender, J B 1865 600)

Insol in acetone (Naumann, B 1904, 37
4329)

Insol in methyl acetate (Naumann, B
1909, 42 3790)

Insol in ethyl acetate (Naumann, B
1904, 37 3601)

Cadmium peroxide, Cd_5O_8 or Cd_3O_5 (?)

(Haas)

CdO_2 , $Cd(OH)_2$ (Kouriloff, A ch (6) 23
431)

Very stable towards H_2O Insol in NH_4OH
+Aq (Haas, B 1884, 17 2253)

$4CdO_2$, $Cd(OH)_2$ Ppt Insol in NaOH+
Aq (Eykman, C C 1905, I 1629)

$5CdO_2$, $CdO+3H_2O$ Ppt (Teletow, C A
1912, 43)

Cadmium oxybromide, CdO , $CdBr_2+H_2O$

Decomp by H_2O (Tassily, C R 1897,
124 1023)

+ $2H_2O$ Stable in dry air, insol in H_2O
(Tassily, C R 1897, 124 1022)

+ $3H_2O$ Slowly decomp by H_2O (Tas
sily, C R 1897, 124 1022)

+ $7H_2O$ (Mailhe, C R 1901, 132 1561)

Cadmium oxychloride, $CdCl_2$, $CdO+H_2O$

Sl sol in hot H_2O (Habermann, M Ch
5 432)

+ $7H_2O$ (Mulhe, Bull Soc 1901, (3) 25
791)

$2CdO$, $CdCl_2$ Insol in H_2O , but slowly
decomp thereby (Cunzoneri, Gazz ch it
1897, 27 (2) 486)

Cadmium oxyiodide, CdO , CdI_2+H_2O

Decomp by H_2O (Tassily, C R 1897,
124 1023)

+ $3H_2O$ Stable in dry air, insol in H_2O
(Tassily, C R 1897, 124 1022)

Cadmium phosphide, Cd_3P_2

Sol in HCl+Aq with evolution of PH_3

CaP₃ in conc HCl+Aq (Lemmerling, B 12 152)

Easily decomp by acids (Kulisch, A 231
327)

CdP_2 Decomp by boiling conc HCl+Aq
(Renault, C R 76 283)

Cadmium selenide, $CdSe$

Sol in HCl+Aq (Uellmann, A 116 122)

Easily decomp by acids (Fonze-Diacon,
C R 1900, 131 897)

Cadmium sulphide, CdS

Insol in H_2O

Solubility in H_2O at $16-18^\circ = 6.6 \times 10^{-6}$
mols per l (Biltz, Z phys Ch 1907, 58
291)

1 l H_2O dissolves 9.00×10^{-6} mols CdS
(artificial greenockite) at 18°

1 l H_2O dissolves 8.86×10^{-6} mols pptd
 CdS at 18° (Weigel, Z phys Ch 1907, 58
294)

Difficultly sol in hot dil HCl+Aq Easily
sol in cold conc HCl+Aq (Stromeyer)
Sol in HNO_3 +Aq (Meissner), and boiling dil
 H_2SO_4 +Aq (1 6) (A W Hoffmann, A
115 286) Very sl sol in NH_4OH +Aq
(Wackenroder, Report 46 226) Insol in
KOH, or $(NH_4)_2S$ +Aq Appreciably sol in
an acid solution of NH_4Cl (Baxter and
Hines, Z anorg 1905, 44 160)

Much more sol in $(NH_4)_2S$ +Aq than usu-
ally supposed (Ditte, C R 85 402) Sol-
ubility increases by warming, and at 68° is
twice that at ordinary temperatures A sat
solution of $(NH_4)_2S$ dissolves about 2 g CdS
to a litre Alkali sulphides dissolve much
less (Ditte)

Fresenius (Z anal 20 236) could not con-
firm the above According to Fresenius, CdS
is not appreciably sol in $(NH_4)_2S$ +Aq

Insol in Na_2SO_3 or KCN +Aq (Fresenius)

Insol in NH_4Cl or NH_4NO_3 +Aq (Brett)

Sol in alkali sulpho-molybdates, -tung-
states, -vanadates, -arsenates, -antimonates,
-stannates+Aq (Storch, B 16 2015)

Insol in liquid NH_3 (Franklin, Am Ch
J 1898, 20 827)

Insol in acetone (Naumann, B 1904, 37
4329, Erdmann, C C 1899, II 1014)

Insol in ethyl acetate (Naumann, B
1910, 43 314)

Min Greenockite Sol in HCl+Aq

Colloidal—Solution of 4 g colloidal C
in a litre H_2O remains transparent several
days If it contains 11 g CdS in a litre, it is
completely coagulated in 24 hours Solutions
of salts of the following concentration cause
an immediate coagulation in an aqueous solu-
tion of CdS containing 3.62 g in a litre

KCl	1 1615
KBr	1 727
KI	1 57
KCN	1 166
KClO ₃	1 1666
KNO ₃	1 1000
K ₂ SO ₄	1 5000
K ₂ SO ₃	1 833
K ₃ Fe(CN) ₆	1 166
K ₄ Fe(CN) ₆	<1 100
K ₂ CrO ₄	1 400
K ₂ Cr ₂ O ₇	1 3571
NaCl	1 2666
Na ₂ S ₂ O ₃	1 98
NaHCO ₃	1 333
Na ₂ CO ₃	1 166
Na ₂ HPO ₄	1 202

$\text{NaC}_2\text{H}_3\text{O}_2$	1	2451
Na benzoate	1	10,000
$(\text{NH}_4)_2\text{C}_2\text{O}_4$	1	588
BaCl_2	1	11,764
$\text{Ba}(\text{NO}_3)_2$	1	8032
BaS_2O_8	1	5617
MgSO_4	1	41,666
MnSO_4	1	22,222
CdSO_4	1	250,000
$\text{Cd}(\text{NO}_3)_2$	1	285,714
$\text{Pb}(\text{ClO}_3)_2$	1	209
$\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2$	1	147,058
$\text{Hg}(\text{CN})_2$	<1	20
$\text{Al}_2(\text{SO}_4)_3$	1	232,558
Alum	1	192,377
Chrome alum	1	42,555
HCl	1	4807
H_2SO_4	1	8000
$\text{HC}_2\text{H}_3\text{O}_2$	1	15
$\text{H}_2\text{C}_2\text{O}_4$	1	23,255
Succinic acid	<1	100
Tartaric acid	1	333

(Prost, Belg Acad Bull (3) 14 312, J B 1887 537)

Cadmium pentasulphide, CdS_5

Insol in H_2O (Schiff, A 115 74)
Mixture of CdS and S (Follenius, Z anal 13 412)

Cadmium potassium sulphide, K_2CdS_4

, anorg 1904, 42 439)

Cadmium sulphide, 3CdS , Na_2S

by H_2O (Schneider, J pr (2)

Cadmium sulphoiodide

See Cadmium iodosulphide

Cadmium telluride, CdTe

Not attacked by dil acids. Attacked in the cold only by HNO_3 (Gibbals, J Am Chem Soc 1909, 31 908)

Cadmic acid

Potassium cadmate

Insol in H_2O , but gradually decomp when in contact therewith (Mummi, C R 63 330)

Cæsium, Cs

Decomp H_2O with great violence (Settemberg, A 211 100)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Cæsium acetylide acetylene, $\text{CsC}\equiv\text{CH}$

Insol in C_6H_6 and in CHCl_3 (Moissan, C R 1903, 136 1218)

Cæsium amide, CsNH_2

Decomp by H_2O . Very sol in liquid NH_3 (Rengade, C R 1905, 140 1185)

Cæsium ammonia, Cs_3NH_3

Sol in liquid NH_3 (Moissan, C R 1903, 136 1177)

Cæsium azoumide, CsN_3

Deliquescent Stable in aq solution

224.2 pts sol in 100 pts H_2O at 0°

307.4 " " " 100 " H_2O " 16°

1.0366 " " " 100 " abs alcohol " 16°

Insol in pure ether (Curtius, J pr 1898, (2) 58 283)

Cæsium bromide, CsBr

Ppt (Chabrie, C R 1901, 132 679)

Sat $\text{CsBr} + \text{Aq}$ at 25° contains 55.23%

CsBr (Foote, Am Ch J 1907, 37 125)

Cæsium tribromide, CsBr_3

Sol in H_2O , decomp by alcohols (Wells, Sill Am J 143 17)

Cæsium pentabromide, CsBr_5

Very unstable (Wells and Wheeler, Sill Am J 144 42)

Cæsium cobalt bromide, Cs_2CoBr_4

Decomp by H_2O (Campbell, Z anorg 1894, 8 126)

Decomp by H_2O and by alcohol (Campbell, Am J Sci 1894, (3) 48 418)

Cs_2CoBr_5 Decomp by H_2O (Campbell, Z anorg 1894, 8 126)

Decomp by H_2O and by alcohol (Campbell, Am J Sci 1894, (3) 48 418)

Cæsium copper bromide, CsBr , CuBr

Sol in H_2O without decomp (Wells and Walden, Z anorg 5 304)

2 CsBr , CuBr_2 (W and W)

Cæsium iridium bromide

See Bromiridate, cæsium

Cæsium iron (ferric) bromide, CsIcBr_3

Sol in H_2O (Walden, Z anorg 1894, 7 332)

$\text{CsIcBr}_3 + \text{H}_2\text{O}$ (Walden, Z anorg 1894 7 332)

Cæsium lead bromide, CsBr , 2PbBr_2

Nearly stable in aqueous solution (Walden, Sill Am J 145 127)

CsBr , PbBr_2 Decomp by H_2O (Walden)

4 CsBr , PbBr_2 As above

Solubility determinations show that the double salts formed by cæsium and lead bromides at 25° are CsPbBr_3 , Cs_2PbBr_4 , and Cs_4PbBr_6 (Foote, Am Ch J 1907 37 125)

Cæsium magnesium bromide, CsBr , $\text{MgBr}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Wheeler and Campbell, Z anorg 5 275)

Cæsium mercuric bromide, CsBr, 2HgBr₂

Not decomp by H₂O 100 pts solution sat at 16° contain 0.807 pt CsBr, 2HgBr₂. Sol in hot strong alcohol, from which CsBr, HgBr₂ separates on cooling (Wells, Sill Am J 144 221)

CsBr, HgBr₂ Decomp by H₂O into above salt Sol in alcohol without decomp (Wells)

2CsBr, HgBr₂ Decomp by H₂O into CsBr, 2HgBr₂

3CsBr, HgBr₂ As above

Cæsium molybdenyl bromide, 2CsBr,

MoOBr₃

(Weinland and Knoll, Z anorg 1905, 44 107)

Cæsium nickel bromide, CsNiBr₃

Decomp by H₂O (Campbell, Z anorg 1894, 8 126)

Decomp by H₂O and by alcohol (Campbell, Am J Sci 1894, (3) 48 418)

Cæsium osmium bromide

See Bromosmate, cæsium

Cæsium palladium bromide

See Bromopalladate, cæsium and bromopalladite, cæsium

Cæsium platinum bromide

See Bromoplatinate, cæsium

Cæsium ruthenium bromide

See Bromoruthenite, cæsium

Cæsium selenium bromide

See Bromoselenate, cæsium

Cæsium tellurium bromide

See Bromotellurate, cæsium

Cæsium thallic bromide, CsBr, TlBr₃

Sol in H₂O with decomp (Priett, Z anorg 1895, 9 19)

By recryst from H₂O, forms 3CsBr, 2TlBr₃ (Priett, Am J Sci 1895 (3) 49 403)

3CsBr, 2TlBr₃ Can be recryst unchanged from H₂O (Priett, Am J Sci 1895, (3) 49 402)

Cæsium tin (stannic) bromide

See Bromostannate, cæsium

Cæsium zinc bromide, 3CsBr, ZnBr₂

Sol in H₂O (Wells and Campbell, Z anorg 5 275)

2CsBr, ZnBr₂ As above

Cæsium bromide columbium oxybromide,

2CsBr, CbOBr₃

Unstable in moist air Decomp by H₂O (Weinland, B 1906, 39 3059)

Cæsium bromochloride, CsBr₂Cl

Properties as CsBr₃ (Wells)

CsBrCl₂ As above (Wells)

Cæsium mercuric bromochloride,

Cs₂HgCl₃Br₂

Decomp by H₂O finally to HgBr (Wells, Sill Am J 144 121)

Cs₂HgCl₃Br As above

CsHgClBr₂ As above

CsHg₂ClBr₄ As above

CsHg₅ClBr₁₀ As above

Cæsium bromochloriodide, CsBrClI

More sol in H₂O than in alcohol Not decomp at once by ether (Wells)

Cæsium bromiodide, CsBrI₂

Decomp by H₂O Sol in alcohol Decomp by ether with residue of CsBr (Wells, Sill Am J 143 17)

CsBr₂I More sol in H₂O than in alcohol Not decomp by ether

CsBr₂I + Aq sat at 20° contains about 4.45% CsBr₂I (Wells)

Cæsium carbide, Cs₂C₂

Decomp by cold H₂O (Moissan, C R 1903, 136 1221)

Cæsium chloride, CsCl

Very deliquescent, sol in H₂O and alcohol

Solubility of CsCl at t°

t°	Pts by wt of CsCl in 100 pts solution
0	3
10	61.9
20	63.5
30	64.9
40	66.3
50	67.4

(Hinrichsen, Z phys Ch 1904, 50 99)

Solubility of CsCl at t°

t	% CsCl	t	% CsCl
0	61.7	60	69.7
10	63.6	70	70
20	65.1	80	71.4
30	66.4	90	72.2
40	67.5	100	73.0
50	68.0	119.4	74.4

(Berkeley, Trans Roy Soc 1904, 203 A 208)

A normal solution of CsCl has sp gr at 25° = 1.1076 (Wagner, Z phys Ch 1890, 5 36)

Sp gr at 20°/4° of a normal solution of CsCl = 1.125815 (Haugh, J Am Chem Soc 1912, 34 1151)

Sp gr of CsCl+Aq			
G equiv CsCl per l at 18°	Sp gr at 6°/8°	Sp gr at 18°/18°	Sp gr at 30°/30°
0 504	1 06556	1 06483	1 06452
1 002	1 12962	1 12825	1 12750
2 007	1 25705	1 25452	1 25307
3 994	1 50514	1 50100	1 49859

(Clausen, W Ann 1914, (4) 44 1071)

Solubility of CsCl+FeCl₃ in H₂O at 21°

Substance added		Pts by weight in 100 pts of solution	
FeCl ₃ grams	CsCl grams	FeCl ₃	CsCl
0	65	0	65 0
0 6	11 6	0 45	55 18
1 4	10 2	2 1	52 38
2 2	8 8	5 24	51 44
2 0	7 4	7 8	47 70
3 8	6 0	8 93	41 15
4 6	4 6	15 34	25 25
5 4	2 8	21 65	14 96
6 2	1 4	27 96	8 42
35	0 2	48 71	0 94
35	0	83 89	0

(Hennrichsen, Z phys Ch 1904, 50 96)

Solubility of CsCl+HgCl₂ in H₂O at 25°

Solution contains		Solid phase
% CsCl	% HgCl ₂	
65 61	0 00	CsCl
65 78	0 215	CsCl+Cs ₂ HgCl
62 36	0 32	Cs ₂ HgCl
57 01	0 64	"
52 35	1 23	"
51 08	1 44	Cs ₃ HgCl ₅ +Cs ₂ HgCl ₄
49 30	1 49	Cs ₂ HgCl ₄
45 95	1 69	"
45 23	1 73	Cs ₂ HgCl ₄ +Cs ₂ HgCl ₃
38 63	1 32	Cs ₂ HgCl ₃
17 03	0 51	"
1 55	0 42	"
0 61	2 64	Cs ₂ HgCl ₃ +Cs ₂ HgCl ₂
0 49	2 91	Cs ₂ HgCl ₂
0 40	3 78	Cs ₂ HgCl ₂ +Cs ₂ Hg ₃ Cl ₁₁
0 44	4 63	"
0 41	4 68	Cs ₂ Hg ₃ Cl ₁₁
0 25	5 65	"
0 18	7 09	Cs ₂ Hg ₃ Cl ₁₁ +HgCl
0 00	6 90	HgCl

(Foote, Am Ch J 1903 30 340)

Insol in acetone (Naumann, B 1904, 37 4329, Fiedmann, C C 1899, II 1014)

100 g solution in acetone sat at 25° contain 0.032 g CsCl (Foote and Hugh, J Am Chem Soc 1911, 33 461)

Solubility of CsCl+HgCl₂ in acetone at 21°

Solution contains		Solid phase
% HgCl	% CsCl	
57 74	0 00	HgCl ₂
57 79	0 13	HgCl ₂ +CsHg ₅ Cl ₁₁
57 74	0 20	CsHg ₅ Cl ₁₁
52 54	0 22	"
49 83	0 32	"
44 32	0 50	CsHg ₅ Cl ₁₁ +CsHg ₂ Cl ₃
44 46	0 44	"
39 65	0 48	CsHg ₂ Cl ₃
28 48	0 48	"
26 96	0 52	CsHg ₂ Cl ₃ +CsHgCl ₃
27 32	0 61	"
21 50	0 46	CsHgCl ₃
13 08	0 45	"
0 16	0 19	Mixtures of salts
0 17	0 25	"
0 02	0 11	"
0 00	0 032	CsCl

(Foote and Haigh, J Am Ch Soc 1911, 461)

Insol in methyl acetate (Naumann, 1909, 42 3790)

Solubility in glycol at ord temp = 10 - 10.8% (de Coninck, Belg Acad Bull 19 359)

Insol in anhydrous pyridine and in 9% pyridine+Aq. Sol in 95% pyridine+ and in 93% pyridine+Aq (Kahlenberg, Am Chem Soc 1908, 30 1107)

Caesium chromium chloride, 2CsCl, CrCl₃ + H₂O

Stable in the anhydrous state. Sol in H₂O (Wells, anorg 1895, 10 182)
2CsCl, CrCl₃+4H₂O, hygroscopic, very soluble in H₂O (Wells, l c)

Caesium tri-aquo chromium chloride, CrCl₃(OH₂)₄Cl, 2CsCl

Ppt (Werner, B 1901, 34 1602)

Caesium cobalt chloride, Cs₂CoCl₄+2H₂O

Decomp by H₂O and alcohol (Cunneff, Z anorg 1894, 8 126)
Cs₂CoCl₄ Decomp by H₂O and by alcohol (Cunneff, Z anorg 1894 8 126)
Cs₂CoCl₄ Decomp by H₂O and by alcohol (Cunneff, Z anorg 1894 8 126)

Caesium cuprous chloride, Cs₂Cl, CuCl

Decomp by H₂O into CuCl, CsCl (Wells, Z anorg 5 306)
3CsCl, CuCl (Wells)
6CsCl, CuCl (Wells)

Caesium cupric chloride, 2CsCl, CuCl₂

Easily sol in H₂O and dil HCl + insol in conc HCl+Aq (Godeffroy, 3 8 9)

Sol in small amount H_2O without decomp (Wells and Dupee, *Z anorg* **5** 300)
 $+2H_2O$ Efflorescent (W and D)
 $3CsCl, 2CuCl_2 + 2H_2O$
 $CsCl, CuCl_2$ Sol in H_2O without decomp (W and D)

Cæsium gold chloride

See Chloraurate, cæsium

Cæsium iridium tetrachloride

See Chloriridate, cæsium

Cæsium iron (feric) chloride, $CsFeCl_4 + \frac{1}{2}H_2O$

Sol in H_2O Decomp in the air (Walden, *Z anorg* 1894, **7** 332)
 $Cs_2FeCl_5 + H_2O$ Sol in H_2O (Walden)
 $Cs_3FeCl_6 + H_2O$ Sol in H_2O (Walden)

Cæsium lanthanum chloride, $Cs_3LaCl_6 + 4H_2O$

Very hygroscopic Easily sol in H_2O (R J Meyer, *Z anorg* 1914, **86** 273)

Cæsium lead chloride, $CsCl, 2PbCl_2$

Nearly stable in aqueous solution (Campbell, *Sill Am J* **145** 126)
 $CsCl, PbCl_2$ Decomp by H_2O (Campbell)
 $4CsCl, PbCl_2$ As above (Campbell)

Cæsium lead tetrachloride

See Chloroplumbate, cæsium

Cæsium magnesium chloride, $CsCl, MgCl_2 + 6H_2O$

Sol in H_2O (Wells and Campbell, *Z anorg* **5** 275)

Cæsium manganous chloride, $CsCl, MnCl_2 + 2H_2O$

Not deliquescent, sol in H_2O (Saunders, *Am Ch J* **14** 143)
 $2CsCl, MnCl_2$ (Godffroy)
 $+ 2\frac{1}{2}H_2O$ (Godffroy)
 $+ 3H_2O$ Sol in H_2O Conc $HCl + Aq$ precipitates anhydrous salt from aqueous solution (Godffroy, *B* **8** 9)
 The only salt which exists contains $2H_2O$ (Saunders *Am Ch J* **14** 143)

Cæsium manganic chloride, $2CsCl, MnCl_3$

Easily decomp (Meyer and Best, *Z anorg* 1899, **22** 187)

Cæsium mercuric chloride, $CsCl, HgCl_2$

100 pts solution sat at 17° contain 1 406 pts $CsHgCl_3$ Not decomp by H_2O Insol in absolute alcohol, but sol on diluting with $\frac{1}{3}$ vol H_2O (Wells, *Sill Am J* **144** 221)
 $2CsCl, HgCl_2$ Easily sol in H_2O and dil $HCl + Aq$, insol in conc $HCl + Aq$ (Godffroy)

$3CsCl, HgCl_2$ Decomp by H_2O , on re-crystallizing from H_2O , $CsCl, HgCl_2$ is finally formed (Wells, *Sill Am J* **144** 221)

$CsCl, 5HgCl_2$ Decomp by H_2O (Wells)
 Solubility determinations show that the only double salts of $CsCl$ and $HgCl_2$ which exist at 25° are Cs_3HgCl_5 , Cs_2HgCl_4 , $CsHgCl_3$, $CsHg_2Cl_5$, $CsHg_3Cl_{11}$ (Foote, *Am Ch J* 1903, **30** 340)

Cæsium molybdenum chloride, $Cs_2MoCl_5 + H_2O$

Sol in H_2O Nearly insol in alcohol and ether (Chilesotti, *C C* **1903**, II 652)

Cæsium molybdenyl chloride, $CsCl, MoO_2Cl_2 + H_2O$

Hygroscopic Decomp by H_2O (Weinland and Knoll, *Z anorg* 1905, **44** 93)
 $2CsCl, MoO_2Cl_2$ Hygroscopic Decomp by H_2O (Weinland and Knoll, *Z anorg* 1905, **44** 92)
 $2CsCl, 6MoO_2Cl_2 + 22H_2O$ Very hygroscopic Decomp by H_2O (Weinland and Knoll, *Z anorg* 1905, **44** 94)
 $2CsCl, MoOCl_3$ Only sl sol in H_2O (Nordenskiöld, *B* 1901, **34** 1573)

Cæsium neodymium chloride, $Cs_3NdCl_6 + 5H_2O$

Very hygroscopic Easily sol in H_2O (R J Meyer, *Z anorg* 1914, **86** 273)

Cæsium nickel chloride, $2CsCl, NiCl_2$

As the corresponding Cu salt
 $CsNiCl_2$ Decomp by H_2O and by alcohol (Campbell, *Am J Sci* 1894, (3) **48** 418)

Cæsium palladium dichloride

See Chloropalladate, cæsium

Cæsium palladium tetrachloride

See Chloropalladate, cæsium

Cæsium praseodymium chloride, $Cs_3PrCl_6 + 5H_2O$

Very hygroscopic Easily sol in H_2O (R J Meyer, *Z anorg* 1914, **86** 273)

Cæsium rhodium chloride

See Chlororhodite, cæsium

Cæsium ruthenium chloride

See Chlororuthenite, cæsium and chlororuthenate, cæsium

Cæsium oxyruthenium chloride, $Cs_2RuO_2Cl_4$

Ppt, decomp by H_2O , sol in cold HCl (Howe, *J Am Chem Soc* 1901, **23** 779)

Cæsium samarium chloride, $Cs_3SmCl_6 + 5H_2O$

Very hygroscopic Easily sol in H_2O (R J Meyer, *Z anorg* 1914, **86** 273)

Cæsium silver chloride, 2CsCl , AgCl

Easily decomp by H_2O (Wells and Wheeler, *Sill Am J* **144** 155)

Cæsium tellurium chloride

See Chlorotellurate, cæsium

Cæsium thallic chloride, 2CsCl , TlCl_3

By recryst from H_2O forms 3CsCl , 2TlCl_3 (Pratt, *Am J Sci* 1895, (3) **49** 398)

+ H_2O Readily sol in hot H_2O but 3CsCl , 2TlCl_3 cryst from the solution (Pratt, *Am J Sci* 1895, (3) **49** 399)

3CsCl , 2TlCl_3 Can be recryst from H_2O without change (Pratt, *Am J Sci* 1895, (3) **49** 401)

3CsCl , $\text{TlCl}_3 + 2\text{H}_2\text{O}$ Sol in 36.4 pts H_2O at 17° and 3 pts at 100° (Godeffroy, *Zeitsch d allgem osterl Apothekerv* **1880** No 9)

Cæsium tin (stannic) chloride

See Chlorostannate, cæsium

Cæsium titanium chloride, TiCl_3 , $2\text{CsCl} + \text{H}_2\text{O}$

Difficultly sol in H_2O (Stahler, *B* 1904,

ungsten chloride, $\text{Cs}_3\text{W}_2\text{Cl}_9$

insol in cold H_2O

sol in a hot mixture of equal pts H_2O and conc HCl

Nearly insol in conc HCl

Sol in very dil $\text{NaOH} + \text{Aq}$

Nearly insol in most organic solvents (Olsson, *B* 1913, **46** 574)

Cæsium uranous chloride, Cs_2UCl_6

As K salt (Aloy, *Bull Soc* 1899, (3) **21** 264)

Cæsium uranyl chloride, 2CsCl , $(\text{UO})\text{Cl}$

Sol in H_2O (Wells, *Z anorg* 1895, **10** 183)

100 pts of the solution contain at 29.75° , 56.07 pts UO_2Cl_2 , 2CsCl (Rimbach, *B* 1904, **37** 468)

Pptd from aq solution by gaseous HCl (Wells, *Am J Sci* 1894, (3) **50** 251)

Cæsium vanadium chloride, $\text{Cs}_2\text{VdCl}_5 + \text{H}_2\text{O}$

Difficultly sol in H_2O and alcohol (Stahler, *B* 1904, **37** 4412)

Cæsium zinc chloride, 3CsCl , ZnCl_2

Sol in H_2O (Wells and Campbell, *Z anorg* **5** 275)

2CsCl , ZnCl_2 Easily sol in H_2O and dil $\text{HCl} + \text{Aq}$ Insol in conc $\text{HCl} + \text{Aq}$ (Godeffroy)

Cæsium chloride chromic oxychloride, 2CsCl , CrOCl_3

Decomp in the air

Sol in conc HCl without decomp (Weinland, *B* 1906, **39** 4045)

Cæsium chloride columbium oxychloride 2CsCl , CbOCl_3

Decomp by H_2O (Weinland, *B* 1906 **39** 3057)

Cæsium chloroiodide, CsCl_2I

Properties as CsBrClI (Wells)

CsCl_2I Sol in H_2O , from which it can be recrystallized without decomp (Well and Wheeler)

Cæsium mercuric chloroiodide, $\text{Cs}_2\text{HgCl}_2\text{I}_2$

Decomp instantly by H_2O to HgI_2 (Wells)

Cæsium fluoride, CsF

Ppt (Chabrie, *C R* 1901, **132** 680)

+ $1\frac{1}{2}\text{H}_2\text{O}$ 100 g H_2O dissolve 366.5 g CsF at 15° (de Forcrand, *C R* 1911, **152** 1210)

Cæsium hydrogen fluoride, CsHF_6

Ppt (Chabrie, *C R* 1901, **132** 680)

Cæsium tantalum fluoride

See Fluotantalate, cæsium

Cæsium tellurium fluoride, CsF , 1eF_4

Decomp by H_2O (Wells, *Am J Sci* 1901 (4) **12** 190)

Cæsium titanium fluoride

See Fluotitanate, cæsium

Cæsium zirconium fluoride

See Fluozirconate, cæsium

Cæsium hydride, CsH

Decomp by H_2O with evolution of H_2 (Moissan, *C R* 1903, **136** 589)

Cæsium hydroxide, CsOH

Very deliquescent and sol in H_2O So in alcohol

79.41%, CsOH is contained in sat aq solution at 15° (de Forcrand, *C R* 1909 **14** 1344)

75.08%, CsOH is contained in sat aq solution at 30° (Schreinemakers, *C R* **1909**, **11**)

Cæsium iodide, CsI

Sol in H_2O

100 pts H_2O dissolve 44 pts CsI at 0 66.3 pts at 14.5° , 160 pts at 61°

Sp gr of $\text{CsI} + \text{Aq}$ sat at $14^\circ = 1.39$ (Betekoff, *Bull Soc Pétrozb* (4) **2** 197)

Cæsium periodide

Solubility determinations show that CsI_3 and CsI_5 are the only periodides of cæsium existing between -4° and $+73^\circ$ (Foote, Am Ch J 1903, 29 203)

Cæsium triiodide, CsI_3

1 ccm sat $\text{CsI} + \text{Aq}$ dissolves 0.0097 g CsI_3 , and sp gr of solution is 1.154. Only sl decomp by solution in H_2O . Much more sol in alcohol than in H_2O . Not immediately decomp by ether (Wells, Sill Am J 143 17)

Cæsium pentaoidide, CsI_5 **Cæsium cobalt iodide, Cs_2CoI_4**

Decomp by H_2O (Campbell, Z anorg 1894, 8 12)

Deliquescent, decomp by H_2O and by alcohol (Campbell, Am J Sci 1894, (3) 43 418)

Cæsium lead iodide, CsPbI_2

Sl sol in hot $\text{CsI} + \text{Aq}$ (Wheeler, Sill Am J 145 129)

Cæsium mercuric iodide, $\text{CsI}, 2\text{HgI}_2$

Decomp by H_2O finally into HgI_2 (Wells, Sill Am J 144 221)

$2\text{CsI}, 3\text{HgI}$ Decomp by H_2O finally into HgI

CsI, HgI_2 As above

$2\text{CsI}, \text{HgI}$ Decomp by H_2O insol in alcohol

$3\text{CsI}, \text{HgI}_2$ As above

Cæsium silver iodide, CsI, AgI

(Penfield, Z anorg 1 100)

$\text{CsI}, 2\text{AgI}$ More sol in hot than in cold acetone (Mush, Chem Soc 1913, 103 782)

Cæsium tellurium iodide

See Iodotellurate, cæsium

Cæsium thallic iodide, CsI, HI_3

Decomp by H_2O (Pratt, Am J Sci 1895, (3) 49 403)

Cæsium zinc iodide, $3\text{CsI}, \text{ZnI}$

Sol in H_2O (Wells and Campbell, Z anorg 5 275)

$2\text{CsI}, \text{ZnI}$ As above

Cæsium oxide, Cs_2O

Absorbs H_2O and CO_2 from the air. Decomp by H_2O and by liquid NH_3 (Rengade, C R 1906, 143 593)

Cæsium dioxide, Cs_2O_2

Decomp by H_2O (Rengade, C R 1905, 140 1537)

Cæsium trioxide, Cs_2O_3

Decomp by H_2O (Rengade, C R 1905, 140 1537)

Cæsium tetroxide, Cs_2O_4

Decomp by H_2O (Rengade, C R 1905, 140 1538)

Cæsium sulphide, $\text{Cs}_2\text{S} + 4\text{H}_2\text{O}$

Deliquescent, very sol in H_2O (Biltz, Z anorg 1906, 48 300)

Cæsium disulphide, Cs_2S_2

Anhydrous Sol in H_2O Hygroscopic (Biltz, Z anorg 1906, 50 72)

$+ \text{H}_2\text{O}$ From $\text{Cs}_2\text{S}_2 + \text{Aq}$ Hygroscopic (Biltz, Z anorg 1906, 50 72)

Cæsium trisulphide, Cs_2S_3

Anhydrous Sol in H_2O Not hygroscopic (Biltz, Z anorg 1906, 50 75)

$+ \text{H}_2\text{O}$ From $\text{Cs}_2\text{S}_3 + \text{Aq}$ (Biltz, Z anorg 1906, 50 76)

Cæsium tetrasulphide, Cs_2S_4

Sol in H_2O Insol in abs alcohol (Biltz, Z anorg 1906, 48 305)

Cæsium pentasulphide, Cs_2S_5

Mpt 2° Not hygroscopic. Very sol in cold 70% alcohol (Biltz, B 1905, 38 129)

Cæsium hydrogen sulphide, CsHS

Deliquescent, very sol in H_2O (Biltz, Z anorg 1906, 48 300)

Cæsium copper tetrasulphide, CsCuS_4

Sl sol in cold H_2O

Decomp by conc and dil HCl , H_2SO_4 and HNO_3

Sl sol in alcohol (Biltz, B 1907, 40 978)

Calcium, Ca

Decomp H_2O violently. Slowly attacked by cold H_2SO_4 . Dil $\text{H}_2\text{SO}_4 + \text{Aq}$ or $\text{HCl} + \text{Aq}$ attack violently and dissolve. Dil $\text{HNO}_3 + \text{Aq}$ oxidizes, but fuming HNO_3 scarcely attacks even on boiling (Bunsen and Matthiessen). Not attacked by anhydrous alcohol (Fies-Bodart and Jobin, A ch (3) 54 364)

Pure Ca is only very slowly decomp by H_2O at ordinary temp, sol in HCl , HNO_3 , H_2SO_4 (Moissan, C R 1898, 129 589)

Insol in liquid NH_3 (Grove, Am Ch J 1898, 20 827)

1 ccm conc acid dissolves 0.0334 g Ca in 6 days (Gates, J phys Chem 1911, 15 143)

Calcium amalgam, Ca_3Hg_4

Decomp H_2O readily (Berz, C R 1898, 127 619)

CaHg_2 Rapidly decomp in moist air (Schurger, Z anorg 1900, 25 425)

Calcium amide, $\text{Ca}(\text{NH}_2)_2$

(Moissan, A ch 1899, (7) 18 326)

Calcium ammonia, $\text{Ca}, 4\text{NH}_3$ Decomp at ordinary temp, takes fire in contact with the air, sl sol in liquid NH_3 (Moissan, C R 1898, 127 691) $\text{Ca}, 6\text{NH}_3$ (Kraus, J Am Chem Soc 1908, 30 665)**Calcium arsenide, Ca_3As_2** Decomp by cold H_2O , insol in cold fuming HNO_3 , very sol in hot HNO_3 (Lebeau, C R 1899, 128 98)**Calcium azomide, $\text{Ca}(\text{N}_3)_2$**

Hydroscopic, explosive

38 1 pts sol in 100 pts H_2O at 0°
45 0 " " " 100 " " 15 2
0 211 " " " 100 " abs alcohol " 16Sol in H_2O , decomp when heated and on standing in the air (Dennis, Z anorg 1898, 17 21)

Insol in pure ether (Curtius, J pr 1898, (2) 58 286)

Calcium boride, CaB_2 Not decomp by H_2O at 250° , sol in fused oxidizing agentsInsol in aq acids, sl sol in conc H_2SO_4 , sol in dil or conc HNO_3 (Moissan, C R 1897, 125 631-32)**Calcium bromide, CaBr** Very deliquescent 100 pts H_2O dissolve—
at 0° 20° 40° 60° 105°
125 143 213 278 312 pts CaBr
(Kremers, Pogg 103 65)Sat $\text{CaBr}_2 + \text{Aq}$ contains at
—22° —22° —14° —7° —5°
50 5 50 2 52 5 52 6 52 6% CaBr_2 †8° 9° 11° 20° 50°
1 55 1 55 7 57 1 62 6% CaBr
(Étard, A ch 1894, (7) 2 540)Sp gr of $\text{CaBr}_2 + \text{Aq}$ at 19.5° containing
5 10 15 20 25 % CaBr_2 ,
1 044 1 089 1 139 1 194 1 25030 35 40 45 50 % CaBr_2
1 315 1 385 1 461 1 549 1 641

(Kremers, Pogg 99 444, calculated by Goulach, Z anal 8 285)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Very sol in alcohol (Henry)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Sol in ethyl acetate (Naumann, B 1910 43 314)

Insol in benzonitrile (Naumann, B 1914 47 1370)

+4 H_2O (Kuznetzov, C A 1911 842)
+6 H_2O **Calcium manganous bromide, $\text{CaMnBr}_4 + 4\text{H}_2\text{O}$**

Sl hydroscopic Unstable (Ephraim, Z anorg 1910, 67 377)

Calcium mercuric bromideDecomp by H_2O (v Bonsdorff)**Calcium molybdenyl bromide, $\text{CaBr}_2, 2\text{MoOBr}_3 + 7\text{H}_2\text{O}$**

(Weinland and Knoll, Z anorg 1905, 44 112)

Calcium stannic bromide

See Bromostannate, calcium

Calcium bromide ammonia, $\text{CaBr}_2, 6\text{NH}_3$ Sol in H_2O (Rammelsberg, Pogg 55 239)**Calcium bromide hydrazine, $\text{CaBr}_2, 3\text{N}_2\text{H}_4$** Easily sol in H_2O (Franzen, Z anorg 1908, 60 288)**Calcium bromofluoride, CaBr, CaF** Decomp by H_2O (Defacqz, A ch 1904, (8) 1 357)**Calcium carbide, CaC** Sp gr 2 22 at 18° Insol in fuming HNO_3 and conc H_2SO_4 but readily decomp by dil acids and H_2O (Moissan, Bull Soc 1894, (3) 11 1005)Insol in HCl in the cold, but decomp at red heat Strong min acids do not act in the cold sol in glacial acetic in the cold, sol in fused alkali (Venables, J Am Chem Soc 1895, 17 307-310)**Calcium chloride, CaCl** Very deliquescent Very sol in H_2O with evolution of heatAnhydrous CaCl is sol in 1 139 pts H_2O (Crichton)Anhydrous CaCl is sol in 1 38 pts H_2O at 10.2° (Kremers, Pogg 103 62)Anhydrous CaCl is sol in 1 33 pts H_2O at 20.0 ± 0.3 pt H_2O at 40.0 ± 0.2 pt H_2O at 60.0 ± 0.1 pt H_2O at 80.0 ± 0.1 pt H_2O at 100.0 ± 0.1 pt H_2O at 120.0 ± 0.1 pt H_2O at 140.0 ± 0.1 pt H_2O at 160.0 ± 0.1 pt H_2O at 180.0 ± 0.1 pt H_2O at 200.0 ± 0.1 pt H_2O at 220.0 ± 0.1 pt H_2O at 240.0 ± 0.1 pt H_2O at 260.0 ± 0.1 pt H_2O at 280.0 ± 0.1 pt H_2O at 300.0 ± 0.1 pt H_2O at 320.0 ± 0.1 pt H_2O at 340.0 ± 0.1 pt H_2O at 360.0 ± 0.1 pt H_2O at 380.0 ± 0.1 pt H_2O at 400.0 ± 0.1 pt H_2O at 420.0 ± 0.1 pt H_2O at 440.0 ± 0.1 pt H_2O at 460.0 ± 0.1 pt H_2O at 480.0 ± 0.1 pt H_2O at 500.0 ± 0.1 pt H_2O at 520.0 ± 0.1 pt H_2O at 540.0 ± 0.1 pt H_2O at 560.0 ± 0.1 pt H_2O at 580.0 ± 0.1 pt H_2O at 600.0 ± 0.1 pt H_2O at 620.0 ± 0.1 pt H_2O at 640.0 ± 0.1 pt H_2O at 660.0 ± 0.1 pt H_2O at 680.0 ± 0.1 pt H_2O at 700.0 ± 0.1 pt H_2O at 720.0 ± 0.1 pt H_2O at 740.0 ± 0.1 pt H_2O at 760.0 ± 0.1 pt H_2O at 780.0 ± 0.1 pt H_2O at 800.0 ± 0.1 pt H_2O at 820.0 ± 0.1 pt H_2O at 840.0 ± 0.1 pt H_2O at 860.0 ± 0.1 pt H_2O at 880.0 ± 0.1 pt H_2O at 900.0 ± 0.1 pt H_2O at 920.0 ± 0.1 pt H_2O at 940.0 ± 0.1 pt H_2O at 960.0 ± 0.1 pt H_2O at 980.0 ± 0.1 pt H_2O at 1000.0 ± 0.1 pt H_2O at 1020.0 ± 0.1 pt H_2O at 1040.0 ± 0.1 pt H_2O at 1060.0 ± 0.1 pt H_2O at 1080.0 ± 0.1 pt H_2O at 1100.0 ± 0.1 pt H_2O at 1120.0 ± 0.1 pt H_2O at 1140.0 ± 0.1 pt H_2O at 1160.0 ± 0.1 pt H_2O at 1180.0 ± 0.1 pt H_2O at 1200.0 ± 0.1 pt H_2O at 1220.0 ± 0.1 pt H_2O at 1240.0 ± 0.1 pt H_2O at 1260.0 ± 0.1 pt H_2O at 1280.0 ± 0.1 pt H_2O at 1300.0 ± 0.1 pt H_2O at 1320.0 ± 0.1 pt H_2O at 1340.0 ± 0.1 pt H_2O at 1360.0 ± 0.1 pt H_2O at 1380.0 ± 0.1 pt H_2O at 1400.0 ± 0.1 pt H_2O at 1420.0 ± 0.1 pt H_2O at 1440.0 ± 0.1 pt H_2O at 1460.0 ± 0.1 pt H_2O at 1480.0 ± 0.1 pt H_2O at 1500.0 ± 0.1 pt H_2O at 1520.0 ± 0.1 pt H_2O at 1540.0 ± 0.1 pt H_2O at 1560.0 ± 0.1 pt H_2O at 1580.0 ± 0.1 pt H_2O at 1600.0 ± 0.1 pt H_2O at 1620.0 ± 0.1 pt H_2O at 1640.0 ± 0.1 pt H_2O at 1660.0 ± 0.1 pt H_2O at 1680.0 ± 0.1 pt H_2O at 1700.0 ± 0.1 pt H_2O at 1720.0 ± 0.1 pt H_2O at 1740.0 ± 0.1 pt H_2O at 1760.0 ± 0.1 pt H_2O at 1780.0 ± 0.1 pt H_2O at 1800.0 ± 0.1 pt H_2O at 1820.0 ± 0.1 pt H_2O at 1840.0 ± 0.1 pt H_2O at 1860.0 ± 0.1 pt H_2O at 1880.0 ± 0.1 pt H_2O at 1900.0 ± 0.1 pt H_2O at 1920.0 ± 0.1 pt H_2O at 1940.0 ± 0.1 pt H_2O at 1960.0 ± 0.1 pt H_2O at 1980.0 ± 0.1 pt H_2O at 2000.0 ± 0.1 pt H_2O at 2020.0 ± 0.1 pt H_2O at 2040.0 ± 0.1 pt H_2O at 2060.0 ± 0.1 pt H_2O at 2080.0 ± 0.1 pt H_2O at 2100.0 ± 0.1 pt H_2O at 2120.0 ± 0.1 pt H_2O at 2140.0 ± 0.1 pt H_2O at 2160.0 ± 0.1 pt H_2O at 2180.0 ± 0.1 pt H_2O at 2200.0 ± 0.1 pt H_2O at 2220.0 ± 0.1 pt H_2O at 2240.0 ± 0.1 pt H_2O at 2260.0 ± 0.1 pt H_2O at 2280.0 ± 0.1 pt H_2O at 2300.0 ± 0.1 pt H_2O at 2320.0 ± 0.1 pt H_2O at 2340.0 ± 0.1 pt H_2O at 2360.0 ± 0.1 pt H_2O at 2380.0 ± 0.1 pt H_2O at 2400.0 ± 0.1 pt H_2O at 2420.0 ± 0.1 pt H_2O at 2440.0 ± 0.1 pt H_2O at 2460.0 ± 0.1 pt H_2O at 2480.0 ± 0.1 pt H_2O at 2500.0 ± 0.1 pt H_2O at 2520.0 ± 0.1 pt H_2O at 2540.0 ± 0.1 pt H_2O at 2560.0 ± 0.1 pt H_2O at 2580.0 ± 0.1 pt H_2O at 2600.0 ± 0.1 pt H_2O at 2620.0 ± 0.1 pt H_2O at 2640.0 ± 0.1 pt H_2O at 2660.0 ± 0.1 pt H_2O at 2680.0 ± 0.1 pt H_2O at 2700.0 ± 0.1 pt H_2O at 2720.0 ± 0.1 pt H_2O at 2740.0 ± 0.1 pt H_2O at 2760.0 ± 0.1 pt H_2O at 2780.0 ± 0.1 pt H_2O at 2800.0 ± 0.1 pt H_2O at 2820.0 ± 0.1 pt H_2O at 2840.0 ± 0.1 pt H_2O at 2860.0 ± 0.1 pt H_2O at 2880.0 ± 0.1 pt H_2O at 2900.0 ± 0.1 pt H_2O at 2920.0 ± 0.1 pt H_2O at 2940.0 ± 0.1 pt H_2O at 2960.0 ± 0.1 pt H_2O at 2980.0 ± 0.1 pt H_2O at 3000.0 ± 0.1 pt H_2O at 3020.0 ± 0.1 pt H_2O at 3040.0 ± 0.1 pt H_2O at 3060.0 ± 0.1 pt H_2O at 3080.0 ± 0.1 pt H_2O at 3100.0 ± 0.1 pt H_2O at 3120.0 ± 0.1 pt H_2O at 3140.0 ± 0.1 pt H_2O at 3160.0 ± 0.1 pt H_2O at 3180.0 ± 0.1 pt H_2O at 3200.0 ± 0.1 pt H_2O at 3220.0 ± 0.1 pt H_2O at 3240.0 ± 0.1 pt H_2O at 3260.0 ± 0.1 pt H_2O at 3280.0 ± 0.1 pt H_2O at 3300.0 ± 0.1 pt H_2O at 3320.0 ± 0.1 pt H_2O at 3340.0 ± 0.1 pt H_2O at 3360.0 ± 0.1 pt H_2O at 3380.0 ± 0.1 pt H_2O at 3400.0 ± 0.1 pt H_2O at 3420.0 ± 0.1 pt H_2O at 3440.0 ± 0.1 pt H_2O at 3460.0 ± 0.1 pt H_2O at 3480.0 ± 0.1 pt H_2O at 3500.0 ± 0.1 pt H_2O at 3520.0 ± 0.1 pt H_2O at 3540.0 ± 0.1 pt H_2O at 3560.0 ± 0.1 pt H_2O at 3580.0 ± 0.1 pt H_2O at 3600.0 ± 0.1 pt H_2O at 3620.0 ± 0.1 pt H_2O at 3640.0 ± 0.1 pt H_2O at 3660.0 ± 0.1 pt H_2O at 3680.0 ± 0.1 pt H_2O at 3700.0 ± 0.1 pt H_2O at 3720.0 ± 0.1 pt H_2O at 3740.0 ± 0.1 pt H_2O at 3760.0 ± 0.1 pt H_2O at 3780.0 ± 0.1 pt H_2O at 3800.0 ± 0.1 pt H_2O at 3820.0 ± 0.1 pt H_2O at 3840.0 ± 0.1 pt H_2O at 3860.0 ± 0.1 pt H_2O at 3880.0 ± 0.1 pt H_2O at 3900.0 ± 0.1 pt H_2O at 3920.0 ± 0.1 pt H_2O at 3940.0 ± 0.1 pt H_2O at 3960.0 ± 0.1 pt H_2O at 3980.0 ± 0.1 pt H_2O at 4000.0 ± 0.1 pt H_2O at 4020.0 ± 0.1 pt H_2O at 4040.0 ± 0.1 pt H_2O at 4060.0 ± 0.1 pt H_2O at 4080.0 ± 0.1 pt H_2O at 4100.0 ± 0.1 pt H_2O at 4120.0 ± 0.1 pt H_2O at 4140.0 ± 0.1 pt H_2O at 4160.0 ± 0.1 pt H_2O at 4180.0 ± 0.1 pt H_2O at 4200.0 ± 0.1 pt H_2O at 4220.0 ± 0.1 pt H_2O at 4240.0 ± 0.1 pt H_2O at 4260.0 ± 0.1 pt H_2O at 4280.0 ± 0.1 pt H_2O at 4300.0 ± 0.1 pt H_2O at 4320.0 ± 0.1 pt H_2O at 4340.0 ± 0.1 pt H_2O at 4360.0 ± 0.1 pt H_2O at 4380.0 ± 0.1 pt H_2O at 4400.0 ± 0.1 pt H_2O at 4420.0 ± 0.1 pt H_2O at 4440.0 ± 0.1 pt H_2O at 4460.0 ± 0.1 pt H_2O at 4480.0 ± 0.1 pt H_2O at 4500.0 ± 0.1 pt H_2O at 4520.0 ± 0.1 pt H_2O at 4540.0 ± 0.1 pt H_2O at 4560.0 ± 0.1 pt H_2O at 4580.0 ± 0.1 pt H_2O at 4600.0 ± 0.1 pt H_2O at 4620.0 ± 0.1 pt H_2O at 4640.0 ± 0.1 pt H_2O at 4660.0 ± 0.1 pt H_2O at 4680.0 ± 0.1 pt H_2O at 4700.0 ± 0.1 pt H_2O at 4720.0 ± 0.1 pt H_2O at 4740.0 ± 0.1 pt H_2O at 4760.0 ± 0.1 pt H_2O at 4780.0 ± 0.1 pt H_2O at 4800.0 ± 0.1 pt H_2O at 4820.0 ± 0.1 pt H_2O at 4840.0 ± 0.1 pt H_2O at 4860.0 ± 0.1 pt H_2O at 4880.0 ± 0.1 pt H_2O at 4900.0 ± 0.1 pt H_2O at 4920.0 ± 0.1 pt H_2O at 4940.0 ± 0.1 pt H_2O at 4960.0 ± 0.1 pt H_2O at 4980.0 ± 0.1 pt H_2O at 5000.0 ± 0.1 pt H_2O at 5020.0 ± 0.1 pt H_2O at 5040.0 ± 0.1 pt H_2O at 5060.0 ± 0.1 pt $\text$

Solubility of $\text{CaCl}_2 + 6\text{H}_2\text{O}$ in H_2O at t°

t°	Sat solution contains % CaCl_2	Sat solution contains % $\text{CaCl}_2 + 6\text{H}_2\text{O}$
-22	32 24	63 61
0	36 91	72 82
+ 7 39	38 77	76 49
13 86	41 03	80 95
19 35	42 50	83 85
23 46	44 15	87 11
24 47	45 33	89 44
27 71	46 30	91 35
29 53	50 67	99 97

(Hammerl, W A B 72, 2 287)

Solubility in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2
0	59 39	13 86	69 49
5	64 83	19 35	73 91
7 88	66 20	21 89	79 77

(Hammerl, calculated by Bakhuis Roozeboom, R t c 8 5)

Solubility in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2	t°	Pts CaCl_2
0	49 6	19	72	38	108
1	50	20	74	39	109
2	51	21	75	40	110
3	52	22	77	41	111
4	53	23	79	42	112
5	54	24	80	43	113
6	55	25	82	44	114
7	56	26	84	45	115
8	57	27	87	46	116
9	58	28	89	47	117
10	60	29	91	48	118
11	61	30	93	49	119
12	62	31	96	50	120
13	63	32	98	51	121
14	65	33	100	52	122
15	66	34	103	53	123
16	68	35	104	54	124
17	69	36	105	55	125
18	71	37	107	56	126
57	127	72	137	87	145
58	128	73	138	88	146
59	129	74	138	89	147
60	129	75	139	90	147
61	130	76	139	91	148
62	131	77	140	92	149
63	131	78	141	93	150
64	132	79	141	94	150
65	133	80	142	95	151
66	133	81	142	96	152
67	134	82	143	97	152
68	135	83	143	98	153
69	135	84	144	99	154
70	136	85	144	179 5	325
71	136	86	145		

If solubility $S = \text{pts anhydrous } \text{CaCl}_2$ in 100 pts solution, $S = 32 + 0.2148t$ from -18° to $+6^\circ$, $S = 54.5 + 0.0755t$ from 50° to 120° (Étard, C R 98 1432)

According to Bakhuis Roozeboom, the solubility of CaCl_2 varies according to the hydrate employed, and the following data were obtained as the result of very exact experiments

Solubility of $\text{CaCl}_2 + 6\text{H}_2\text{O}$ in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2	t°	Pts CaCl_2
20 4	75 1	28 0	88 8	29 5	96 07
25 05	81 67	28 9	92 05	30 2	102 7

There are two modifications of $\text{CaCl}_2 + 4\text{H}_2\text{O}$, α and β

Solubility of $\text{CaCl}_2 + 4\text{H}_2\text{O}\beta$ in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2
18 4	103 3	35 0	122 74
25 0	108 8	38 4	127 50
30 0	114 1		

Solubility of $\text{CaCl}_2 + 4\text{H}_2\text{O}\alpha$ in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2
22 0	92 67	35 95	107 21
24 7	95 59	40 00	115 3
29 8	100 6	45 00	129 9

Solubility of $\text{CaCl}_2 + 2\text{H}_2\text{O}$ in 100 pts H_2O at t°

t°	Pts CaCl_2	t°	Pts CaCl_2	t°	Pts CaCl_2
40	128 1	95 8	156 5	139	191 0
45	129 9	115	169 5	155	214 3
50	132 3	124	176 0	165	236 2
59 5	136 5	137	187 6	174	275 7
80 5	145 3				

Solubility of $\text{CaCl}_2 + \text{H}_2\text{O}$ in 100 pts H_2O at t°

t°	Pts CaCl_2
191	306
235	331

(Mulder, Scheik Verhandel 1864 107)

(Bakhuis Roozeboom, R t c 8 1)

Sp gr of $\text{CaCl}_2 + \text{Aq}$

% CaCl_2	Sp gr	% CaCl_2	Sp gr	% CaCl_2	Sp gr
3.95	1.03	20.85	1.18	34.57	1.33
7.66	1.06	23.93	1.21	36.49	1.36
11.23	1.09	26.86	1.24	38.31	1.39
14.42	1.12	29.67	1.27	40.43	1.42
17.60	1.15	32.35	1.30	41.91	1.45

(Richter)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 19.5° containing pts CaCl_2 to 100 pts H_2O

Pts CaCl_2	Sp gr	Pts CaCl_2	Sp gr
6.97	1.0545	36.33	1.2469
12.58	1.0954	50.67	1.3234
23.33	1.1681	62.90	1.3806

(Kremers Pogg 99 444)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ $G = \text{sp gr at } 15^\circ \text{ if } \% \text{ is } \text{CaCl}_2$, according to Gerlach, $S = \text{sp gr at } 18.3^\circ \text{ if } \% \text{ is } \text{CaCl}_2 + 6\text{H}_2\text{O}$, according to Schiff

%	G	S	%	G	S
1	1.00852	1.0039	36	1.35610	1.1575
2	1.01704	1.0079	37	1.36790	1.1622
3	1.02555	1.0119	38	1.37970	1.1671
4	1.03407	1.0159	39	1.39150	1.1719
5	1.04259	1.0200	40	1.40330	1.1768
6	1.05146	1.0241	41		1.1816
7	1.06033	1.0282	42		1.1865
8	1.06921	1.0323	43		1.1914
9	1.07808	1.0365	44		1.1963
10	1.08695	1.0407	45		1.2012
11	1.09628	1.0449	46		1.2062
12	1.00561	1.0491	47		1.2112
13	1.10494	1.0534	48		1.2162
14	1.12427	1.0577	49		1.2212
15	1.13360	1.0619	50		1.2262
16	1.14332	1.0663	51		1.2312
17	1.15305	1.0706	52		1.2363
18	1.16277	1.0750	53		1.2414
19	1.17250	1.0794	54		1.2465
20	1.18222	1.0838	55		1.2516
21	1.19251	1.0882	56		1.2567
22	1.20279	1.0927	57		1.2618
23	1.21308	1.0972	58		1.2669
24	1.22336	1.1017	59		1.2721
25	1.23365	1.1062	60		1.2773
26	1.24450	1.1107	61		1.2825
27	1.25535	1.1153	62		1.2877
28	1.26619	1.1199	63		1.2929
29	1.27704	1.1246	64		1.2981
30	1.28789	1.1292	65		1.3034
31	1.29917	1.1339	66		1.3087
32	1.31045	1.1386	67		1.3140
33	1.32174	1.1433	68		1.3193
34	1.33602	1.1480	69		1.3246
35	1.34430	1.1527	70		1.3300

(Calculated by Gerlach, Z. anal. 8, 283)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ $a = \text{no of half molecules in grammes dissolved in 1000 g H}_2\text{O}$, $b = \text{sp gr at } 24.3^\circ \text{ when } a = \text{CaCl}_2 + 6\text{H}_2\text{O}$ ($\frac{1}{2} \text{ mol} = 109.5 \text{ g}$), $c = \text{sp gr at } 24.3^\circ \text{ when } a = \text{CaCl}_2$ ($\frac{1}{2} \text{ mol} = 55.5$)

a	b	c	a	b	c
1	1.041	1.043	7	1.198	1.2
2	1.076	1.084	8	1.214	
3	1.106	1.122	9	1.229	
4	1.133	1.159	10	1.242	
5	1.157	1.193	11	1.255	
6	1.179	1.227			

(Favre and Valson, C. R. 79 968)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 18°

% CaCl_2	Sp gr	% CaCl_2	Sp gr
5	1.0409	25	1.230 ^F
10	1.0852	30	1.2841
15	1.1311	35	1.3420
20	1.1794		

(Kohlrausch, W. Ann. 1879 1)

$\text{CaCl}_2 + \text{Aq}$ sat at 0° has sp gr = 1.7 (Engel, Bull. Soc. 1887, (2) 47 318)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 9.5°C

Mass of salt per unit mass of solution	Density of solution (g per cc)
0.00191	1.00165
0.00381	1.00317
0.00570	1.00465
0.00759	1.00615
0.00947	1.00765
0.01320	1.01050

(McGregor, C. N. 1887, 55 6)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 25°

Concentration of $\text{CaCl}_2 + \text{Aq}$	Sp gr
1-normal	1.0446
$\frac{1}{2}$ -normal	1.0218
$\frac{1}{3}$ -normal	1.0105
$\frac{1}{4}$ -normal	1.0050

(Wagner, Z. phys. Ch. 1890 5 36)

Sp gr at 16°/4° of $\text{CaCl}_2 + \text{Aq}$ containing 12.1638% $\text{CaCl}_2 = 1.10489$ (Schonrock, Z. phys. Ch. 1895 11 768)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 17 925°C

% CaCl_2	Sp gr	% CaCl_2	Sp gr	% CaCl_2	Sp gr
0 0	0 99869	13	1 11206	33	1 31562
0 1	0 99954	14	1 12130	34	1 32689
0 2	1 00037	15	1 13067	35	1 33821
0 3	1 00116	16	1 14016	36	1 34956
0 4	1 00201	17	1 14969	37	1 36100
0 6	1 00371	18	1 15926	38	1 37242
0 8	1 00539	19	1 16920	39	1 38400
1 0	1 00703	20	1 17910	40	1 39489
1 5	1 01127	21	1 18897	41	1 40641
2	1 01548	22	1 19901	42	1 41770
3	1 02386	23	1 20901	43	1 42882
4	1 03238	24	1 21918	44	1 44007
5	1 04089	25	1 22941	45	1 45124
6	1 04951	26	1 23969	46	1 46238
7	1 05822	27	1 25030	47	1 47329
8	1 06680	28	1 26092	48	1 48450
9	1 07569	29	1 27182	49	1 49573
10	1 08467	30	1 28271	50	1 50676
11	1 09373	31	1 29360	51	1 51778
12	1 10288	32	1 30461		

(Pickering, B 1894, 27 1385)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at t°

t	Concentration of $\text{CaCl}_2 + \text{Aq}$	Sp gr
20	1 pt CaCl_2 in 7 1045 pts H_2O	1 1062
20	1 " " " 164 25 " "	1 0032

(Hittorf, Z phys Ch 1902, 39 628)

Sp gr of $\text{CaCl}_2 + \text{Aq}$ at 20°

μ mol CaCl_2 per l	Sp gr
0 010	1 000982
0 025	1 002539
0 050	1 004874
0 075	1 006814
0 10	1 008971
0 25	1 02267
0 50	1 04451
0 75	1 06641
1 00	1 08744

(Jones and Pearce, Am Ch J 1907, 38 606)

Sat $\text{CaCl}_2 + \text{Aq}$ forms crust at 150°, and contains 178 pts CaCl_2 to 100 pts H_2O (Gerlach)

Sat $\text{CaCl}_2 + \text{Aq}$ boils at 180° (Rudolf)

B-pt of $\text{CaCl}_2 + \text{Aq}$ containing pts CaCl_2 to 100 pts H_2O G=according to Gerlach (Z anal 26 440), L=according to Le-grand (A ch (2) 39 43)

B pt	G	L	B pt	G	L
101°	6 0	10	134°		117 2
102	11 5	16 5	135	119	
103	16 5	21 6	136		123 5
104	21 0	25 8	138		129 9
105	25 0	29 4	140	137 5	136 3
106	29 0	32 6	142		142 8
107	32 5	35 6	144		149 4
108	35 5	38 5	145	157	
109	38 5	41 3	146		156 2
110	41 5	44 0	148		163 2
111		46 8	150	178	170 5
112		49 7	152		178 1
113		52 6	154		186 0
114		55 6	155	200	
115	55 0	58 6	156		194 3
116		61 6	158		203 0
117		64 6	160	222	212 1
118		67 6	162		221 6
119		70 6	164		231 5
120	69 0	73 6	165	245	
121		76 7	166		241 9
122		79 8	168		252 8
123		82 9	170	268	264 2
124		86 0	172		276 1
125		89 1	174		285 5
126		92 2	175	292	
128		98 4	176		301 4
130	101	104 6	178	305	314 8
130 4	102 67		179 5		325 0
132		110 9			

B-pt of $\text{CaCl}_2 + \text{Aq}$

% CaCl_2	B pt	% CaCl_2	B pt
5 6	101°	17 5	104°
10 3	102	20 0	105
14 5	103		

(Skinner, Chem Soc 61 340)

Less sol in $\text{HCl} + \text{Aq}$ than in H_2O $\text{HCl} + \text{Aq}$ sat at 12° dissolves 27% CaCl_2 which crystallizes out with $2\text{H}_2\text{O}$ (Ditt, C R 92 242)

Solubility of CaCl_2 in $\text{HCl} + \text{Aq}$ at 0°

Sp gr of solutions	μ per 100 cc solution	
	CaCl_2	HCl
1 367	51 45	0 0
1 344	46 45	3 32
1 326	42 80	5 83
1 310	36 77	10 66
1 285	29 84	15 84
1 250	20 12	23 05
1 238	11 29	34 62

(Engel, C R 1887 104, 434)

$\text{CaCl}_2 + \text{CaO}_2\text{H}_2$ Solubility of $\text{CaCl}_2 + \text{CaO}_2\text{H}_2$ in H_2O at 25°

% CaCl_2	% CaO_2H_2	Solid phase
5 02	0 101	$\text{CaO}_2\text{H}_2 + \text{CaCl}_2 \cdot 4\text{CaO} \cdot 14\text{H}_2\text{O}$ $\text{CaCl}_2 \cdot 4\text{CaO} \cdot 14\text{H}_2\text{O}$
10 00	0 115	
12 94	0 128	
15 14	0 140	
17 20	0 145	
18 15	0 148	
18 01	0 152	
21 02	0 147	
23 80	0 146	
24 33	0 147	
28 37	0 170	$\text{CaO} \cdot \text{H}_2\text{O}$ $\text{CaCl}_2 \cdot 4\text{CaO} \cdot 14\text{H}_2\text{O}$ $\text{CaO} \cdot 2\text{H}_2\text{O}$ $\text{CaCl}_2 \cdot \text{CaO} \cdot 2\text{H}_2\text{O}$
29 54	0 180	
32 67	0 225	
33 21	0 245	
33 72	0 254	
34 36	0 173	
38 61	0 060	
41 32	0 048	
44 30	0 030	
44 60	0 029	
44 77		$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$

(Schreinemakers and Figuee, Chem Weekbl 1911, 8 685)

See also under **Calcium hydroxide**

$\text{CaCl}_2 + \text{KCl}$ 100 pts H_2O dissolve 56 pts CaCl_2 at 7° , 100 pts H_2O dissolve 31 pts KCl at 7° , 100 pts H_2O dissolve 63 5 pts $\text{CaCl}_2 + 4 9$ pts KCl at 7° (Mulder, J B 1866 67)

$\text{CaCl}_2 + \text{NaCl}$ 100 pts H_2O dissolve 53 pts CaCl_2 at 4° , and 56 pts at 7° , 100 pts H_2O dissolve 35 7 pts NaCl at 4° , and 35 7 pts at 7° , 100 pts H_2O dissolve 57 6 pts $\text{CaCl}_2 + 2 4$ pts NaCl at 4° , 100 pts H_2O dissolve 59 5 pts $\text{CaCl}_2 + 4 6$ pts NaCl at 7° (Mulder, l c)

100 g H_2O dissolve 72 6 g $\text{CaCl}_2 + 16 0$ g NaCl at 15° (Rudorff)

Sol in sat $\text{KNO}_3 + \text{Aq}$ (Foureroy)
Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Sol in 1 pt strong boiling alcohol (Wenzel)

Sol in 8 pts alcohol at 15° , and in 1 pt spirits of wine (Beigman)

Sol in 0 7 pt boiling absolute alcohol (Otto)

Sol in 1 43 pts boiling absolute alcohol at $78 3^\circ$ (Graham)

Solubility of CaCl_2 in methyl alcohol
 CaCl_2 forms with methyl alcohol two complexes $\text{CaCl}_2 \cdot 4\text{CH}_3\text{OH}$ and $\text{CaCl}_2 \cdot 3\text{CH}_3\text{OH}$

Solubility of $\text{CaCl}_2, 4\text{CH}_3\text{OH}$ in CH_3OH

t°	% by weight of $\text{CaCl}_2 \cdot 4\text{CH}_3\text{OH}$
0	33 3
10	37 6
20	42 2
30	47 0
40	52 0
50	57 3
55	60 0
56	61 3

Solubility of $\text{CaCl}_2, 3\text{CH}_3\text{OH}$ in CH_3OH

t°	% by weight of $\text{CaCl}_2 \cdot 3\text{CH}_3\text{OH}$
55	60 5
75	63 1
95	66 3
115	70 3
135	75 2
155	81 8
165	86 2
170	89 5
174	93 5
177 (mpt)	100

(Menschutkin, Z anorg 1907, 52 21)

Solubility of CaCl_2 in ethyl alcohol

CaCl_2 forms with ethyl alcohol a complex $\text{CaCl}_2 \cdot 3\text{C}_2\text{H}_5\text{OH}$

Solubility of $\text{CaCl}_2 \cdot 3\text{C}_2\text{H}_5\text{OH}$ in $\text{C}_2\text{H}_5\text{OH}$ at t°

t°	% by weight of $\text{CaCl}_2 \cdot 3\text{C}_2\text{H}_5\text{OH}$	t	%
0	34 8	80	56 5
20	46 0	85	59 2
40	58 7	90	91 9
60	73 0	95	96 2
70	80 8	97 mpt	100

(Menschutkin, Z anorg 1907, 52 21)

Sp gr at $16^\circ/4^\circ$ of CaCl_2 + alcohol containing 5 668% $\text{CaCl}_2 = 0 836 36$ (Schonrod Z phys Ch 1893, 11 768)

B-pt of an alcoholic solution of CaCl_2

% CaCl_2	B pt
2 4	$78 43 + 0 70$
5 39	$78 43 + 2 11$
8 01	$78 43 + 4 18$
9 93	$78 43 + 5 55$
15 94	$78 43 + 11 71$

(Skinner, Chem Soc 61 340)

Sol in propyl alcohol (Berthelot)

100 g propyl alcohol dissolve 10 75 g CaCl_2 (Schlamp Z phys Ch 1894, 14, 276)

Sol in amyl alcohol (Bous)

Pptd from alcoholic solution by ether (Dobbiner)

Sol in wood-spirit, sol in lignone (Liebig),
insol in lignone (Gmelin)

Insol in acetone, sol in butyl alcohol
(Wurtz)

Very sl sol in acetone (Krug and
M'Elroy, J Anal Ch 6 184)

Solubility in acetone + Aq at 20°

CaCl₂ will salt out acetone from aqueous
solution. The table shows the composition
of the solutions at the points at
which inhomogeneous solutions of CaCl₂,
acetone and H₂O just become homogenous
at 20° 100 g of the solution contain

g CaCl ₂	g H ₂ O	g acetone
13 03	52 49	34 48
8 5	45 37	46 15
6 38	39 51	54 11
5 35	35 95	58 70
4 11	31 8	64 09
3 58	29 88	66 54
3 31	28 59	68 10
3 04	27 03	69 93
2 77	26 67	70 56
13 90	53 47	32 63
10 12	48 86	41 02
8 47	45 59	45 94
6 92	41 24	51 84
6 31	39 15	54 54
5 28	36 09	58 63
4 94	34 72	60 34
4 37	33 8	61 83
1 99	23 38	74 63
1 6	21 4	77 00
1 35	19 92	78 73
18 787	55 301	25 913
12 443	52 153	35 404
10 70	49 61	39 69
9 59	47 75	42 66
8 52	46 04	45 14
7 48	42 75	49 77
7 07	41 54	51 39
6 72	40 48	52 8
30 04	49 39	20 57
18 23	55 01	26 76
15 49	54 00	30 51
13 18	52 52	34 3
11 40	50 20	38 40
28 09	51 71	20 20
26 81	52 01	21 18
22 67	55 66	21 67
18 189	56 21	25 60
31 21	48 00	20 81
2 23	24 93	72 84
1 82	22 27	75 89
0 68	15 57	83 44
0 58	14 93	84 49
0 45	13 55	86 00
0 48	14 49	85 13
0 27	12 31	87 42
0 20	9 95	89 85
0 15	9 05	90 81

(Frankforter, J Am Chem Soc 1914, 36
1125)

Sol in many compound ethers, as ethyl
acetate (Liebig), ethyl lactate (Strecker)

Sol in considerable quantity in amyl sul-
phocyanide (Medlock, Chem Soc 1 374)

Sol in valyl (Kolbe)

Very sol in conc HC₂H₃O (Liebig)

Solubility of CaCl in acetic acid

CaCl₂ forms with acetic acid a complex,
CaCl₂, 4CH₃COOH

Solubility of CaCl₂, 4CH₃COOH in
CH₃COOH at t°

t°	% by wt CaCl ₂ 4CH ₃ COOH
11 1	42 0
30	47 6
35	50 0
40	54 7
45	63 0
50	69 5
60	79 5
65	84 5
70	91 2
73	100 0

(Menschutkin, Z anorg 1907, 54 95)

Insol in benzonitrile (Naumann, B 1914,
47 1370)

Insol in ethyl acetate (Naumann, B
1910, 43 314)

Sl sol in anhydrous pyridine

Sol in 97%, 95% and 93% pyridine + Aq
(Kahlenberg, J Am Chem Soc 1908, 30
1107)

100 g sat solution of CaCl₂ in sat sugar +
Aq at 31 25° contain 42 84 g sugar + 25 25 g
CaCl₂, or 100 g H₂O dissolve 135 1 g sugar
+ 79 9 g CaCl₂ at 31 25° (Kohler, Z Ver
Zuckerind, 1907, 47 447)

+H₂O (Bakhuus Roozeboom) See above

+2H O (Bakhuus Roozeboom) See above

+4H O Two modifications (Bakhuus
Roozeboom) See above

α and β modifications (α = stable form)

(Kuznetsov, C A 1911, 842)

+6H₂O Very deliquescent Sol in H O
with absorption of much heat

250 pts CaCl₂ + 6H₂O with 100 pts H₂O
at 10 8° lower the temp 23 2° (Rudorff, B
2 68)

Melts in crystal H O at 28° (Tilden, Chem
Soc 45 409), at 30 2° (Bakhuus Roozeboom)

Sat solution in H₂O contains at

—22°	—17°	—5°	—5°	+4°
31 5	32 4	35 1	35 2	36 5% salt,

8°	22°	29°	35°	49°
37 9	42 1	46 1	49 0	55 1% salt,

63°	80°	104°	115°
55 9	57 5	58 5	58 6% salt

(Étard, A ch 1894, (7) 2 532)

Sat solution of CaCl + 6H O contains

44 77 g CaCl_2 at 25° (Schreinemakers and Figgie, Chem Weekbl 1911, 8 685)

See also above

Solubility of $\text{CaCl}_2 + 6\text{H}_2\text{O}$ in ethyl alcohol + Aq under addition of increasing amounts of CaCl_2

Per cent of alcohol by volume	G CaCl_2 added	Grams CaCl_2 in 5 cc of solution
92 3		1 430
97 3		1 409
99 3		1 429
"	1	1 529
"	2	1 561
"	3	1 590
"	4	1 641
"	5	1 709

(Bodtker, Z phys Ch 1897, 22 510)

Calcium hydroxylamine chloride, CaCl_2 , $3\text{NH}_2\text{OH}$, HCl

(Antonow, J Russ Phys Chem Soc 1905, 37 479)

Calcium iodine trichloride, 2ICl_3 , $\text{CaCl}_2 + 8\text{H}_2\text{O}$

Hydroscopic (Weinland, Z anorg 1902, 30 142)

Calcium mercuric chloride, CaCl_2 , $5\text{HgCl} + 8\text{H}_2\text{O}$

Decomp by cold H_2O , which dissolves out CaCl_2 , but all dissolves on heating (v Bonsdorff, 1829)

CaCl_2 , $2\text{HgCl}_2 + 6\text{H}_2\text{O}$ Deliquescent Very sol in H_2O (v Bonsdorff)

CaCl_2 , $6\text{HgCl}_2 + 6\text{H}_2\text{O}$ Very deliquescent Decomp by H_2O (Stromholm, J pr 1902, (2) 66 521)

Calcium lead chloride, basic

See Calcium lead oxychloride

Calcium magnesium chloride, CaCl_2 , $2\text{MgCl} + 12\text{H}_2\text{O}$

Min *Pachhydrite* Deliquescent

100 pts H_2O dissolve 160 3 pts at $15-75^\circ$ By dissolving 20 pts in 80 pts H_2O the temp is raised $7-75^\circ$ (Bischof)

Calcium mercuric chloride, basic, CaCl_2 , $2\text{HgO} + 4\text{H}_2\text{O}$

See Calcium mercuric oxychloride

Calcium thallic chloride, 2HCl_3 , $\text{CaCl}_2 + 6\text{H}_2\text{O}$

Can be cryst from H_2O (Gewecke A 1909, 366 222)

Calcium tin (stannic) chloride

See Chlorostannate, calcium

Calcium uranium chloride, CaCl_2 , UCl_4

Decomp by H_2O (Aloy, Bull Soc 1899, (3) 21 265)

Calcium zinc chloride

$\text{CaZnCl}_4 + 5\frac{1}{2}\text{H}_2\text{O}$, and $\text{Ca}_2\text{ZnCl}_6 + 6\text{H}_2\text{O}$ Very hygroscopic (Ephraim, Z anorg 1910 67 379)

Calcium chloride ammonia, CaCl_2 , 8NH_3

Sol in H_2O with decomp (Faraday)

Calcium chloride hydrazine, CaCl_2 , $2\text{N}_2\text{H}_4$ (?)

Ppt (Franzen, Z anorg 1908, 60 288)

Calcium chloride hydroxylamine, CaCl_2 , $\text{NH}_2\text{OH} + 5\text{H}_2\text{O}$

Not hygroscopic (Antonow, J Russ Phys Chem Soc 1905, 37 479)

CaCl_2 , $2\text{NH}_2\text{OH}$

+ H_2O Aqueous solution sat at 20° contains 56 6 pts salt

+ $2\text{H}_2\text{O}$ (Antonow, l c)

2CaCl_2 , $3\text{NH}_2\text{OH} + 6\text{H}_2\text{O}$ (Antonow, l c)

2CaCl_2 , $5\text{NH}_2\text{OH} + 4\text{H}_2\text{O}$ (Antonow, l c)

Calcium chloride lead oxide, CaCl_2 , $3\text{PbO} + 3\text{H}_2\text{O}$

See Calcium lead oxychloride

Calcium chloroferrite, CaO , CaCl_2 , Fe_2O_3

Insol in H_2O (le Chatelier, C R 99 276)

Calcium chlorofluoride, CaF_2 , CaCl_2

Decomp by H_2O , by very dil HCl , HNO_3 or acetic acid, by hot dil or conc H_2SO_4 Sol in conc HCl or HNO_3 Insol in, and decomp by cold or boiling alcohol (Defauq A ch 1904, (8) 1 355)

Calcium cyanamide, basic, $\text{CN}(\text{COH})$, $6\text{H}_2\text{O}$

Sol in H_2O (Meyer J pr 1878, (2) 1 42)

Calcium cyanamide, CaCN_2

Decomp by H_2O (Meyer, J pr 1878, (2) 18 42)

Calcium subfluoride, CaF

Decomp by H_2O

Sol in hot dil HCl and somewhat sol in dil acetic acid

Somewhat sol in boiling absolute alcohol (Wohler, Z anorg 1909, 61 51)

Calcium fluoride, CaF_2

Sol in 26,923 pts H_2O at $15-5^\circ$ (Wilse, Ch Gaz 1850 366)

1 l H_2O dissolves 16 mg CaF_2 at 1° (Kohlrausch, Z phys Ch 1904, 50 556)

16 3 mg in 1 l of sat solution at 1° (Kohlrausch, Z phys Ch 1908, 64 168)

When pptd not completely insol in H_2O , scarcely sol in dil, more sol in conc $HCl + Aq$, decomp by conc H_2SO_4 , not decomp by dil alkaline solutions (Fresenius)

Not decomp by conc H_2SO_4 below 40° , but forms a transparent syrup CaF_2 is pptd from this solution by addition of H_2O

Sol in conc HCl and $HNO_3 + Aq$ in the same way, but the liquid is not viscid Very sl sol in HF Boiling $HCl + Aq$ dissolves slightly Decomps by boiling $HNO_3 + Aq$

Sol in NH_4 salts + Aq (Rose)
Partly decomp by boiling K_2CO_3 , and $Na_2CO_3 + Aq$ (Dulong, A ch 82 278)
Insol in liquid HF (Franklin, Z anorg 1905, 46 2)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Min *Fluorite* (*Fluorspar*) Calculated from electrical conductivity of $CaF_2 + Aq$, 1 l H_2O dissolves 14 mg CaF_2 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

Calcium hydrogen fluoride, $CaH_2F_4 + 6H_2O$

Decomp by boiling H_2O Sol in $HF + Aq$ (Fremy, A ch (3) 47 35)

Calcium tantalum fluoride

See Fluotantalate, calcium

Calcium stannic fluoride

See Fluostannate, calcium

Calcium titanium fluoride

See Fluotitanate, calcium

Calcium fluoriodide, CaI_2

Very deliquescent Decomps by cold H_2O , more rapidly by hot H_2O , by dil HCl , HNO_3 , H_2SO_4 conc H_2SO_4 , and by alcohol and by ether if these reagents are not absolute (De lauz, A ch 1904, (8) 1 358)

Calcium hydride, CaH_2

Decomp by $HCl + Aq$ (Winkler, B 24 1975 (Moldenhauer, Z anorg 1913, 82 136))

CaH_2 Readily decomp by H_2O and dil acids, almost insol in conc acids Insol in benzene, turpentine and alkyl haloids (Moissan, C R 1898 127 30-31)

Decomp H_2O and ether, sol in dil H_2SO_4 and HNO_3 , almost insol in conc H_2SO_4 and HNO_3 (von Lngyll, C C 1898, II 262)

Insol in CCl_4 , CS_2 , alcohols and ethers No known solvent (Moissan, C C 1903, I 563)

Calcium hydrosulphide, CaS_2H

Cryst with $6H_2O$ Extremely sol in H_2O and alcohol $\frac{1}{4}$ of its weight of H_2O at or-

dinary temp more than suffices to hold it in solution (Divers and Shumidzu, Chem Soc 45 271)

Sp gr of aqueous solution containing 32% anhydrous CaS_2H_2 (64% $CaS_2H_2 + 6H_2O$) = 1.255, 37.5% CaS_2H_2 (75.5% $CaS_2H_2 + 6H_2O$) = 1.310 (Divers and Shumidzu)

Calcium hydroxide, CaO_2H_2

See also Calcium oxide

Sl sol in cold, and less in hot H_2O

1 pt CaO dissolves at t° in pts H_2O

t°	Pts H_2O	Authority
20	450	Davy
0	556	Philips (A Phil 17 107)
	700	Bergman (Essays etc.)
13	785	Paves and Rotondi (B 7 817)
18	780	Bineau (A ch (3) 51 290)
19.5	806	P and R (l c)
23	814	P and R (l c)
18.75	960	Abi
54.4	972	Dalton (Syst 2 231)
15.6	778	Dalton (l c)
15.6	752	Philips (l c)
15.6	731	Wittstein (Repert Pharm 1 182)
15.6	741	Tichborne (Bull Soc (2) 17 24)
100	1270	Dalton (l c)
100	1280	Philips (l c)
100	1330	Wittstein (l c)
100	1340	Tichborne (l c)
100	1500	Bineau (l c)
100	1758	Tichborne (l c)

Solubility in H_2O 1000 pts $CaO_2H_2 + Aq$ sat at t° contain pts CaO

t°	Pts CaO		
	From Nitrate	Marble	Hydrate
0	1 362	1 381	1 430
10	1 311	1 342	1 384
15	1 277	1 299	1 344
30	1 142	1 162	1 195
45	0 996	1 005	1 033
60	0 854	0 868	0 885
100	0 562	0 576	0 584

(Lamy, C R 86 333)

Solubility of CaO_2H_2 in H_2O at t°

t°	Pts H_2O to 1 pt CaO	Pts CaO in 100 pts H_2O	t°	Pts H_2O to 1 pt CaO	Pts CaO in 100 pts H_2O
0	759	0 131	60	1136	0 088
10	770	0 129	70	1235	0 080
20	791	0 126	80	1362	0 073
30	862	0 116	90	1579	0 063
40	932	0 107	100	1650	0 060
50	1019	0 098			

(Mabon, Pharm J Trans (3) 14 505)

1 pt CaO_2H_2 is sol in 640 pts H_2O at 19° , and 3081 pts at 150° (Shenstone and Cundall, Chem Soc 53 550)

1000 g H_2O dissolve 1.251 g CaO (Carles, Arch Pharm (3) 4 558)

Solubility of CaO_2H_2 in H_2O 100 pts H_2O
dissolve pts CaO at t°

t°	Pts CaO	t	Pts CaO
20	0 1374	80	0 0845
40	0 1162	100	0 0664
60	0 1026		

(Zahorsky, Z anorg 3 34)

1 pt CaO is sol in pts H_2O at t°
 t° 15° 20° 25° 30° 35° 40° 45°
 pts H_2O 776 813 848 885 924 962 1004

t° 50° 55° 60° 65° 70° 75° 80°
 pts H_2O 1044 1108 1158 1244 1330 1410 1482

(Herzfeld, C C 1897, I, 932)

100 g sat $\text{CaO}_2\text{H}_2 + \text{Aq}$ contain g CaO
 at t°
 t° 5 10 15 20 25
 g CaO 0 135 0 1342 0 132 0 1293 0 1254

t° 30 35 40 50 60
 g CaO 0 1219 0 1161 0 1119 0 0981 0 0879

t° 70 80 90 100
 g CaO 0 0781 0 074 0 0696 0 0597
 (J Soc Chem Ind 1901, 20 223)

ity in H_2O at high temp
 of the solution contains at

0° 150° 190°
 0 305 0 169 0 084 g CaO

(Herold, Z elektrochem 1905, 11 421)

Solubility in H_2O at t°

t°	1 g CaO is sol in g H_2O at t
2	768 5
10	786 8
15	804 3
20	826 4
25	868 7
30	908 2
40	988 1
50	1083 0
60	1179 0
70	1274 8
80	1368 1

(Moody, Chem Soc 1908, 93 1772)

Sat $\text{CaO}_2\text{H}_2 + \text{Aq}$ contains at
 95° 76°

0 0580 0 0705% by wt CaO

(Tschugaeff, Z anorg 1914, 86 159)

100 g sat solution of CaO_2H_2 in H_2O at
 25° contain 0 117 g CaO_2H_2 (Cameron and
 Potter, J phys Ch 1911, 15 70)

Readily sol in most acids

Sol in $\text{H}_3\text{BO}_3 + \text{Aq}$ at 30° (Sborgi, Real
 Ac Linc 1913, (5) 22 I, 715 and 798)
 Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Much more sol in
 $\text{NaCl} + \text{Aq}$ than in H_2O (Rose)

Solubility of CaO_2H_2 in $\text{NH}_4\text{Cl} + \text{Aq}$ at 25°

Concentration of $\text{NH}_4\text{Cl} + \text{Aq}$ in millimols per liter	Solubility of CaO_2H_2 in millimols per liter
0 00	20 22
21 76	29 08
43 52	39 23
87 03	59 68

(Noyes and Chapin, Z phys Ch 1899, 26
 520)

Solubility of CaO_2H_2 in $\text{CaCl}_2 + \text{Aq}$ 100 pt
 $\text{CaCl}_2 + \text{Aq}$ of given strength dissolve pt
 CaO at t°

t°	$\text{CaCl}_2 + \text{Aq}$ 5% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 10% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 15% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 20% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 25% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 30% CaCl_2
20	0 1370	0 1661	0 1993	0 1857*	0 1661*	0 1630
40	0 1160	0 1419	0 1781	0 2249	0 3030*	0 3682
60	0 1020	0 1313	0 1706	0 2204	0 2989	0 3662
80	0 0936	0 1328	0 1736	0 2295	0 3261	0 412
100	0 0906	0 1389	0 1842	0 2325	0 3710	0 492

* In these cases ppts of $3\text{CaO} \cdot \text{CaCl}_2 + 10\text{H}_2\text{O}$ were
 formed

(Zahorsky, Z anorg 3 34)

See also $\text{CaCl} + \text{CaO} \cdot \text{H}_2$ under Calcium
 chloride

Solubility in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 25°

$\text{bp } 25^\circ/25$	g CaO as $\text{Ca}(\text{OH})_2$ in 100 g H_2O	g $\text{Ca}(\text{NO}_3)_2$ in 100 g H_2O	Solid phase
1 0249	0 096	3 38	$\text{Ca}(\text{OH})_2$ $\text{CaO} \cdot x\text{H}_2\text{O}$ and solid solution $\text{CaO} \cdot x\text{H}_2\text{O}$
1 0484	0 109	5 52	
1 0940	0 125	13 42	
1 1383	0 181	20 73	
1 1840	0 187	28 98	Solid solution $\text{CaO} \cdot x\text{H}_2\text{O}$
1 2101	0 198	32 84	
1 2287	0 212	36 83	
1 2290	0 213	37 55	
1 2541	0 224	40 25	Solid solution $\text{CaO} \cdot x\text{H}_2\text{O}$
1 2581	0 230	41 98	
1 2826	0 260	47 00	
1 2905	0 263	47 16	
1 3337	0 332	58 67	Solid solution $\text{CaO} \cdot x\text{H}_2\text{O}$ and $\text{Ca}(\text{NO}_3)_2$ $3\frac{1}{2}\text{H}_2\text{O}$
1 3735	0 429	69 40	
1 4195	0 545	83 03	
1 4840	0 449	99 70	$\text{Ca}(\text{NO}_3)_2 \cdot 3\frac{1}{2}\text{H}_2\text{O}$ $\text{Ca}(\text{NO}_3)_2$ and $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
1 5330	0 371	115 50	
1 5809	0 303	135 30	
1 5842	0 000	139 30	

(Cameron and Robinson, J phys Chem
 1907, 11 275)

Solubility of CaO_2H_2 in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$
Temp = 25°

G per 100 g sat solution		Solid phase
CaO	$\text{Ca}(\text{NO}_3)_2$	
0 1150	0	CaO H_2
0 0978	4 84	
0 1074	9 36	
0 1193	13 77	
0 1444	22 46	
0 1650	27 83	
0 1931	32 94	
0 2579	40 66	
0 3060	44 44	
0 2802	45 28	$\text{Ca}_2\text{N}_2\text{O}_7 \cdot 3\text{H}_2\text{O}$
0 2314	47 79	
0 1894	51 07	$\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
0 1659	53 20	
0 1486	55 25	
0 0836	57 72	
0	57 98	

Temp = 100°

0 0561	0	CaO H
0 0550	2 42	
0 0624	4 91	
0 1110	15 39	
0 1200	16 10	
0 155	21 86	
0 269	33 03	
0 480	42 26	
0 973	50 94	
1 261	53 75	$\text{CaO}_2\text{H} + \text{Ca}_2\text{N}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ $\text{Ca}_2\text{N}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$
1 477	55 40	
1 476	55 43	
1 491	55 65	
1 635	56 89	
1 686	57 03	
1 596	57 91	
1 576	58 67	
1 348	60 44	
1 167	62 82	$\text{Ca N}_2\text{O}_7 \cdot 2\text{H}_2\text{O} + \text{Ca N}_2\text{O}_7 \cdot 1/2\text{H}_2\text{O}$ $\text{Ca N}_2\text{O}_7 \cdot 1/2\text{H}_2\text{O}$
1 077	66 44	
1 141	69 12	
1 252	70 60	
1 203	70 40	
1 103	71 44	
0 937	73 85	
0 849	75 74	
0 815	76 94	
0 804	77 62	$\text{Ca}(\text{NO}_3)_2$
0 412	77 74	
0	78 43	

(Bassett and Laylor, Chem Soc 1914, **105**
1926)Solubility of CaO in KCl and $\text{NaCl} + \text{Aq}$
Curves are given which show that the solubility of lime in solutions of either NaCl or

KCl is a maximum for all temps when the solution contains about 60 g of salt per l. It is a minimum at any fixed temp when the solution is sat, the solubility then being much less than in pure H_2O of the same temp. A solution of NaCl dissolves more lime at all temps and concentrations than a corresponding solution of KCl . In all cases the maximum solubility of lime occurs when the temp is lowest. With solutions of all concentrations the solubility decreases regularly as the temp increases (Cabot, J Soc Chem Ind 1897, **16** 417-419).

Solubility in $\text{KCl} + \text{Aq}$ increases with increased quantities of KCl and then diminishes, becoming less than the solubility in H_2O alone (Kernot, Gazz ch it 1908, **38** (1) 532).

KOH or $\text{NaOH} + \text{Aq}$ containing 1 pt KOH or NaOH in 100 pts H_2O do not dissolve more than $1/50000$ pt CaO_2H_2 , but it is sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Pelouze, A ch (3) **33** 11).

Solubility in $\text{NaOH} + \text{Aq}$ at t°

G NaOH per l	Solubility of CaO in g per liter at			
	20°	50°	70°	100°
0	1 17	0 88	0 75	0 54
0 400	0 94	0 65	0 53	0 35
1 600	0 57	0 35	0 225	0 14
2 666	0 39	0 20	0 11	0 05
5 000	0 18	0 06	0 04	0 01
8 000	0 11	0 02	0 01	traces
20 000	0 02	traces	0	0

(d'Anselme, Bull Soc 1903, (3) **29** 936)Solubility of CaO in $\text{NaCl} + \text{NaOH} + \text{Aq}$

G NaCl per l	G CaO per l of solution containing		
	No NaOH	0.59 g NaOH per l	4.09 g NaOH per l
0	1 3	0 8	0 22
5	1 4	0 9	
10	1 6	1 0	
25	1 7	1 1	
50	1 8	1 25	
75	1 9	1 4	0 55
100	1 85	1 4	
150	1 65	1 25	0 44
175	1 6	1 2	
182	1 6	1 2	
225	1 4	1 0	
250	1 3	0 9	
300	1 1	0 7	0 22

(Maugret, Bull Soc 1905, (3) **33** 631)

Solubility of CaO_2H_2 in H_2O 100 pts H_2O
dissolve pts CaO at t°

t°	Pts CaO	t°	Pts CaO
20	0 1374	80	0 0845
40	0 1162	100	0 0664
60	0 1026		

(Zahorsky, Z anorg 3 34)

1 pt CaO is sol in pts H_2O at t°
 t° 15° 20° 25° 30° 35° 40° 45°
 pts H_2O 776 813 848 885 924 962 1004

t° 50° 55° 60° 65° 70° 75° 80°
 pts H_2O 1044 1108 1158 1244 1330 1410 1482

(Herzfeld, C C 1897, I, 932)

100 g sat $\text{CaO}_2\text{H}_2 + \text{Aq}$ contain g CaO
 at t°
 t° 5 10 15 20 25
 g CaO 0 135 0 1342 0 132 0 1293 0 1254

t° 30 35 40 50 60
 g CaO 0 1219 0 1161 0 1119 0 0981 0 0879

t° 70 80 90 100
 g CaO 0 0781 0 074 0 0696 0 0597
 (Guthrie, J Soc Chem Ind 1901, 20 223)

Solubility in H_2O at high temp

1 litre of the solution contains at

120° 150° 190°
 0 305 0 169 0 084 g CaO

(Herold, Z elektrochem 1905, 11 421)

Solubility in H_2O at t°

t°	1 g CaO is sol in g H_2O at t°
2	768 5
10	786 8
15	804 3
20	826 4
25	868 7
30	908 2
40	988 1
50	1083 0
60	1179 0
70	1274 8
80	1368 1

(Moody, Chem Soc 1908, 93 1772)

Sat $\text{CaO}_2\text{H}_2 + \text{Aq}$ contains at

95° 76°
 0 0580 0 0705% by wt CaO

(Tschugaëff, Z anorg 1914, 86 159)

100 g sat solution of CaO_2H_2 in H_2O at
 25° contain 0 117 g CaO_2H_2 (Cameron and
 Potter, J phys Ch 1911, 15 70)
 Readily sol in most acids

Sol in $\text{H}_3\text{BO}_3 + \text{Aq}$ at 30° (Sborgi, I al
 Ac Linc 1913, (5) 22 I, 715 and 798)
 Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Much more so in
 $\text{NaCl} + \text{Aq}$ than in H_2O (Rose)

Solubility of CaO_2H_2 in $\text{NH}_4\text{Cl} + \text{Aq}$ at t°

Concentration of $\text{NH}_4\text{Cl} + \text{Aq}$ in millimols per liter	Solubility of CaO millimols per lit
0 00	20 22
21 76	29 08
43 52	39 23
87 03	59 68

(Noyes and Chapin, Z phys Ch 1899 28
 520)

Solubility of CaO_2H_2 in $\text{CaCl}_2 + \text{Aq}$ 100 pts
 $\text{CaCl}_2 + \text{Aq}$ of given strength dissolv pts
 CaO at t°

t°	$\text{CaCl}_2 + \text{Aq}$ 5% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 10% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 15% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 20% CaCl_2	$\text{CaCl}_2 + \text{Aq}$ 25% CaCl_2	CaCl_2
20	0 1370	0 1661	0 1993	0 1857*	0 1661*	630*
40	0 1160	0 1419	0 1781	0 2249	0 3030*	684*
60	0 1020	0 1313	0 1706	0 2204	0 2989	664
80	0 0936	0 1328	0 1736	0 2295	0 3261	122
100	0 0906	0 1389	0 1842	0 2325	0 3710	922

* In these cases ppts of $3\text{CaO} \cdot \text{CaCl}_2 + 1\text{H}_2\text{O}$ were
 formed

(Zahorsky, Z anorg 3 34)

See also $\text{CaCl} + \text{CaO} + \text{H}$ under **Ca** num
 chloride

Solubility in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 25°

$\frac{\text{bp}}{25^\circ/25^\circ}$	$\frac{\text{g } \text{CaO} \text{ as } \text{Ca}(\text{OH})_2}{\text{in } 100 \text{ g } \text{H}_2\text{O}}$	$\frac{\text{g } \text{Ca}(\text{NO}_3)_2}{\text{in } 100 \text{ g } \text{H}_2\text{O}}$	Solid phase
1 0249	0 096	3 38	$\text{Ca}(\text{OH})_2$ $\text{Ca}(\text{OH})_2$ and solid solution $\text{CaO} \cdot x\text{N}(\text{O})_2 \cdot y\text{H}_2\text{O}$
1 0484	0 109	5 32	
1 0940	0 12, 13 42		
1 1383	0 181	20 73	
1 1840	0 187	28 98	
1 2101	0 198	32 54	Solid solution $\text{CaO} \cdot x\text{N}(\text{O})_2 \cdot y\text{H}_2\text{O}$
1 2287	0 212	36 83	
1 2290	0 213	37 55	
1 2341	0 224	40 25	
1 2581	0 230	41 98	
1 2826	0 260	47 00	Solid solution $\text{CaO} \cdot \text{N}(\text{O})_2$ $3\text{H}_2\text{O}$
1 2905	0 263	47 16	
1 3337	0 332	58 67	
1 3735	0 429	69 40	
1 4195	0 545	83 03	
1 4840	0 449	99 70	Solid solution $\text{CaO} \cdot \text{N}(\text{O})_2$ $3\text{H}_2\text{O}$ and $\text{Ca}(\text{NO}_3)_2$
1 5330	0 371	115 30	
1 5809	0 303	135 30	
1 5842	0 000	139 30	

(Cameron and Robinson, J phys chem
 1907, 11 275)

Solubility of CaO_2H_2 in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$
Temp = 25°

G per 100 g sat solution		Solid phase
CaO	$\text{Ca}(\text{NO}_3)_2$	
0 1150	0	CaO H
0 0978	4 84	
0 1074	9 36	
0 1193	13 77	
0 1444	22 46	
0 1650	27 83	
0 1931	32 94	
0 2579	40 66	
0 3060	44 44	
0 2802	45 28	Ca N_2O_7 3H O
0 2314	47 79	
0 1894	51 07	
0 1659	53 20	Ca $(\text{NO}_3)_2$ 4H O
0 1486	55 25	
0 0836	57 72	
0	57 98	

Temp = 100°

0 0561	0	CaO H
0 0550	2 42	
0 0624	4 91	
0 1110	15 39	
0 1200	16 10	
0 155	21 86	
0 269	33 03	
0 480	42 26	
0 973	50 94	
1 261	53 75	
1 477	55 40	CaO $_2$ H + Ca N_2O_7 2H O Ca $_2$ N $_2$ O 2H O
1 476	55 43	
1 491	55 65	
1 635	56 89	
1 686	57 03	
1 596	57 91	
1 576	58 67	
1 348	60 44	
1 167	62 82	
1 077	66 44	
1 141	69 12	Ca N_2O_7 2H $_2$ O + Ca N_2O_7 $\frac{1}{2}$ H O Ca N O $_7$ $\frac{1}{2}$ H O
1 252	70 60	
1 203	70 40	
1 103	71 44	
0 937	73 85	
0 849	75 74	
0 815	76 94	
0 804	77 62	
0 412	77 74	
0	78 43	

KCl is a maximum for all temps when the solution contains about 60 g of salt per l. It is a minimum at any fixed temp when the solution is sat, the solubility then being much less than in pure H_2O of the same temp. A solution of NaCl dissolves more lime at all temps and concentrations than a corresponding solution of KCl. In all cases the maximum solubility of lime occurs when the temp is lowest. With solutions of all concentrations the solubility decreases regularly as the temp increases (Cabot, J Soc Chem Ind 1897, 16 417-419).

Solubility in KCl + Aq increases with increased quantities of KCl and then diminishes, becoming less than the solubility in H_2O alone (Kernot, Gazz ch it 1908, 38 (1) 532).

KOH or NaOH + Aq containing 1 pt KOH or NaOH in 100 pts H_2O do not dissolve more than $\frac{1}{50000}$ pt CaO_2H_2 , but it is sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Pelouze, A ch (3) 33 11).

Solubility in NaOH + Aq at t°

G NaOH per l	Solubility of CaO in g per liter at			
	20°	50°	70°	100°
0	1 17	0 88	0 75	0 54
0 400	0 94	0 65	0 53	0 35
1 600	0 57	0 35	0 225	0 14
2 666	0 39	0 20	0 11	0 05
5 000	0 18	0 06	0 04	0 01
8 000	0 11	0 02	0 01	traces
20 000	0 02	traces	0	0

(d'Anselme, Bull Soc 1903, (3) 29 936)

Solubility of CaO in NaCl + NaOH + Aq

G NaCl per l	G CaO per l of solution containing		
	No NaOH	0 89 g NaOH per l	4 09 g NaOH per l
0	1 3	0 8	0 22
5	1 4	0 9	
10	1 6	1 0	
25	1 7	1 1	
50	1 8	1 25	
75	1 9	1 4	0 55
100	1 85	1 4	
150	1 65	1 25	0 44
175	1 6	1 2	
182	1 6	1 2	
225	1 4	1 0	
250	1 3	0 9	
300	1 1	0 7	0 22

(Maigret, Bull Soc 1905, (3) 33 631)

(Bassett and Laylor, Chem Soc 1914, 105 1926)

Solubility of CaO in KCl and NaCl + Aq. Curves are given which show that the solubility of lime in solutions of either NaCl or

Solubility of CaO_2H_2 in $\text{CaSO}_4 + \text{Aq}$ at 25°

G per 100 cc sat solution		Solid phase
CaSO_4	CaO	
0	0 1166	CaO_2H
0 0391	0 1141	
0 0666	0 1150	
0 0955	0 1215	
0 1214	0 1242	
0 1588	0 1222	$\text{CaO}_2\text{H}_2 + \text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
0 1634	0 0939	
0 1722	0 0611	
0 1853	0 0349	
0 1918	0 0176	
0 2030	0 0062	
0 2126	0	

(Cameron and Bell, J Am Chem Soc 1906, **28** 1220)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 827)

Alcohol dissolves traces

Methyl alcohol forms colloidal solution containing 1.125 g per l (Neuberg and Rewald, Biochem Z 1908, **9** 545)

Insol in ether

Insol in acetone (Naumann, B 1904, **37** 4329)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Insol in ethyl acetate (Naumann, B 1904, **37** 3601)

Much more sol in glycerine, or sugar + Aq than in H_2O

Solubility of CaO in glycerine

Wt of glycerine in 100 cc of solution	Wt CaO contained in 100 cc of liquid at with CaO	Relation of CaO to glycerine	
		CaO	Glycerine
10 00	0 370	3 6	96 4
5 00	0 240	4 6	95 4
2 86	0 196	6 4	93 6
2 50	0 192	7 1	92 9
2 00	0 186	8 5	91 5
1 00	0 165	14 2	85 8

(Berthelot, A ch (3) **46** 176)

1000 g H_2O dissolve 1.251 g CaO , 1000 g $\text{H}_2\text{O} + 50$ g glycerine dissolve 1.865 g CaO , 1000 g $\text{H}_2\text{O} + 100$ g glycerine dissolve 2.583 g CaO , 1000 g $\text{H}_2\text{O} + 200$ g glycerine dissolve 4.040 g CaO , 1000 g $\text{H}_2\text{O} + 400$ g glycerine dissolve 6.569 g CaO (Carles, Aich Pharm (3) **4** 558)

Insol in pure glycerine

Solubility of CaO_2H_2 in glycerine + Aq at 5°
G = g glycerine in 100 g glycerine + A
 $\frac{1}{2}\text{CaO}(\text{H})$ = millimols sol in 100 cc glycerine + Aq

G	$\frac{1}{2}\text{CaO}(\text{H})$	Sp gr
0	4 3	1 0003
7 15	8 13	1 0244
20 44	14 9	1 0537
31 55	22 5	1 0842
40 95	40 1	1 1137
48 7	44 0	1 1356
69 2	95 8	1 2027

(Herz and Knoch, Z anorg 1905, **46** 3)

Solubility in glycerine + Aq at 25°

Solution contains			Sp g
% $\text{Ca}(\text{OH})_2$	% glycerine	% H_2O	
0 117	0		
0 178	3 50	96 32	1 00
0 413	15 59	80 28	
0 48	17 84	81 68	1 0
0 88	34 32	64 80	1 00
1 34	55 04	43 62	1 1

Solid phase in this system is $\text{CaO} \cdot \text{H}_2\text{O}$.
(Cameron and Patten, J phys Chem 1914, **15** 71)

100 pts sugar dissolved in H_2O dissolve 50 pts CaO (Osann) 50 pts CaO (Ure) 49 6 pts CaO (Daniell) 29-30 6 pts CaO (Huntton) 23 pts CaO (Soubeiran)

Sugar solution at 100 takes up $\frac{1}{4}$ mol CaO for each mol sugar at 0° if it contains not less than 25% of sugar it takes up 2 mols CaO to 1 mol sugar (Brunfauf)

Amount dissolved is proportional to the density and temperature of the solutions

Solubility of CaO in sugar + Aq

Pt sugar dissolved in 100 pt H_2O	Relation of CaO to sugar	
	CaO	Sugar
40	21 0	79 8
37	20 8	79 2
33 0	20	79 0
32	20 3	79 7
30 0	20 1	79 9
27	19 3	80 1
25 0	19 8	80 2
22	19 3	80 7
20 0	18 8	81 2
17	18 7	81 3
15 0	18	81
12	18 3	81 7
10 0	18 1	81 9
7	16 9	83 1
5 0	15 3	84 7
2	13 8	86 2

(Berthelot, C R **32** 33)

100 g solution of sugar sat with CaO between 10 and 14° contain 22 to 23 % CaO (Huntton **1** 7)

Solubility of CaO in dil sugar solutions

Wt of sugar in 100 cem of solution	Wt of CaO contained in 100 cem of liquid sat with CaO	Relation of CaO to sugar	
		CaO	Sugar
4 850	1 031	17 5	82 5
2 401	0 484	16 8	83 2
2 000	0 433	17 8	82 2
1 660	0 364	18 0	82 0
1 386	0 326	19 0	81 0
1 200	0 316	20 8	79 2
1 058	0 281	21 0	79 0
0 960	0 264	21 6	78 4
0 400	0 194	32 7	67 3
0 191	0 172	47 4	52 6
0 096	0 154	61 6	78 4
0 000	0 148		

(Berthelot, A ch (3) 46 176)

Solubility in sugar + Aq at t°

t°	G sugar in 100 cem of solution	G CaO dissolved per 100 g sugar
16-17°	0 7814	37 9
	0 9120	32 3
	1 4000	30 5
	1 6930	28 9
	4 754	27 7
	5 730	27 1
	10 159	27 5
	11 200	27 2
	12 500	27 3
	13 930	27 9
	14 487	27 5
	16 410	28 0
15°	0 625	71 6
	0 964	53 4
	2 084	36 0
	3 028	32 3
	3 451	31 7
	4 168	30 2
	4 880	28 7
	5 73	28 3
	6 12	27 4
	6 25	27 7
	6 51	27 5
	7 55	27 9
	8 20	27 3

(Weisberg, Bull Soc 1899, (3) 21 775)

Solubility in sugar + Aq at 25°

Solution contains			Sp gr
% Ca(OH)	% sugar	% H O	
0 117	0		0 983
0 188	0 62	99 19	1 000
0 730	4 82	94 50	1 021
1 355	7 50	91 12	1 037
2 31	9 87	87 85	1 051
3 21	11 90	84 89	1 067
4 57	15 10	80 33	1 092
5 38	17 42	76 93	1 109
6 07	19 86	73 07	1 123

The solid phase in this system consists of a series of solid solutions with Ca(OH) a limiting case

(Cameron and Patten, J phys Chem 1911, 15 70)

Solubility of CaO in sugar + Aq at 80°

% sugar	% CaO	% Sugar	% CaO
4 90	0 117	19 50	0 358
9 90	0 189	24 60	0 458
14 75	0 230	29 70	1 017

Solid phase, CaO₂H₂.
(von Ganneken, Proc Kon Akad v Wetensch, Amsterdam, 1911, 14 457)

Solubility of CaO in mannite + Aq

Wt of mannite in 100 cem of solution	Wt of CaO contained in 100 cem of liquid sat with CaO	Relation of CaO to mannite	
		CaO	Mannite
9 60	0 753	7 3	92 7
4 80	0 372	7 2	92 8
2 40	0 255	9 6	90 4
1 92	0 225	10 5	89 5
1 60	0 207	11 4	88 6
1 37	0 194	12 5	87 5
1 20	0 193	13 9	86 1
1 07	0 190	15 1	84 9
0 96	0 186	16 2	86 8
0 192	0 155	44 6	55 4
0 096	0 154	61 6	38 4
0 000	0 148		

(Berthelot, A ch (3) 46 176)

Solutions of CaO in sugar, mannite, or glycerine afford an abundant ppt on being heated, but this redissolves on cooling (Berthelot)

Sol in sorbite + Aq (Pelouze), sl sol in quercite + Aq. Sol in monobasic C₁₂ sugarate + Aq (Peligot) Much more sol in gelatine + Aq than in pure H₂O

Calcium hydroxyhydrosulphide, Ca(OH)SH + 3H₂O

Easily sol in H₂O with almost immediate decomposition Insol in alcohol, but slowly

decomp thereby (Divers and Shimidzu, Chem Soc **45** 270)

Calcium subiodide, CaI

Decomp by moisture (Wohler, Z anorg 1909, **61** 76)

Calcium iodide, CaI_2

Deliquescent 100 pts H_2O dissolve—
at 0° 20° 40° 43° 92°
192 204 228 286 435 pts CaI_2
(Kremers, Pogg **103** 65)

Sp gr of $\text{CaI}_2 + \text{Aq}$ at 19.5° containing
5 10 15 20 25 30% CaI_2 ,
1.044 1.09 1.14 1.198 1.26 1.321

35 40 45 50 55 60% CaI_2
1.398 1.477 1.567 1.665 1.78 1.91
(Kremers, calculated by Gerlach, Z anal **8** 285)

Sol in absolute alcohol (Gay-Lussac, A ch **91** 57)

Sol in acetone (Naumann, B 1904, **37** 4328, Eidmann, C C **1899**, II 1014)

Sol in ethyl acetate (Naumann, B 1910, **43** 314)

+4H₂O (Kuznetzov, C A **1911** 842)

+6H₂O Sat aq solution contains at
—22° +7° 10° 19°
61.6 65.0 65.1 66.3% salt

51° 64° 130° 248°
69.4 75.9 81.3 87.1% salt

(Étard, A ch 1894 (7) **2** 543)

+7H₂O (Kuznetzov)

Calcium periodide, $\text{CaI}_2 + 15\text{H}_2\text{O}$

(Mosnier, A ch 1897, (7) **12** 401)

CaI_4 (Herz and Bulla, Z anorg 1911, **71** 255)

Calcium mercuric iodide, $\text{CaI}_2 \cdot \text{HgI}_2 + 8\text{H}_2\text{O}$

Very deliquescent Sol in H_2O , alcohols, allyl iodide, aldehyde, acetic acid, ethyl oxalate and iniline Sl sol in nitrobenzene Completely insol in CHCl_3 , CCl_4 , ethyl iodide ethylene bromide, C_6H_6 , monochlorobenzene and toluene (Duboin, C R 1906, **142** 573)

3C₆H₅I, 4HgI₂ + 24H₂O Sol in H₂O with pptn of red HgI

Very sol in alcohols, glycerine, ethyl acetate, methyl and isobutyl propionate, allyl iodide, aldehyde, acetone, aniline and ethyl oxalate Insol or sl sol in nitrobenzene Insol in CHCl_3 , C_6H_6 , ethyl iodide, monochlorobenzene, etc (Duboin, C R 1906, **142** 397)

$\text{CaI}_2 \cdot 2\text{HgI}_2$

Decomp by H_2O (Boullay)

$\text{CaI}_2 \cdot 5\text{HgI}_2 + 8\text{H}_2\text{O}$ Decomp by H_2O ,

alcohols, glycerine, aldehyde, and acetic id, slowly by nitrobenzene and ethyl oxalate Insol in monochlorobenzene, toluene, C_6H_6 and ethylene bromide (Duboin, l c)

Calcium silver iodide, $\text{CdI}_2 \cdot 2\text{AgI} + 6\text{H}_2\text{O}$

Immediately decomp by H_2O (Simmons, Roy Soc Proc **27** 120)

Calcium zinc iodide, $\text{CaI}_2 \cdot \text{ZnI}_2 + 8\text{H}_2\text{O}$

Very hygroscopic (Ephraim, Z anorg 1910, **67** 384)

Calcium iodide ammonia, $\text{CaI}_2 \cdot 6\text{NH}_3$

(Isambert, C R **66** 1259)

Calcium nitride, Ca_3N_2

Sol in dil acids, insol in conc (water free) acids (Moissan, C R 1898, **127** 499)

Calcium oxide, CaO

Decomp by H_2O , with evolution of much heat, to form CaO_2H_2 , which see for solubility in H_2C , etc

Calcium peroxide, CaO_2

Very sl sol in H_2O , easily sol in acids, and NH_4 salts + Aq Insol in $\text{NH}_4\text{OH} + \text{q}$ (Conroy, Chem Soc (2) **11**, 808)

+2H₂O True composition is $\text{CaO}_2\text{H}_2 + \text{H}_2\text{O}_2$ (de Forcrand, C R 1900, **130** 131) +8H₂O Efflorescent Difficultly sol in H_2O with gradual decomp Insol in alcohol or ether (Gay-Lussac and Thenard, A ch (2) **8** 313)

Calcium oxybromide, $3\text{CaO} \cdot \text{CaBr}_2 + 16\text{H}_2\text{O}$

Decomp by H_2O and alcohol Very easily sol in hydracids and dil HNO_3 (Laspeyres, C R 1894, **119** 372)

Calcium oxychloride, $\text{Ca}_4\text{O}_3\text{Cl} + 15\text{H}_2\text{O} = 3\text{CaO} \cdot \text{CaCl}_2 + 15\text{H}_2\text{O}$

Decomp by H_2O or alcohol (Rosen) Formula is $\text{Ca}_2\text{HOCl} + 7\text{H}_2\text{O}$ (Grimshaw, C N **30** 280)

+16H₂O Decomp by H₂O into CaO and CaCl_2 until a maximum of 85 g CaI_2 is dissolved per litre (Ditté, C R **91** 51) 4CaO, $\text{CaCl}_2 + 14\text{H}_2\text{O}$ (Schreinemakers and Figue, Chem Weekbl 1911, **8** 685) $\text{CaO} \cdot \text{CaCl}_2$ (Schreinemakers and Figue)

Calcium lead oxychloride, $\text{CaCl}_2 \cdot \text{PbCl}_2 + 4\text{H}_2\text{O}$

Sol in H_2O with decomp (Andrić, C R **104** 359)

$\text{CaCl}_2 \cdot 3\text{PbO} + 3\text{H}_2\text{O}$ (Andrić)

Calcium mercuric oxychloride, $\text{CaCl}_2 \cdot 2\text{HgCl}_2 + 4\text{H}_2\text{O}$

Decomp immediately by H₂O (Klingenberg, B **16** 997)

Calcium oxyiodide, 3CaO , $\text{CaI}_2 + 16\text{H}_2\text{O}$

Decomp by H_2O , alcohol, and acids Sol in hydracids and in very dil HNO_3 (Tassily, C R 1894, 119 372)

Calcium oxysulphide, $\text{Ca}_4\text{O}_3\text{S}_4 + 12\text{H}_2\text{O} = 3\text{CaO}$, $\text{CaS}_4 + 12\text{H}_2\text{O}$

Decomp by H_2O Not acted on by absolute alcohol (Schöne, Pogg 117 77)

According to Geuther (A 224 178) = CaS_3 , $2\text{CaO} + 10$, or $11\text{H}_2\text{O}$ Sol in dil $\text{HCl} + \text{Aq}$ with separation of S

$\text{Ca}_5\text{O}_4\text{S}_4 + 18\text{H}_2\text{O} = 4\text{CaO}$, $\text{CaS}_4 + 18\text{H}_2\text{O}$ Decomp by H_2O , but not acted on by absolute alcohol (Schöne, Pogg 117 82)

According to Geuther (A 224 178) = CaS_3 , $3\text{CaO} + 14$, or $15\text{H}_2\text{O}$

$\text{Ca}_6\text{O}_5\text{S}_5 + 20\text{H}_2\text{O} = 5\text{CaO}$, $\text{CaS}_5 + 20\text{H}_2\text{O}$ (Rose, Pogg 55 433)

Sol in 400 pts cold, decomp by boiling H_2O (Buchner), sl sol in cold, much more in hot H_2O , but it is not deposited on cooling Aqueous solution sat at $6^\circ - 7^\circ$ has sp gr = 1.0105 (Herschel), sol in alcohol (Gay-Lussac), insol in alcohol (Gmelin)

Calcium phosphide, CaP

Deliquescent Decomp in moist air or with H_2O Not attacked by conc HNO_3 , but decomp by dil $\text{HNO}_3 + \text{Aq}$ (Thénard, A ch (3) 14 14)

Ca_3P_2 Crystallized

Decomp by H_2O

Not attacked by conc H_2SO_4 Violently attacked by dil H_2SO_4

Not attacked by abs alcohol, ether, benzene or oil of turpentine (Moissan, C R 1899, 128 792)

Ca_2P_3 Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Calcium selenide, CaSe

Sl sol in H_2O Very easily decomp (Fabre, C R 102 1469)

Calcium silicide, CaSi_2

Slowly decomp by H_2O , sol in conc H_2SO_4 and dil HNO_3 with evolution of H_2 With conc HCl it gives H_2 , Si and silicon hydride with dil HCl , H_2 and a yellow substance Sol in alkali + Aq or $\text{NH}_3 + \text{Aq}$ with evolution of H_2 (Moissan, C R 1902, 134 505)

Two modifications

(a) Only sl sol in HNO_3 , decomp H_2O to give an insol ppt on addition of HCl

(b) Easily sol in HNO_3 and acetic acid, decomp HCl to give a ppt which is sol in $\text{KOH} + \text{Aq}$ (de Chalmot, Am Ch J 1896, 18, 320)

Ca_3Si_2 Slowly decomp by H_2O , rapidly by dil acetic acid or by $\text{H}_2\text{SO}_4 + \text{Aq}$ without evolution of spontaneously inflammable gas (Hönigschmid, M 1909, 30 497)

Decomp by dil min acids, with evolution

of spontaneously inflammable gas (Hack-spill, Bull Soc 1908, (4) 3 619)

$\text{Ca}_6\text{Si}_{10}$ Insol in all solvents Decomp by boiling H_2O , by conc HCl and by acetic acid Sol in dil alkali and alkali carbonates + Aq Hardly attacked by conc H_2SO_4 or HNO_3 (Kolb, Z anorg 1909, 64 349)

$\text{Ca}_{11}\text{Si}_{10}$ Easily decomp by boiling with H_2O Decomp by dil acetic acid, dil or conc HCl (Kolb, Z anorg 1909, 64 349 and 356)

Calcium siliconitride, CaSi_2N_3

(Kolb, Z anorg 1909, 64 363)

$\text{Ca}_2\text{Si}_3\text{N}_4$ Slowly decomp by boiling with H_2O , somewhat more rapidly with dil $\text{NaOH} + \text{Aq}$ Slowly decomp by conc HCl (Kolb, l c)

$\text{Ca}_{11}\text{Si}_{10}\text{N}_1$ Completely decomp by HCl (Kolb, l c)

Calcium sulphide, CaS

500 pts H_2O dissolve 1 pt CaS completely, less H_2O dissolves out CaS_2H_2 and leaves CaO_2H_2 Very much H_2O decomposes completely into CaO_2H_2 and H_2S (Béchamp, A ch (4) 16 222)

Not decomp by H_2O , and only sl sol therein at ordinary temp (Pelouze)

After 48 hours contact with CaS , 1 l H_2O contains at

10°	18°	40°	60°	90°
0 15	0 23	0 30	0 48	0 33 g CaS

After boiling for 2 hours, 0.27 g CaS is dissolved, addition of NaCl diminishes solubility, but Na_2SO_4 increases it Lime-water dissolves at 14° 0.18 g CaS , the same amount which H_2O dissolves at 60° Milk of lime dissolves 0.55 g at 60° H_2O containing 3 to 79 g Na_2O per litre dissolves only traces of CaS at 10° , but at $40 - 60^\circ$, or by boiling, a large amount of Na_2S is formed (Kolb, A ch (4) 7 126)

Sol in 12,500 pts H_2O at 12.6° (Scheurer-Kestner, Répert chim appl 1862 331)

Sat $\text{Na}_2\text{CO}_3 + \text{Aq}$ has scarcely any action on CaS , but a dilute solution has more action (Kolb)

Sol in H_2O and sulphur, forming CaS_4

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann B 1909, 42 3790)

Insol in ethyl acetate (Naumann B 1904, 37 3601)

Insol in methylal (Fidmann, C C 1899, II 1014)

Sol in 10 pts glycerine (Cup and Guot J Pharm (3) 26 81)

Sol in sugar + Aq (Stoll, C C 1900, I 1044)

Calcium tetrasulphide, CaS_4

Known only in solution

Calcium pentasulphide, CaS_5

Sol in H_2O and alcohol (Berzelius)
 Exists only in aqueous solution (Schone, Pogg 117 73)

Calcium hydroxyl sulphide, $\text{Ca}(\text{OH})\text{SH} + 3\text{H}_2\text{O}$

Easily sol in H_2O with immediate decomp and separation of $\text{Ca}(\text{OH})_2$. Insol in alcohol, but slowly decomp thereby (Divers and Shumidzu, Chem Soc 45 270)

Calcium stannic sulphide

See Sulphostannate, calcium

Calomel

See Mercurous chloride

Carbamic acid**Ammonium carbamate acid carbonate (commercial carbonate of ammonia)**

See Carbonate carbamate, ammonium hydrogen

— (salts of hartshorn), $2\text{NH}_4\text{HCO}_3$, NH_4CONH_2

See Carbonate carbamate, ammonium hydrogen

Carbazote silicon, C SiN

Insol in acids, even HF , also in boiling $\text{KOH} + \text{Aq}$ (Schutzenberger and Colson, C R 92 1508)

Carbon, C

Insol in all solvents

Diamond is unacted upon by $\text{KClO}_3 + \text{fum. HNO}_3$, graphite forms graphitic acid by $\text{KClO}_3 + \text{fum. HNO}_3$, amorphous carbon is sol in $\text{KClO}_3 + \text{fum. HNO}_3$ (Berthelot, A ch 41 139 399)

Diamond is sol in molten iron at 1160° . Amorphous carbon is insol in molten iron at 1160° , but becomes sol therein by heating to 1400° (Hempel, B 18 998)

Insol in liquid CO_2 (Buchner Z phys Ch 1906 54 674)

Charcoal is sol in liquid NH_3 (Gore Am Ch J 1898 20 830)

The quantity of carbon dissolved by iron diminishes by increasing phosphorus, falling by about 0.5% for each additional 2.0% of phosphorus (Fettweis, Metallurgie 1906, 3 60)

Solubility in iron is reduced by the presence of tin and of sulphur (Wust, Metallurgie 1906 3 169)

The solubility of C in iron is increased by the presence of chromium 9.2% C dissolved when 62% Cr is present in the mixture (Gorens, Metallurgie 1907, 4 18)

Carbon boride, CB_2

Insol in boiling $\text{HNO}_3 + \text{Aq}$ (Joly, R 97 456)

Carbon suboxide, C_3O_2

B-pt $+7^\circ$ at 761 mm

Sol in H_2O with formation of malonic acid
 Slowly decomp on standing in a sealed tube (Diels, B 1906, 39 696)

Carbon monoxide, CO

Sol in 50 vols recently boiled H_2O (Davy)

Sol in 16 vols H_2O (de Saussure)

Sol in 27 vols H_2O (Dalton)

100 vols H O dissolve 6.2 vols CO at 18° (Davy)

Solubility of CO in H O 1 vol H_2O at dissolves V vols CO reduced to 0° and 76 mm

t°	V	t°	V	t°	V
0	0.03287	7	0.02796	14	0.2466
1	0.03207	8	0.02739	15	0.2432
2	0.03131	9	0.02686	16	0.2402
3	0.03057	10	0.02635	17	0.2374
4	0.02987	11	0.02588	18	0.2350
5	0.02920	12	0.02544	19	0.2329
6	0.02857	13	0.02504	20	0.2312

(Bunsen's Gasometry, pp 287, 128, 16)

Coefficient of absorption = 0.032874

0.00081632t + 0.000016421t (Bunsen and Pauli, A 93 16)

Solubility of CO in H_2O

β = Vol CO absorbed by 1 vol H O at a partial pressure of 760 mm

β' = Vol CO (reduced to 0° and 760 mm) absorbed by 1 vol of H O under a total pressure of 760 mm

q = g CO dissolved by 100 g H O at a total pressure of 760 mm

t	β	β'	q
0	0.03537	0.03516	0.44
5	0.03149	0.03122	0.39
10	0.02816	0.02782	0.33
15	0.02543	0.02501	0.31
20	0.02319	0.02266	0.28
25	0.02142	0.02076	0.26
30	0.01998	0.01915	0.24
40	0.01775	0.01647	0.21
50	0.01615	0.01420	0.18
60	0.01488	0.01197	0.15
70	0.01440	0.00998	0.13
80	0.01430	0.00762	0.10
90	0.01420	0.00438	0.06
100	0.01410	0.00000	0.00

(Winkler, B 1901, 34 1416)

Solubility in H₂O at various pressures

V = Volume of the absorbing liquid

P = Hg pressure in metres

 λ = Coefficient of solubility

V	t°	P	λ
30 830 ccm	17 7	0 9202	0 02791
		1 1438	0 02787
		1 4624	0 02786
		1 7986	0 02783
		2 3659	0 02782
		2 8390	0 02776
		3 2622	0 02771
		4 0114	0 02770
		4 6017	0 02763
		5 1953	0 02761
		5 8717	0 02756
31 939 ccm	19 0	6 5462	0 02744
		7 0983	0 02738
		7 6470	0 02723
		8 0184	0 02715
		0 9176	0 02716
		1 1506	0 02717
		1 3897	0 02715
		1 7044	0 02712
		2 1239	0 02708
		2 7173	0 02701
		3 2576	0 02693
		3 9311	0 02689
		4 4584	0 02680
		5 2470	0 02673
		6 0346	0 02665
		6 6303	0 02654
		7 1842	0 02636
		7 9542	0 02617

(Cassuto, Phys. Zeit 1904, 5 236)

Coefficient of absorption of CO in H₂O at 25° equals 0.0154 (Findlay and Creighton, Biochem J 1911, 5 294)

Cuprous chloride in an hydrochloric acid or ammoniacal solution, and ammoniacal solutions of cuprous salts absorb large amounts of CO (Ichlinc, C R 30 488)

Cuprous chloride dissolved in HCl + Aq absorbs 15-20 vols CO (Berthelot, A ch (3) 51 66)

Absorbed by KOH, NaOH, Ba(OH)₂ and Cu(OH)₂ + Aq more readily by ether, alcohol, and wood spirit with formation of formic acid (Berthelot, A ch (3) 61 463)

Sol in HCN (Böttger, B 10 1122)

1 vol alcohol absorbs 0.20443 vols CO gas at all temperatures between 0° and 25° (Carius, A 94 135)

100 vol alcohol (0.84 sp gr) dissolve 14 vols CO at 18 100 vols rectified naphtha (0.784 sp gr) 20.0 vols CO at 18 100 vol oil of lavender (0.88 sp gr) 15.6 vol CO at 18 100 vols olive oil (0.915 sp gr) 14.2 vol CO at 18 100 vols sat KCl + Aq (1.165 sp gr) 2 vols CO at 18 (de Saussure 1814)

1 vol oil of turpentine absorbs 0.16-0.20 vol CO (de Saussure)

Sol in ether (Regnault)

Insol in caoutchouc

Solubility in alcohol + Aq

% alcohol by weight	0 00	9 09	16 67	23 08
Solubility	2 41	1 87	1 75	1 68
% alcohol by weight	28 57	33 33	50 00	
Solubility	1 50	1 94	3 20	

(Lubarsch, W Ann 1889, 37 524)

Solubility of CO in organic solvents

Solvent	Solubility at 20° C	Solubility at 25° C
Glycerine	Not measurable	
Water	0 02404	0 02586
Aniline	0 05358	0 05055
Carbon bisulphide	0 08314	0 08112
Nitrobenzene	0 09366	0 09105
Benzene	0 1707	0 1645
Glacial acetic acid	0 1714	0 1689
Amyl alcohol	0 1714	0 1706
Xylene	0 1781	0 1744
Toluene	0 1808	0 1742
Ethyl alcohol (99.8%)	0 1921	0 1901
Chloroform	0 1954	0 1897
Methyl alcohol	0 1955	0 1830
Amyl acetate	0 2140	0 2108
Acetone	0 2225	0 2128
Isobutyl acetate	0 2365	0 2314
Ethyl acetate	0 2516	0 2419

(Just, Z phys Ch 1901, 37 361)

Solubility of CO in ether at 0° = 0.3618, and at 10° = 0.3842 (Christoff, Z phys Ch 1912, 79 459)

Solubility of CO in organic mixtures

CO in benzene and naphthalene at 25° C

Percent by weight of naphthalene	Percent by weight of benzene	* Solubility of CO
0	100	0 174
11 52	88 48	0 164
11 65	88 35	0 163
23 98	76 02	0 149
23 60	76 40	0 148
32 35	67 65	0 142
32 74	67 26	0 143
33 79	66 21	0 141

(Skirrow, Z phys Ch 1902 41 144)

* See under Oxygen

CO in benzene and phenanthrene at 25° C

Percent by weight of phenanthrene	Percent by weight of benzene	Solubility of CO
0	100	0 174
10 48	89 52	0 144
10 48	89 52	0 144
19 22	80 78	0 132
18 99	81 01	0 133
27 04	72 96	0 128
27 39	72 61	0 127

(Skirrow)

CO in benzene and α naphthol at 25° C

Per cent by weight of α naphthol	Per cent by weight of benzene	Solubility of CO
0	100	0 174
3 48	96 52	0 149
6 75	93 25	0 145
6 59	93 41	0 144
12 10	87 90	0 139
11 81	88 19	0 139

(Skirrow)

CO in benzene and β -naphthol at 25° C

Per cent by weight of β naphthol	Per cent by weight of benzene	Solubility of CO
0	100	0 174
2 06	97 94	0 158
4 14	95 86	0 151
4 36	95 64	0 149

(Skirrow)

CO in benzene and nitrobenzene at 25° C

Per cent by weight of nitrobenzene	Per cent by weight of benzene	Solubility of CO
0	100	0 174
14 5	85 5	0 162
14 12	85 88	0 162
28 18	71 82	0 152
28 14	71 86	0 152
40 58	59 42	0 140
40 63	59 37	0 140
54 9	45 1	0 126
54 9	45 1	0 127
83 33	16 67	0 101
83 2	16 8	0 102
100	0	0 093

(Skirrow)

CO in benzene and aniline at 25° C

Per cent by weight of aniline	Per cent by weight of benzene	Solubility of CO
0	100	0 174
12 69	87 31	0 156
12 03	87 97	0 158
19 57	80 43	0 145
19 43	80 57	0 144
28 43	71 57	0 131
28 26	71 74	0 131
57 68	42 32	0 0945
57 38	42 62	0 0953
78 90	21 10	0 0689
78 80	21 20	0 0684
100	0	0 053

(Skirrow)

CO in toluene and naphthalene at 25° C

Per cent by weight of naphthalene	Per cent by weight of toluene	Solubility of CO
0	100	0 18
7 13	92 87	0 16
7 10	92 9	0 1
15 10	84 9	0 16
15 13	84 87	0 16
22 75	77 25	0 11
22 58	77 42	0 11

(Skirrow)

CO in toluene and phenanthrene at 25° C

Per cent by weight of phenanthrene	Per cent by weight of toluene	Solubility of CO
0	100	0 1
5 59	94 41	0 1
5 58	94 42	0 1
11 16	88 84	0 16
11 20	88 8	0 16
21 62	78 38	0 1
21 93	78 07	0 1

(Skirrow)

CO in toluene and nitrobenzene at 25° C

Per cent by weight of nitrobenzene	Per cent by weight of toluene	Solubility of CO
0	100	0 1
8 86	91 14	0 16
8 87	91 13	0 16
18 27	81 73	0 16
18 19	81 81	0 16
26 82	73 18	0 1
26 76	73 24	0 1
49 14	50 86	0 1
49 02	50 98	0 1
76 31	23 69	0 16
76 31	23 69	0 16
100	0	0 09

(Skirrow)

CO in toluene and aniline at 25° C

Per cent by weight of aniline	Per cent by weight of toluene	Solubility of CO
0	100	0 1
6 61	93 39	0 16
6 61	93 39	0 16
13 56	86 44	0 1
13 55	86 45	0 1
19 91	80 09	0 1
19 96	80 04	0 1
44 64	55 36	0 1
44 31	55 69	0 1
74 63	25 37	0 0 8
75 03	24 97	0 0 3
100	0	0 0

(Skirrow)

CO in toluene and α -naphthol at 25° C

Per cent by weight of α naphthol	Per cent by weight of toluene	Solubility of CO
0	100	0 182
4 46	95 54	0 171
4 44	95 56	0 171
8 75	91 25	0 162
8 89	91 11	0 163

(Skirrow)

CO in acetone and naphthalene at 25° C

Per cent by weight of naphthalene	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
13 31	86 69	212 4	0 199
27 40	72 60	196 6	0 187

(Skirrow)

CO in acetone and phenanthrene at 25° C

Per cent by weight of phenanthrene	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
12 77	87 23	218	0 205
25 04	74 96	207 5	0 183

(Skirrow)

CO in acetone and β -naphthol at 25° C

Per cent by weight of β naphthol	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
13 95	86 05	213	0 190
26 58	73 12	195	0 169

(Skirrow)

CO in acetone and nitrobenzene at 25° C

Per cent by weight of nitrobenzene	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
21 59	78 4	201	0 207
20	80	152	0 157
100	0		0 093

(Skirrow)

CO in acetone and aniline at 25° C

Per cent by weight of aniline	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
20 83	79 17	192	0 179
55 10	44 9	120	0 110
100	0		0 053

(Skirrow)

CO in acetic acid and nitrobenzene at 25° C

Per cent by weight of nitrobenzene	Per cent by weight of acetic acid	Solubility of CO
0	100	0 173
21 65	78 35	0 156
51 03	48 97	0 130
100	0	0 093

(Skirrow)

CO in acetic acid and aniline at 25° C

Per cent by weight of aniline	Per cent by weight of acetic acid	Solubility of CO
0	100	0 173
13 5	86 5	0 110
41 64	58 36	0 0699
60 77	39 23	0 0618
82 21	17 79	0 0580
100	0	0 053

(Skirrow)

CO in methyl alcohol and glycerine at 25° C

Per cent by weight of glycerine	Per cent by weight of methyl alcohol	Measured vapor pressure	Solubility of CO
0	100	122	0 196
39 6	60 4	106	0 0964
60 5	39 5	91	0 0515
77 1	22 9	63	0 0246
100	0		very small

(Skirrow)

CO in acetone and chloroform at 25° C

Per cent by weight of chloroform	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
33 38	66 62	202	0 226
53 2	46 8	179	0 219
65 03	34 97	167	0 220
73 46	26 54	162	0 212
79 83	20 17	163	0 204
87 3	12 7	168	0 207
94 4	5 6	178	0 205
100	0	188	0 207

(Skirrow)

CO in acetone and carbon bisulphide at 25° C

Per cent by weight of carbon bisulphide	Per cent by weight of acetone	Measured vapor pressure	Solubility of CO
0	100	229 6	0 238
8 18	91 82	306	0 236
18 02	81 98	367	0 236
49 46	50 54	443	0 227
62 6	37 4	457	0 210
74 05	25 95	457	0 187
85 51	14 49	433	0 144
96 42	3 58	382	0 114
100	0	356	0 0959

(Skirrow)

CO

CO in benzene and ethyl alcohol at 25° C

Per cent of c

Per cent by weight of acetic acid	Per cent by weight of chloroform	Measured vapor pressure	Solubility of CO
0	100	95.9	0.174
15.43	84.56	125	0.179
52.34	47.66	119	0.181
100	0	59	0.192

(Skirrow)

CO in chloroform and methyl alcohol at 25° C

C
Per of

Per cent by weight of alcohol	Per cent by weight of chloroform	Measured vapor pressure	Solubility of CO
0	100	188	0.207
13	87	233	0.202
100	0	122	0.196

(Skirrow)

CO in acetic acid and benzene at 25° C

C
Per of

Percent by weight of acetic acid	Percent by weight of benzene	Measured vapor pressure	Solubility of CO
0	100	95.9	0.174
19.17	80.83	87.5	0.190
33.54	66.46	82	0.198
67.51	32.49	64.5	0.199
100	0	14	0.172

(Skirrow)

CO in acetic acid and toluene at 25° C

Per cent by weight of acetic acid	Per cent by weight of toluene	Measured vapor pressure	Solubility of CO
0	100	9	0.182
20.48	79.52	31.6	0.190
56.89	43.11	28	0.195
74.71	25.29	25.6	0.191
100	0	14	0.172

(Skirrow)

CO in acetic acid and chloroform at 25° C

Per cent by weight of acetic acid	Per cent by weight of chloroform	Measured vapor pressure	Solubility of CO
0	100	188	0.206
26.6	73.33	144.5	0.207
56.46	43.54	88.5	0.196
100	0	14	0.172

(Skirrow)

CO in carbon bisulphide and chloride at 25° C

Per cent by volume of carbon bisulphide	Per cent by volume of ethylene dichloride	Measured vapor pressure	Solubility of CO
0	100	77	0.147
25	75	231	0.159
49	51	294	0.160
81.6	18.4	338	0.140
100	0	356.5	0.083

(Skirrow)

Coefficient of absorption for 0.123 at 20°, and 0.134 at 10° and Walfisz, Zeit phys Ch 1,

ethylene d

Solubility of CO
0.147
0.159
0.160
0.140
0.083

etroleum (Gniewas)

Carbon dioxide, CO

Gas —

H₂O dissolves about its own vol. CO temperature (the solution obtained by gr.) and pressure and an additional vol. of each additional atmosphere to which

The power of H₂O to absorb CO₂ does precisely the same ratio as the pressure. 1 vol. CO dissolves in 1 vol. H₂O at 7 mm and much greater pressure is necessary to increase the amount of gas dissolved, but atmospheric the amount of gas dissolved is proportional to the pressure (Courbe 121)

100 vols. H₂O at 1278 absorb 116 vol. dissolved at 2344 84 vol. CO (Henry) vols. CO (Skirrow) at 100 108 vols. at 100 100 vols. CO (Dillon)

100 vol. H₂O at 100 mm pressure reduced to 60 mm pressure

t	V	t	V
0	17.72	20	68.60
4.1	14.14	25	57.30
10	12.27	30	49.39
14.1	10.00	40	31.10
14.1	8.80	100	trace

(Dillon, Am J Sci (C) 61)

1 vol. H₂O at 100 mm pressure reduced to 60 mm pressure

Solubility of CO in H₂O 1 vol. and 760 mm dissolves 1 vol. reduced to 0 and 760 mm

the ordinary of 1.0018 sp the pressure is subjected it increases it (Soubeiran) 108 pressure order to in up to 4 or very nearly Pharm 26

CO₂ (Caven 1.56° 106 O₂ (Henry)

CO gas ure

than 1 vol higher temp of the CO be air the But as CO humidity the temperature held so spl it com

H₂O at t° CO gas

t	V	t	V	t	V
0	1.7967	7	1.3759	1	1.0321
1	1.7207	8	1.2809	1	1.0020
2	1.6481	9	1.2011	1	0.9753
3	1.5787	10	1.1416	1	0.9519
4	1.5126	11	1.1018	1	0.9318
5	1.4497	12	1.1018	1	0.9150
6	1.3901	13	1.0653	2	0.9014

(Bunsen's Gasometry, pp 257,

8, 152)

Coefficient of absorption = 1.796 + 0.001642t (Bunsen)

-0.0776t

Solubility in H₂O at various pressures P = pressure in atmospheres

P	Vol gas in 1 ccm H O		P	Vol gas in 1 ccm H O	
	at 0	at 12 43°		at 0°	at 12 43°
1	1 797	1 086	20	26 65	17 11
5	8 65	5 15	25	30 55	20 31
10	16 03	9 65	30	33 74	23 35
15	21 95	13 63		-	

(Wroblewski, C R 94 1355)

Absorption of CO₂ in H₂O at various pressures P=pressure in mm, V=vols CO₂, reduced to 0° and 760 mm, absorbed by 1 vol H₂O

P	V	P	V
697 71	0 9441	2188 65	3 1764
809 03	1 1619	2369 02	3 4857
1289 41	1 8647	2554 00	3 7152
1469 95	2 1623	2738 33	4 0031
2002 06	2 9067	3109 51	4 5006

(Khanikoff and Longunne, A ch (4) 11 412)

C=coefficient of absorption in H₂O at t° and 760 mm

t°	C	t°	C	t°	C
15 2	1 000	18 38	0 806	21	0 838
17 6	0 930	18 3	0 885	23	0 798

(Setschenow, Mém Acad St Petersb 22 Nos 6, 7)

Absorption coefficient of CO₂ in H₂O at 0° = 1 7308 (Prytz and Holst, W Ann 1895, 54 136)

Absorption of CO₂ by H₂O at t°
a=coefficient of absorption

t°	a	t°	a
0	1 713	19	0 902
1	1 646	20	0 878
2	1 584	21	0 854
3	1 527	22	0 829
4	1 473	23	0 804
5	1 424	24	0 781
6	1 377	25	0 759
7	1 331	26	0 738
8	1 282	27	0 718
9	1 237	28	0 699
10	1 194	29	0 682
11	1 154	30	0 665
12	1 117	35	0 592
13	1 083	40	0 530
14	1 050	45	0 479
15	1 019	50	0 436
16	0 985	55	0 394
17	0 956	60	0 359
18	0 928		

(Bohr, W Ann 1899, 68 504)

Solubility in H₂O at 25°=0 8255, at 15°=1 070 (Geffcken, Z phys Ch 1904, 49 273)
75 cc H₂O absorb 0 1381 g CO₂ at 15 5° and 720 mm (Christoff, Z phys Ch 1905, 53 329)

Absorption-coefficient of CO₂ in H₂O at 20°=0 877, or 1000 g H₂O dissolve 878 cc CO (Usher, Chem Soc 1910, 97 72)

Solubility of CO in H₂O=1 158 at 12° and 0 825 at 25° (Findlay and Shenn, Chem Soc 1911, 99 1315)

Absorption of CO₂ by H₂O at high pressure

Amount of H₂O used { a=0 210 ccm
b=0 102 ccm

V=ccm of CO₂ absorbed by H₂O at t°, reduced to a pressure of 1 kg per sq cm

V₁=ccm of CO₂ absorbed by 1 ccm of H₂O

Pressure kg/sq cm	t°	V ₁	
		a	b
25	20°		17 77
30			19 77
40			21 52
50			23 09
55			29 75
30	35°	11 77	13 57
40		14 82	20 00
50		18 96	24 64
60		22 90	22 50
70		27 18	27 62
80	60°		32 85
40		10 88	9 798
50		12 24	13 72
60		14 46	15 28
70		16 80	17 46
80		19 74	22 67
90		22 74	21 16
100		26 21	27 85
110		28 92	28 79
120		30 20	33 90
60	100°	8 965	
70		10 11	6 39
80		11 05	9 591
90		12 63	10 85
100		15 65	12 40
110		14 85	16 51
120		16 40	15 78
130		17 93	16 89
140		19 56	17 71
150		20 58	17 49
160		22 07	
170		22 78	

(Sunder, Z phys Ch 1912, 78 557)

Solubility of carbon dioxide in water at 25°

P = Pressure in mm Hg

S = Solubility calculated according to formula for which see the original article (Findlay, Chem Soc 1910, 97 538)

P	S	P	S
743	0 816	1059	0 817
752	0 817	1064	0 819
800	0 815	1153	0 818
841	0 817	1243	0 819
955	0 816	1351	0 820
955	0 817	1351	0 820

(Findlay and Creighton, Chem Soc 1910, 97 538)

Solubility of carbon dioxide in water at 25°

P = Pressure in mm Hg

S = Solubility See above

P	S	P	S
755	0 826	1069	0 823
759	0 825	1084	0 825
836	0 825	1210	0 825
841	0 826	1211	0 825
927	0 826	1350	0 824
934	0 824	1350	0 826

(Findlay and Creighton, Chem Soc 1912, 101 1460)

Solubility of carbon dioxide in water at 25°

P = Pressure in mm Hg

S = Solubility See above

P	S	P	S
263	0 817	495	0 816
271	0 816	651	0 816
382	0 814	667	0 817
392	0 811	752	0 818
479	0 816	768	0 817

(Findlay and Creighton, Chem Soc 1913, 103 638)

Sl sol in HCl + Aq

100 vols H₂SO₄ of 1.840 sp gr absorb 4 vol CO (de Saussure)

H₂SO₄ of ordinary density at 1.50 and common pressure absorbs 94% of its vol of CO fuming H₂SO₄ 125% the absorption for pure H₂O under the same conditions being 98% (Rogers Am J Sci (2) 5 115)

H₂SO₄ absorbs 7-10% CO (Hlasiwetz, W A B 20 193)

Coefficient of absorption by conc H₂SO₄ = 0.932, which is the same as that by H₂O, but this diminishes on diluting, and is at its lowest limit 0.666, when the composition of the solution is H₂SO₄, H₂O, upon further dilution the coefficient of solubility gradually increases, and when 58 H₂O are present to 1 H₂SO₄, the

coefficient of absorption is 0.857 (Set-schenow, J B 1876 46)

Absorption of CO₂ by H₂SO₄ + Aq

Solution	Grams CO ₂ absorbed by at 15.5° and 720 mm	cc
1/2-N H ₂ SO ₄	0 1273	
1-N H ₂ SO ₄	0 1179	
2-N H ₂ SO ₄	0 1092	
4-N H ₂ SO ₄	0 1003	

(Christoff, Z phys Ch 1905, 53 32)

Solution	Grams CO ₂ absorbed by at 15.5° and 720 mm	cc
2 5% H ₂ SO ₄	0 1282	
5% "	0 1179	
10% "	0 0833	
20% "	0 0755	
30% "	0 0751	
40% "	0 0713	
45% "	0 0725	
70% "	0 0918	
90% "	0 1433	

(Christoff, l c)

Coefficient of absorption for 96% H₂ O₂ = 0.926 at 20.2° (Bohr, Z phys Ch 1911, 71 48)

Absorption of CO₂ by acids

M = Content in gram-equivalents per liter
S = Solubility (see under oxygen)

Absorption of CO₂ by HNO₃ + Aq

M	S	S ₁₀
0 472	0 8382	1 07
0 475	0 8366	1 07
0 557	0 8387	1 06
0 704	0 8447	1 08
1 382	0 8620	1 06
1 387	0 8622	1 06
1 860	0 8752	1 10
2 519	0 8839	1 10
2 539	0 8865	1 11

(Geffcken, Z phys Ch 1904, 49 27)

Absorption of CO by HCl + Aq

M	S	S ₁₀
0 499	0 8047	1 04
0 511	0 8074	1 04
1 212	0 7973	1 02
1 249	0 7984	1 02
2 080	0 7951	0 98
2 180	0 7951	1 00

(Geffcken)

Absorption of CO by $\frac{\text{H}_2\text{SO}_4}{2} + \text{Aq}$

M	S ₂	S ₁ °
0 512	0 7923	1 016
0 517	0 7936	1 016
0 995	0 7693	0 9772
1 039	0 7685	0 9775
1 067	0 7672	0 9756
1 956	0 7302	0 9175
2 088	0 7273	0 9143
3 790	0 6736	0 8354
3 800	0 6747	0 8385

(Geffcken)

In collecting CO₂ gas in pneumatic operations a saturated solution of common salt is better than H₂O for filling the trough. This solution will only absorb about 1/3 of the amount of CO₂ absorbed by pure H₂O (de Saussure l c)

100 vols of the following solutions at 18° and ordi nary pressure absorb vols CO₂—

	Sp gr	Vols CO
Sat NaCl+Aq (containing 29% of NaCl)	1.212	32.9
Sat NH ₄ Cl+Aq (containing 27.53% of NH ₄ Cl)	1.078	75
Sat KCl+Aq (containing 26% of KCl)	1.168	61
Sat CaCl ₂ +Aq (containing 40.2% of CaCl ₂)	1.402	26.1
Sat K ₂ SO ₄ +Aq (containing 9.42% of K ₂ SO ₄)	1.077	62
Sat Na ₂ SO ₄ +Aq (containing 11.14% of Na ₂ SO ₄)	1.105	58
Sat K ₂ Al ₂ (SO ₄) ₄ +Aq (containing 9.14% of K ₂ Al ₂ (SO ₄) ₄ +24H ₂ O)	1.047	70
Sat KNO ₃ +Aq (containing 20.6% of KNO ₃)	1.139	57
Sat NaNO ₃ +Aq (containing 26.4% of NaNO ₃)	1.206	47
Sat H ₂ C ₄ H ₄ O ₆ +Aq (containing 53.37% of H ₂ C ₄ H ₄ O ₆)	1.283	41
(de Saussure Gilberts Ann Phys 47 187)		

About half as sol in NaCl+Aq (15% NaCl) is in H₂O

Much more sol in Na₂HPO₄+Aq or Na₂CO₃+Aq than in H₂O, the quantity dissolved increasing with the amount of salt in the solution. The solubility in these solutions depends on the coefficient of solubility in H₂O plus the product of a constant coefficient multiplied by the amount of salt in the solution, this constant coefficient for Na₂HPO₄, and 0.055 for Na₂CO₃, Arch (3) 47 307)

Direct determinations are not accurate (I M.C.V., A Suppl 2 157)

1 mol Na₂HPO₄ in dil Na HPO₄+Aq absorbs 2 mols CO (Setschenow)

Solutions of salts of similar constitution are equivalent in regard to their power of absorption of CO, when they contain the same percentage of crystal water. Experiments were made with solutions of alum, MgSO₄, 7H₂O, and ZnSO₄, 7H₂O, containing 10% of the salts. The MgSO₄ solution absorbed the greatest proportional amount of CO₂, and the alum the least. The further rule was deduced that with salts of similar constitution and the same amount of crystal water, the

absorptiometric equivalents are identical with the chemical equivalents (Setschenow, B 6 1461)

Salts can be divided into two classes, according as CO₂ has chemical action on the salt or not. In the first case, i.e., when there is chemical combination or action of CO₂ on the salt in solution, the amount of CO₂ absorbed increases with increasing concentration of the solution, in the second case, however, the amount of CO₂ decreases with the strength of the solution. Several salts can be arranged in a series as regards their power of absorption, beginning with that which has the greatest, as follows Na₂CO₃, Na₂B₄O₇, Na₂HPO₄, Na₂C₂H₃O₂, Na₂C₆H₅O₇, Na₂C₂O₄, Na₂C₂H₃O₂, MnO₃, MCl, M₂SO₄. The division between the two classes occurs in this series at Na₂C₂O₄.

The matter is discussed at length in the original papers (Setschenow, Mémoires Acad St Petersb 22 No 6. Also further, Setschenow, ib 34 No 3, and 35 No 7. See also Ostwald, Allgemeine Chemie, 2te Aufl vol 1, p 629)

Solubility of CO₂ in salts+Aq at 15.2°

CO₂=cc CO₂ (at 0° and 760 mm) dissolved per cc of salt solution

Salt	g salt per l	CO
NH ₄ Cl	1	1 005
"	10	0 985
"	51.6	0 941
"	172	0 819
"	258	0 770
NH ₄ NO ₃	2.8	1 013
"	11.2	1 002
"	55	0 989
"	101	0 962
"	202.1	0 911
"	404.3	0 807
"	810.4	0 612
(NH ₄) ₂ SO ₄	72.2	0 712
"	144.4	0 575
Ba(NO ₃) ₂	62.7	0 922
Ca(NO ₃) ₂	41	0 923
LiCl	16.72	1 035
"	50.15	0 808
"	127.4	0 596
"	250.8	0 497
"	501.5	0 120
MgSO ₄	26.5	0 901
"	79.5	0 669
"	159	0 441
"	318	0 188
KBr	83.9	0 908
"	167.7	0 819
"	251.5	0 748
"	503.1	0 579
KI	319.1	0 777
"	478.6	0 688
"	957.3	0 506
KSCN	326	0 691
"	489	0 590

Solubility of CO₂ in salts + Aq at 15 2°—Cont

Salt	g salt per l	CO
KSCN	978	0 387
KNO ₃	58 8	0 959
"	117 5	0 890
"	235 1	0 781
NaCl	12 9	0 978
"	64	0 760
"	128	0 580
"	192	0 466
NaBr	115 1	0 775
"	460 3	0 364
"	690 4	0 221
NaNO ₃	89 3	0 835
"	125	0 762
"	208 4	0 621
"	416 8	0 385
"	625 2	0 244
NaClO ₃	233 3	0 625
"	349 9	0 506
"	699 8	0 257
Na ₂ SO ₄	14 2	0 950
"	94 8	0 620
"	284 4	0 234
ZnSO ₄	38 3	0 903
"	76 7	0 783
"	230	0 474
"	460	0 209

(Setschenow, A ch 1892, (6) 25 226)

CO₂ is not disengaged at ordinary temp from H₂O, in which $\frac{1}{1000}$ pt of CaCO₃ or MgCO₃ is held in solution thereby. These solutions have a great power of retaining CO₂ even at a boiling temp or with diminished pressure, and they also absorb CO₂ from the air in much larger quantity than pure H₂O (Bineau).

BaCO₃ in H₂O also retains CO₂ even after long boiling (Storer).

CO₂ is also absorbed from the air by Na₂CO₃ or K₂CO₃ + Aq, especially if dilute.

Absorption of CO₂ by NaCl + Aq at t°

α = Coefficient of absorption for a 6.52% NaCl solution

α_1 = Coefficient of absorption for a 17.62% NaCl solution

t°	α	α_1
0	1 234	0 678
5	1 024	0 577
10	0 875	0 503
15	0 755	0 442
20	0 664	0 393
25	0 583	0 352
30	0 517	0 319
35	0 460	0 288
40	0 414	0 263
45	0 370	0 235
50	0 335	0 215
55	0 305	0 198
60		0 183

(Bohr, W Ann 1899, 68 504)

Absorption of CO₂ by CsCl + Aq

M = Content in g equiv per l

S = Solubility (See under Oxygen)

M	S _{25°}	S _{15°}
0 552	0 7771	1 001
0 554	0 7769	0 999

(Geffcken, Z phys Ch 1904, 49 273)

Absorption of CO₂ by KNO₃ + Aq

M	S _{25°}	S _{15°}
0 536	0 7832	1 002
0 537	0 7818	0 999
1 022	0 7452	0 943
1 033	0 7447	0 942

(Geffcken)

Absorption of CO₂ by KI + Aq

M	S ₂₅	S _{1°}
0 559	0 7678	0 980
0 573	0 7676	0 983
1 043	0 7236	0 914
1 119	0 7166	0 909

(Geffcken)

Absorption of CO₂ by RbCl + Aq

M	S ₂₅	S ₁
0 479	0 7705	0 990
0 481	0 7698	0 991
1 007	0 7190	0 921
1 012	0 7157	0 920

(Geffcken)

Absorption of CO by KBr + Aq

M	S ₂	S ₁
0 550	0 7621	0 978
0 565	0 7619	0 976
1 056	0 7030	0 910
1 064	0 7068	0 906

(Geffcken)

Absorption of CO₂ by KCl + Aq

M	S	S ₁
0 423	0 7695	0 989
0 432	0 7667	0 986
1 045	0 6920	0 887
1 058	0 6961	0 891

(Geffcken)

Absorption of CO₂ by salts + Aq

Salt	Grams CO ₂ absorbed by 75 cc of salt solution at 15° and 720 mm
1-N KBr	0 1280
1-N KNO ₃	0 1231
1-N KCl	0 1213
1-N KI	0 1204
1-N LiCl	0 1087
1-N NaCl	0 1050
1-N (NH ₄) ₂ SO ₄	0 1093
1-N (NH ₄) ₂ SO ₄ · Fe ₂ (SO ₄) ₃ + 24H ₂ O	0 0991
1-N K ₂ SO ₄	0 1002
1-N K ₂ SO ₄ · Al ₂ (SO ₄) ₃ + 24H ₂ O	0 1054
² / ₃ -N K ₂ SO ₄	0 1140
¹ / ₂ -N MgSO ₄	0 1209
1-N MgSO ₄	0 1047
2-N MgSO ₄	0 0656
4-N MgSO ₄	0 0527
2-N CuSO ₄	0 0751
2-N ZnSO ₄	0 0720
² / ₃ -N KHSO ₃	0 1017
2-N KHSO ₄	0 0999
1-N KH ₂ AsO ₄	0 0808
1-N KH ₂ PO ₄	0 0852
¹ / ₃ -N K ₂ HAsO ₄	0 1111
¹ / ₂ -N K ₂ HPO ₄	0 4989
¹ / ₄₀ -N Na ₂ B ₄ O ₇	0 2205
¹ / ₅ -N Na ₂ B ₄ O ₇	0 5317
¹ / ₄ -N Na ₂ B ₄ O ₇	0 8511
¹ / ₄ -N NaBO ₃	0 8124
¹ / ₄ -N NH ₄ HB ₂ O ₄	0 7672
N-Na ₂ PO ₄ + 12H ₂ O	0 5828
N-Na ₄ P ₂ O ₇ + 10H ₂ O	0 8457
N-NaPO ₃	0 2081
N-KPO ₃	0 2618

(Christoff, Z phys Ch 1905, 53 338-340)

Solubility of CO in KCl + Aq at 25°

Concentration, 7.45 g in 100 cc of solution, sp gr = 1.043

Pressure 756 850 953 1116 1249 1362
Solubility 0.694 0.693 0.688 0.700 0.709 0.710

Concentration 5 g in 100 cc of solution, sp gr = 1.031

Pressure 756 832 901 1050 1150 1223
Solubility 0.731 0.727 0.724 0.726 0.735 0.736

Concentration, 2.56 g in 100 cc of solution, sp gr = 1.016

Pressure 756 852 981 1079 1190 1362
Solubility 0.767 0.761 0.761 0.763 0.768 0.766

(Findlay and Crighton, Chem Soc 1910, 97 557)

Solubility of CO₂ in NH₄Cl + Aq at 25°

Concentration (C) denotes number of grams of solute in 100 cc of solution

Density (D) equals the specific gravity of the solution

Solubility (S) calculated by formula given in the original article

C	D	S
2 35	1 005	0 791
5 05	1 013	0 754
8 24	1 022	0 732
10 02	1 027	0 712
17 09	1 045	0 665

(Findlay and Shenn, Chem Soc 1912, 101 1461)

Solubility of CO₂ in KCl + Aq at 25°

C	D	S
1 84	1 008	0 792
3 05	1 017	0 764
4 58	1 026	0 749
7 46	1 044	0 701

(Findlay and Shenn)

Solubility of CO₂ in BaCl₂ + Aq at 25°

C	D	S
2 80	1 018	0 789
5 81	1 040	0 741
8 15	1 054	0 710
9 97	1 070	0 676

(Findlay and Shenn)

Solubility of CO in (NH₄)₂Fe(SO₄)₂ + Aq at 25°

C	D	S
9 51	1 052	0 641
10 26	1 057	0 629
22 47	1 124	0 460

(Findlay and Shenn)

Solubility of CO₂ in solutions of sucrose at 25°

C	D	S
2 63	1 009	0 813
5 16	1 018	0 798
9 68	1 038	0 767
12 33	1 051	0 744

(Findlay and Shenn)

Solubility of CO in solutions of chloral hydrate at 25°

C	D	S
5 08	1 019	0 815
10 12	1 041	0 795

(Findlay and Shenn)

100 vols alcohol (0.803 sp gr) at 18° absorb 260 vols CO₂
 100 vols alcohol (0.840 sp gr) at 18° absorb 186 vols CO (de Saussure l c)

Solubility of CO₂ in alcohol 1 vol alcohol at t° and 760 mm dissolves V vols CO₂ gas reduced to 0° and 760 mm

t°	V	t°	V	t	V
0	4 3295	9	3 5844	18	3 0402
1	4 2368	10	3 5140	19	2 9921
2	4 1466	11	3 4461	20	2 9465
3	4 0589	12	3 3807	21	2 9034
4	3 9736	13	3 3178	22	2 8628
5	3 8908	14	3 2573	23	2 8247
6	3 8105	15	3 1993	24	2 7890
7	3 7327	16	3 1438		
8	3 6573	17	3 0908		

(Bunsen's Gasometry, pp 287, 128, 153)

Coefficient of absorption = 4 32955—
 0.09395t + 0.00124t² (Bunsen)

Much less sol in 30% alcohol than in pure alcohol or pure H₂O (Muller, W Ann 37 24)

Solubility of CO in 99% alcohol at t°

α = Coefficient of absorption, i.e., the no of ccm of CO₂ measured at 0° and 760 mm which are absorbed at the given temp and at an absorption pressure of 760 mm by 1 ccm alcohol

α_1 = Coefficient of absorption corrected for increase in the volume of the alcohol used due to absorption of CO

t°	α	α_1
-65	38 41	35 93
-25	8 75	8 61
-20	7 51	7 41
-15	6 59	6 51
-10	5 75	5 69
-5	5 01	4 96
0	4 44	4 40
+5	3 96	3 91
10	3 57	3 55
15	3 25	3 23
20	2 98	2 96
25	2 76	2 74
30	2 57	2 56
35	2 41	2 39
40	2 20	2 19
45	2 01	2 00

(Bohr, W Ann 1900, (4) 1 249)

Solubility in 98.7% alcohol at t°

α = Coefficient of absorption

α_1 = Coefficient of absorption corrected for increase in volume of the alcohol used due to absorption of CO.

t°	α	α_1
0	4 35	4 31
-10	5 43	5 38
-20	7 25	7 16
-30	9 97	9 79
-40	14 25	13 89
-50	21 28	20 49
-60	31 25	29 59
-65	39 89	37 22
-67	44 07	40 83

(Bohr, W Ann 1900, (4) 1 253)

Solubility in alcohol + Aq at t°

t°	% by wt of alcohol in the solvent	Solubility of CO ₂ in alcohol + Aq	Solubility of CO ₂ in H ₂ O
1 4	6 325	1 5864	1 69
3 2	4 464	1 4878	1 56
9 2	7 276	1 1829	1 22
13 8	2 870	1 0268	1 03

(Langer, C C 1904, I, 1583)

Solubility of CO₂ in ethyl alcohol at 25°

Concentration 2.95 g alcohol in 100 cc of solution Sp gr 25°/15° = 0.99308
 Pressure 737 836 929 1073 1213 38
 Solubility 0.812 0.813 0.812 0.811 0.813 0 11

Concentration 3.01 g alcohol in 100 cc of solution Sp gr 25°/15° = 0.99295
 Pressure 745 823 937 1083 1226 57
 Solubility 0.814 0.812 0.815 0.813 0.812 0 12

Concentration 8.83 g alcohol in 100 cc of solution Sp gr 25°/15° = 0.98342
 Pressure 747 846 942 1090 1231 60
 Solubility 0.786 0.786 0.784 0.785 0.786 0 88
 (Findlay and Shenn, Chem Soc 1911, 19 1315)

Solubility of CO in organic solvents at various temperatures

Solvent Ethyl alcohol

t = -75 sp gr = 0.872

Pressure	Coefficient of absorption	Solubility
100	111 8	68 4
200	115 7	69 5
400	123 8	71 4
700	138 6	74 7

Solubility of CO₂ in organic solvents at low temperatures—*Continued*

t = -59° sp gr = 0.856		
Pressure	Coefficient of absorption	Solubility
100	40.85	27.27
200	41.00	27.16
400	42.35	27.65
700	44.15	28.10

Solvent Methyl alcohol

t = -78° Sp gr = 0.884		
Pressure	Coefficient of absorption	Solubility
50	194.0	120.5
100	195.0	119.6
200	202.9	120.1
400	221.5	122.2
500	226.4	
740	260.0	126.8

t° = -59° sp gr = 0.866		
Pressure	Coefficient of absorption	Solubility
100	63.0	42.5
200	64.2	42.7
400	66.3	43.1
700	69.0	43.3

Solvent Acetone

t = -78° sp gr = 0.900		
Pressure	Coefficient of absorption	Solubility
50	311	196.6
100	322	198.1
200	344.5	201.5
400	400	208.8
640	487	215.7
700	545.5	

t = -19° sp gr = 0.879		
Pressure	Coefficient of absorption	Solubility
100	97.5	67.2
200	101.2	68.0
400	106.6	72.3
700	115.8	72.8

Solvent—Ethyl acetate

t = -78° sp gr = 1.017		
Pressure	Coefficient of absorption	Solubility
50	250.2	177.5
100	255.6	177.1
200	271.5	179.2
400	310.9	183.2
650	386.9	191.2

Solubility of Co in organic solvents at low temperatures—*Continued*

t = -59° sp gr = 0.994		
Pressure	Coefficient of absorption	Solubility
100	85.3	65.6
200	86.3	65.3
400	91.6	66.7
700	101.5	69.7

Solvent Methyl acetate

t = -78° sp gr = 1.056		
Pressure	Coefficient of absorption	Solubility
50	304.9	224.1
100	315.0	224.3
200	337.4	223.1
400	389.3	225.6
650	498.1	231.2

t = -19° sp gr = 1.032		
Pressure	Coefficient of absorption	Solubility
100	94.3	75.8
200	98.45	77.1
400	103.6	77.6
700	112.9	79.0

(Stern, Z phys Ch 1912, 81 468)

Solubility of CO₂ in ether at 0° = 7.33, at 10° = 6.044, at 15° = 5.46 (Christoff, Z phys Ch 1912 79 459)

Coefficient of absorption in chloroform is 0.20376 at 36.57 mm, and 4.43757 at 762 mm pressure (Woukoloff, C R 109 62)

100 vols of following liquids absorb vols CO ₂ at 15° —		
	Sp gr	Vols CO
Ether	0.727	217
Rectified naphtha	0.784	169
Oil of turpentine	0.860	166
Oil of lavender (freshly distilled)	0.880	191
Oil of thyme	0.890	185
Linseed oil	0.940	156
Olive oil	0.910	151
Cum arabic + Aq (containing 25% of the gum)	1.092	70
Cane sugar + Aq (containing 2% of sugar)	1.104	72

(de Saussure, l c)

1 vol oil of turpentine absorbs 17-19 vols CO (Saussure)

1 vol spirit at 10° absorbs 2 vols CO (de Saussure)

1 vol olive oil at 10° absorbs 1+vol CO (de Saussure)

1 vol oil of turpentine at 10° absorbs 2 vols CO (Bergman)

1 vol caoutchouc absorbs 11 vols CO (Bergman)

Coefficient of absorption for petroleum is 1.17 at 20° and 1.31 at 10° (Gniewasz and Walfisz, Zeit phys Ch 1 70)

100 vols petroleum absorb 70 vols CO₂ at 10° (Robinet, C R 58 608)

Solubility of CO₂ in $\frac{N}{2}$ solutions of various organic substances at 20°

Substance	Sp gr of $\frac{N}{2}$ solution	Coeff of absorption	cc CO ₂ dissolved in 1000 g H ₂ O
Dextrose	1 0328	0 792	841
Mannite	1 03031	0 782	833
Glycerine	1 01413	0 843	864
Pyrogallol	1 01718	0 853	894
Hydrochmon	1 00946	0 887	928
Resorcin	1 00958	0 901	945
Pyrocatechin	1 0107	0 868	908
Urethane	1 0037	0 869	907
Carbamide	1 00715	0 864	884
Thiocarbamide	1 00917	0 859	885
Antipyrine	1 01339	0 859	935
Acetamide	1 005	0 879	906
Acetic acid	1 0026	0 868	893
N Propylic acid	0 9939	0 869	902

(Usher, Chem Soc 1910, 97 73)

Absorption of CO₂ by ethyl alcohol

Amount of alcohol used = 0 093 ccm
 V = ccm of CO₂ absorbed by the solvent at t°, reduced to a pressure of 1 kg per sq cm
 V₁ = ccm of CO₂ absorbed by 1 ccm of the solvent

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
30	20°	57 31	9 462	104 8
40			15 15	149 7
50			23 04	188 8
30	35°	60 05	7 114	77 87
40			10 52	113 1
50			14 73	144 5
60			19 63	173 0
70			27 39	210 8
40	60°	64 44	6 429	72 82
50			9 023	97 09
60			12 27	122 5
70			15 64	145 2
80			19 11	167 9
90			20 64	180 7
100			23 88	195 7
50	100°	72 19	3 809	42 49
60			6 034	66 05
70			8 374	88 67
80			10 76	111 2
90			13 06	129 0
100			14 90	145 7
110			16 22	155 0
120			18 93	174 6
130			20 48	182 6
140			20 61	186 0

(Sander, Z phys Ch 1912, 78 524)

Absorption of CO₂ by propyl alcohol
 Amount of alcohol used = 0 103 ccm
 V and V₁ See under absorption of CO₂ by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
20	20°	60 59	4 867	6 16
30			8 472	6 62
40			13 46	2 1
50			21 62	4 6
20	35°	62 96	3 493	0 00
30			6 307	4 08
40			9 296	8 16
50			13 99	2 8
60			18 90	9 9
70			35 03	8 2
80			49 23	9 6
20	60°	68 08	2 602	4 73
30			4 722	7 68
40			6 723	4 65
50			9 810	8 54
60			13 05	1 5
70			17 15	4 4
80			19 61	9 2
90			24 75	3 3
100			30 19	3 9
40	100°	76 27	2 592	6 50
50			5 669	4 19
60			8 025	7 51
70			10 44	32 17
80			13 13	37 7
90			15 72	32 3
100			17 10	44 7
110			20 95	3 5
120			23 55	75 4

(Sander)

Absorption of CO₂ by ether
 Amount of ether used = 0 131 ccm
 V and V₁ See under absorption of CO₂ by alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
45	35°	62 06	42 62	35 6
56			46 81	17 3
60			57 83	41 6
50	60°	67 11	28 49	71 6
60			35 24	35 4
70			42 01	10 0
80			46 64	21 4
90			50 72	35 0
100			56 63	48 7
60	100°	71 03	12 57	01 0
70			20 00	34 6
80			26 34	42 8
90			32 16	66 4
100			35 70	75 4

(Sander)

Absorption of CO₂ by benzene
Amount of benzene used = 0.080 ccm
V and V₁ See under absorption of CO₂ by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
15	20°	55.14	2.728	46.89
20			4.845	71.16
30			9.618	125.3
40			18.70	192.4
50			30.10	264.3
15	35°	58.17	2.225	39.94
20			3.373	48.65
30			6.879	94.39
40			11.56	138.3
50			17.09	186.6
60	60°	61.86	25.73	243.1
70			35.80	269.0
20			2.140	34.57
30			3.880	55.97
40			6.699	88.71
50	100°	73.75	10.28	128.5
60			13.57	156.6
70			17.71	184.6
80			22.50	215.0
90			28.09	246.6
100			33.76	284.4
40	100°	73.75	2.822	46.52
50			3.981	58.46
60			6.440	91.27
70			8.398	119.0
80			11.96	155.8
90	100°	73.75	14.57	182.5
100			17.79	212.9
110			20.60	237.7
120			23.98	258.2

(Sander)

Absorption of CO₂ by chlorbenzene
Amount of chlorbenzene used = 0.106 ccm
V and V₁ See under absorption of CO₂ by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
20	20°	61.03	5.813	62.61
30			10.25	95.22
40			17.17	137.3
50			26.59	187.5
20	35°	64.16	4.650	46.66
30			7.705	72.73
40			11.81	101.5
50			16.83	137.3
60			22.82	168.3
70	60°	69.38	32.83	205.5
20			3.685	35.86
30			5.510	53.94
40			7.982	73.69

Absorption of CO₂ by chlorbenzene —Cont

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
50			11.16	99.06
60			13.74	118.1
70			16.65	134.5
80			19.50	149.3
90			22.23	165.5
110	100°	77.73	31.64	204.4
30			3.562	33.65
40			5.008	48.16
50			7.106	63.78
60			8.701	77.24
70	100°	77.73	10.37	91.02
80			12.05	103.00
90			13.88	121.2
100			14.89	121.5
110			16.35	130.7
120	100°	77.73	17.77	140.7
130			18.54	146.8

(Sander)

Absorption of CO₂ by brombenzene
Amount of brombenzene used = 0.113 ccm
V and V₁ See under absorption of CO₂ by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
20	20°	60.84	4.531	50.83
30			7.793	82.29
40			12.22	121.1
50			17.37	160.0
20	35°	63.96	3.947	43.38
30			5.782	62.69
40			8.508	90.43
50			11.96	116.4
60			16.00	146.0
70	60°	69.16	22.56	184.1
80			41.26	233.9
20			2.650	30.58
30			3.714	46.15
40			5.971	62.64
50	100°	77.48	7.406	77.19
60			9.718	98.73
70			10.27	108.4
80			13.99	131.4
90			16.70	144.3
100	100°	77.48	20.06	169.7
110			23.13	190.6
30			2.970	30.56
40			4.032	41.49
50			5.833	59.64
60	100°	77.48	7.239	72.64
70			8.330	82.56
80			9.714	92.86
90			11.14	107.1
100			12.79	118.0
110	100°	77.48	13.80	125.3
120			15.50	140.7

(Sander)

Absorption of CO₂ by nitrobenzene
Amount of nitrobenzene used = 0.164 ccm
V and V₁ See under absorption of CO₂
by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
15	20°	57.65	5.459	41.60
20			7.354	57.12
30			12.14	92.50
40			15.93	115.9
50			21.71	155.9
20	35°	59.86	5.644	44.48
30			8.658	68.23
40			11.98	94.39
50			15.59	113.4
60			19.94	145.1
70			25.57	179.6
80			34.95	227.0
20	60°	64.73	3.787	31.38
30			4.519	38.23
40			6.308	52.26
50			7.750	64.21
60			8.887	72.15
70			10.15	82.40
80			10.80	85.03
20	100°	75.52	2.749	24.67
30			4.162	41.00
40			5.393	50.36
50			6.832	63.80
60			7.763	70.85
70			9.048	75.75
80			10.65	86.86

(Sander)

Absorption of CO₂ by toluene
Amount of toluene used = 0.114 ccm
V and V₁ See under absorption of CO
by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
20	20°	59.97	7.420	57.91
30			13.31	103.3
40			23.25	155.9
50			45.10	235.8
20	35°	63.05	6.018	49.60
30			10.13	82.63
40			16.03	118.8
50			23.34	155.8
60			31.39	192.1
70			44.17	225.5
30	60°	68.17	6.735	54.67
40			9.885	78.67
50			13.98	104.6
60			18.00	128.1
70			22.66	150.1
80			26.60	171.9
90			31.66	191.5
100			38.86	210.0

Absorption of CO₂ by toluene — *Contd.*

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
30	100°	76.37	3.356	2.68
40			5.945	4.25
50			8.703	6.93
60			11.18	8.98
70			13.72	10.7
80			16.30	11.6
90			18.88	13.6
100			21.85	14.0
110			24.86	16.9
120			26.80	17.8
130			28.21	17.7

(Sander)

Absorption of CO₂ by ethyl acetate
Amount of ethyl acetate used = 0.157 ccm
V and V₁ See under absorption of CO₂
by ethyl alcohol

Pressure kg/sq cm	t°	Gas volume ccm	V	V ₁
25	20°	60.30	29.43	15.6
30			37.91	18.2
40			51.26	22.9
30	35°	63.40	26.54	14.2
40			38.69	18.4
50			48.35	21.9
60			51.88	21.8
30	60°	68.55	18.12	10.0
40			25.67	14.5
50			33.21	16.2
60			40.12	18.7
70			45.47	20.1
80			49.16	22.4
40	100°	76.80	12.76	8.70
50			18.80	11.1
60			24.12	13.0
70			28.99	15.0
80			32.96	16.3
90			36.92	17.1
100			42.75	19.5

(Sander)

Absorption of CO by CH₃COOH + C

Solvent	cc CO absorbed
1 mol CH ₃ COOH	58.5
0.8 " CH ₃ COOH +	
0.2 " CCl ₄	61.0
0.5 " CH ₃ COOH +	
0.5 " CCl ₄	62.4
0.2 " CH ₃ COOH +	
0.8 " CCl ₄	60.2
1 " CCl ₄	57.6

(Christoff, J phys Ch 1905, 53 38)

Absorption of CO₂ by C₂H₄Cl₂ + CS₂

Solvent	cc CO ₂ absorbed
1 mol C ₂ H ₄ Cl ₂	209 7
0 8 " C ₂ H ₄ Cl ₂ +	
0 2 " CS ₂	173 4
0 5 " C ₂ H ₄ Cl ₂ +	
0 5 " CS ₂	140 0
0 2 " C ₂ H ₄ Cl ₂ +	
0 8 " CS ₂	71 9
1 " CS ₂	19 9

(Christoff)

Solubility of CO₂ in organic solvents

$\frac{ds}{dt}$ = change of solubility for 1° increase in temp

Solvent	Solubility at 20° C	Solubility at 20° C	Solubility at 15° C	$\frac{ds}{dt}$
Glycerine	0 0302			
Water	0 8256			
Carbon bisulphide	0 8699	0 8888	0 9446	-0 00747
Iodobenzene	1 301	1 371	1 440	-0 0139
Aniline	1 324	1 434	1 531	-0 0207
o Toluidine	1 381	1 473	1 539	-0 0158
m Toluidine	1 436	1 581	1 730	-0 0244
Fugenol	1 539	1 653	1 762	-0 0223
Benzotrithloride	1 643			
Cumene	1 782	1 879	1 978	-0 0196
Carvene	1 802	1 921	2 034	-0 0232
Dichlorhydrin	1 810	1 917	2 020	-0 0210
Amyl alcohol	1 831	1 941	2 058	-0 0227
Brombenzene	1 842	1 964	2 092	-0 0250
Isobutyl alcohol	1 849	1 964	2 088	-0 0239
Benzyl chloride	1 938	2 072	2 180	-0 0242
m Xylene	2 090	2 216	2 346	-0 0256
Ethylene bromide	2 157	2 294	2 424	-0 0267
Chlorobenzene	2 265	2 420	2 581	-0 0316
Carbon tetrachloride	2 294	2 502	2 603	-0 0309
Propylene bromide	2 301	2 453	2 586	-0 0281
Toluene	2 305	2 426	2 557	-0 0256
Benzene	2 425	2 540	2 710	-0 0285
Amyl bromide	2 455	2 638	2 803	-0 0348
Nitrobenzene	2 456	2 635	2 845	-0 0389
Propyl alcohol	2 495			
Carvol	2 498	2 690	2 914	-0 0416
l thyl alcohol (97%)	2 706	2 923	3 130	-0 0424
Benzaldehyde	2 841	3 057	3 304	-0 0463
Amyl chloride	2 910	3 127	3 303	-0 0453
Isobutyl chloride	3 105	3 388	3 659	-0 0554
Chloroform	3 430	3 681	3 956	-0 0526
Butyric acid	3 478	3 767	4 084	-0 0606
l thylene chloride	3 525	3 795	4 061	-0 0536
l yridine	3 656	3 862	4 291	-0 0635
Methyl alcohol	3 837	4 205	4 606	-0 0769
Amyl formate	4 026	4 329	4 646	-0 0620
l ropionic acid	4 078	4 417	4 787	-0 0709
Amyl acetate	4 119	4 411	4 850	-0 0731
l eumyl acetate acid	4 679	5 129	5 614	-0 0935
Isobutyl acetate	4 691	4 968		-0 0134
Acetic anhydride	5 206	5 720	6 218	-0 1012
Acetone	6 295	6 921		-0 1232
Methyl acetate	6 494			

(Just, / phys Ch 1901 37 354)

Absorption of CO₂ by organic substances + Aq at 15°

P = % of the organic substance in the solvent

 β_{15}° = Coefficient of absorption at 15° S_{15}° = Solubility at 15°

Organic substance used	P	β_{15}°	S_{15}°
Chloral hydrate	0	0 996	
	0	0 992	1 056
	0	1 012	
	17 7	0 885	0 935
	21 8	0 860	0 908
	31 6	0 803	0 848
	37 0	0 790	0 834
	38 3	0 781	0 825
	49 8	0 760	0 802
	51 1	0 769	0 812
	52 6	0 764	0 807
	57 1	0 765	0 808
	61 1	0 780	0 824
	68 8	0 797	0 842
	71 0	0 812	0 857
Glycerine	74 6	0 848	0 895
	79 4	0 903	0 953
	0	1 003	1 064
	0	1 013	
	26 11	0 785	0 829
	27 69	0 800	0 845
	43 72	0 639	0 675
	46 59	0 620	0 655
	62 14	0 511	0 540
	73 36	0 449	0 474
	77 75	0 430	0 454
	87 74	0 422	0 446
	90 75	0 404	0 427
	96 64	0 415	0 438
	99 26	0 410	0 438

(Hammel, Z phys Ch 1915, 90 123)

Solubility of carbon dioxide in solutions of aniline at 25°

I Concentration, 0 206 g aniline in 100 c c of solution

P = Pressure

S = Solubility calc according to formula given in original article

P	S	P	S
748	0 865	1053	0 855
808	0 855	1159	0 862
920	0 857	1243	0 860

II Concentration, 0 425 g aniline in 100 c c of solution

P	S	P	S
760	0 909	1150	0 897
816	0 897	1236	0 902
921	0 897	1380	0 908

Solubility of carbon dioxide in solutions of aniline at 25°—*Continued*

III Concentration, 0.566 g aniline in 100 c c of solution

P	S	P	S
760	0.935	1082	0.923
823	0.929	1223	0.924
941	0.925	1341	0.930

IV Concentration, 0.743 g aniline in 100 c c of solution

P	S	P	S
760	0.953	1063	0.940
895	0.941	1223	0.940
983	0.940	1302	0.942

(Findlay and Creighton, Chem Soc 1910, 97 555)

Solubility of CO₂ in CS₂ increases approximately with the pressure. The absorption is greater at lower temp and less at higher temp than is required by Dalton's law (Woukoloff, C R 1889, 108 674)

Absorption of CO₂ by sugar + Aq

Sugar + Aq	Grams CO absorbed by 75 cc of solution at 15.5° and 720 mm
1/10-N sugar solution	0.1225
1/1-N " "	0.1089
1-N " "	0.0931

(Christoff, Z phys Ch 1905, 53 329)

Absorption of CO₂ in sugar + Aq at 20°

Conc of solution	Sp gr	Coefficient of absorption
1/8 mol per l	1.01518	0.846
1/4 " " "	1.03125	0.815
1/2 " " "	1.06372	0.756
1 " " "	1.12809	0.649

(Usher, Chem Soc 1910, 97 72)

Liquid—Not miscible with H₂O, though slightly sol therein, or with fatty oils, miscible with alcohol, ether, CS₂, and the essential oils (Thilorier, Mitchell)

Unacted upon by H₂O, sol in alcohol, ethers, petroleum, oil of turpentine, and CS₂ (Mareska and Donny)

Petroleum dissolves 5 to 6 vols liquid CO₂ (Cailletet, C R 75 1271)

Sl sol in CS₂ (Cailletet)

Solid—When immersed in H₂O, rapidly volatilizes and dissolves. With alcohol or ether it forms a semi-fluid mixture (Channing, Am J Sci (2) 5 186)

Only slightly sol in anhydrous ether, but may be mixed therewith to a paste (Thilorier)

Sol in methyl chloride below -65° at the point of sat without decomp (Villard, C R 1895, 120 1413)
+6H₂O (Villard, C R 1894, 119 59)

Carbon selenide, C₃Se

Sol only in hot conc H₂SO₄ (Villard, Ch Z 1906, 30 810)

C₃Se Insol in H₂O, CS₂, and ether. Easily sol in hot conc H₂SO₄, sol in conc NaOH + Aq from which it is pptd by HCl (V Bartsch)

Carbon silicide CSi

(*Carborundum*) Not attacked by acids, even HF, sl attacked by caustic alkalis or carbonates (Acheson, C R 1898, 179)

Not attacked by KOH + Aq (Schlenker, C R 114 1089)

Carbon monosulphide, CS

Insol in H₂O, alcohol, oil of turpentine, or benzene, somewhat sol in CS₂ or ether sol in warm HNO₃, sol in conc KOH Aq (Sidot, C R 81 32)

Readily absorbed by alcohol and a little (Deninger, J pr 1895, (2) 51 349)

Carbon disulphide, CS₂

Very sl sol in H₂O
1 l H₂O dissolves 2-3 g CS₂ (Chandrasekhar, Soc 43 562), 3.5-4.52 g (Peligot, ib 43 663)
30 ccm CS₂ shaken with 8690 ccm H₂O at 20-23° for 18 days decreased 11 ccm in 14 days and 1.4 ccm in the next 3 days by daylight, and 0.6 ccm in the last 5 days (no light). Part of the CS₂ was decomp and 7.8 ccm were dissolved, therefore H₂O dissolves 1/1000 of its weight CS (Sestini, Gazz ch 1 473)

Solubility of CS₂ in H₂O

100 pts H₂O dissolve 0.203 pts CS₂ at 13°
" " 0.191 " " 16°
" " 0.168 " " 22°
" " 0.145 " " 33°

(Purge, C N 41 195)

Solubility of CS in H₂O at 0°
1000 ccm solution at t°

a	t	a	t	a	t
2.04	0	1.79	20	1.11	40
1.99	5	1.69	25	0.70	45
1.94	10	1.55	30	0.14	49
1.87	15	1.37	35		

(Chancel and Parmentier, C R 100 3)

100 g H₂O dissolve at t°

t° 0 10 20 30
0.258 0.239 0.201 0.195 g CS
(Rex, Z phys Ch 1906, 55 365)

Absorption of CS₂ vapor by H₂O at t°

t	Coefficient of absorption
0	3 573
10	2 189
20	1 346
30	0 799

Calc from data of Chancel and Parmentier, C R 100 733)

(Winkler, Z phys Ch 1906, 55 352)

Vapors of CS₂ are most easily absorbed by alcoholic solution of KOH. Sl absorbed by KOH+Ag, and very slowly by CuSO₄, Pb(C₂H₃O₂)₂+Ag, conc H₂SO₄, or CaCl₂ in HCl+Ag (Berthelot, A ch (3) 51 74)

Solubility in alcohol S=strength of alcohol in per cent by weight, P=pts CS₂ which dissolve in 10 ccm alcohol at 17°

S	P	S	P
100	∞	91 37	5 00
98 5	18 20	84 12	3 00
98 15	13 20	76 02	2 00
96 95	10 00	48 40	0 20
93 54	7 00	47 90	0 00

(Tuchschmidt and Follenius, B 4 583)

Miscible with absolute alcohol, ether, ethereal and fatty oils, and liquid CO₂

Carbon disulphide, C₂S₂

Insol in H₂O, easily sol in alcohol ether, chloroform, benzene, and CS₂. The alcoholic and ethereal solutions decomp on standing (Lengyel, B 26 2960)

Sol in alcohol with decomp. Sol in CS₂ and in benzene (Stock, B 1912, 45 3575)

Solid modification Insol in H₂O and ordinary solvents. Sol in KOH+Ag (Lengyel)

Carbon sulphoselenide, CS₂Se

Mpt -55°, bpt +84°

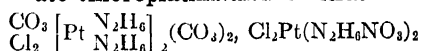
Decomp by light. Not attacked by H₂O

Sol in hot conc HNO₃. Decomp by Bi₂ to oil. Sol in alcohol with decomp. Miscible with CS₂ (Stock, B 1914, 47 150)

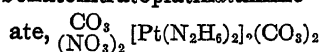
Carbon sulphotelluride, CS₂Te

Mpt -4° Very unstable

Miscible with CS₂ and benzene without decomp (Stock, B 1914, 47 142)

Carbonatochloroplatin diamine carbonate chloroplatin diamine nitrate

Precipitate (Cleve, J B 1867 321)

Carbonatotrapiatin diamine carbonate

Sol in boiling H₂O (Cleve)

Carbonatotetramine cobaltic bromide, Co(NH₃)₄CO₃Br

Much less sol than chloride (Jorgensen, Z anorg 2 279)

— *carbonate*, [Co(NH₃)₄CO₃]₂CO₃+3H₂O
Very sol in H₂O (Jorgensen)

— *chloraurate*, [Co(NH₃)₄CO₃]₂AuCl₄+
½H₂O

Somewhat sol in H₂O, nearly absolutely insol in alcohol (Jorgensen)

— *chloride*, Co(NH₃)₄CO₃Cl

Easily sol in H₂O, insol in alcohol (Jorgensen)

— *chloroplatinate*, [Co(NH₃)₄CO₃]₂PtCl₆+
2H₂O

Nearly insol in H₂O and alcohol (Jorgensen)

— *chloroplatinite*, [Co(NH₃)₄CO₃]₂PtCl₄

Nearly insol in H₂O, wholly in alcohol (Jorgensen)

— *dithionate*, [Co(NH₃)₄CO₃]₂S₂O₈
Ppt (Jorgensen)

— *iodide*, Co(NH₃)₄CO₃I

Much less sol than bromide or chloride (Jorgensen)

— *nitrate*, Co(NH₃)₄CO₃NO₃+½H₂O

Sol in about 15 pts cold H₂O, insol in alcohol (Jorgensen)

— *sulphate*, [Co(NH₃)₄CO₃]₂SO₄+3H₂O

Considerably less sol in H₂O than the nitrate (Jorgensen)

Carbonic acid, H CO₃

See Carbon dioxide

Carbonates

Carbonates of Na, K, Rb, and Cs are easily sol in H₂O, carbonates of Li and H are much less sol, other carbonates are nearly or quite insol. All carbonates are sol to some extent in H₂O containing CO₂. All carbonates, except those of NH₄, Rb, and Cs, are insol in alcohol.

Sol in those acids which are themselves sol in H₂O, except HCN and H₃BO₃.

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 824)

Aluminum carbonate, basic

$5\text{Al}_2\text{O}_3, 6\text{CO}_2 + 37\text{H}_2\text{O} = 3\text{Al}(\text{OH})_3, \text{Al}_2(\text{CO}_3)_3 + 14\text{H}_2\text{O}$ (Seubert, Z anorg 1893, 4 67)

$\text{Al}_2\text{O}_3, \text{CO}_2$ (Parkmann, Sill Am J (2) 34 324)

$3\text{Al}_2\text{O}_3, 2\text{CO}_2 + 16\text{H}_2\text{O}$ (Muspratt and Danson, A 72 120)

$3\text{Al}_2\text{O}_3, 2\text{CO}_2 + 9\text{H}_2\text{O}$ (Wallace, Chem Gaz 1858 410)

$5\text{Al}_2\text{O}_3, 3\text{CO}_2 + 18\text{H}_2\text{O}$ (Bley, J pr 39 11)

$2\text{Al}_2\text{O}_3, \text{CO}_2 + 6\text{H}_2\text{O} = 10\text{Al}(\text{OH})_3, \text{Al}_2(\text{CO}_3)_3 + 3\text{H}_2\text{O}$ Sol in cold dil acids (Schlumberger Bull Soc 1895, (3) 13 46)

$+8\text{H}_2\text{O}$ (Urban and Renoul J Pharm (4) 30 340) $= 10\text{Al}(\text{OH})_3, \text{Al}_2(\text{CO}_3)_3 + 9\text{H}_2\text{O}$ (Seubert Z anorg 1893 4 67)

$8\text{Al}_2\text{O}_3, 3\text{CO}_2 + 40\text{H}_2\text{O}$ (Langlois, A ch (3) 48 505)

All are precipitates, insol in H_2O , sol in acids, and give off CO_2 at slight heat

There are no definite carbonates of aluminum (Cameron, J phys Chem 1908, 12 572)

Aluminum ammonium carbonate, $\text{Al}_2\text{O}_3, \text{CO}_2, (\text{NH}_4)_2\text{CO}_3 + 4\text{H}_2\text{O}$

Precipitate (Rose, Pogg 91 460)

Aluminum sodium carbonate, $\text{Al}_2\text{O}_3, \text{CO}_2, 2\text{Na}_2\text{CO}_3 + 24\text{H}_2\text{O}$

Precipitate Sol in cold dil acids (Bley, J pr 39 22)

Ammonium carbonate, $(\text{NH}_4)_2\text{CO}_3 + \text{H}_2\text{O}$

Sol at 15° in its own weight H_2O Solution in H_2O gives off gas at $70-75^\circ$, and boils at $75-80^\circ$ Sl sol in cold dil $\text{NH}_4\text{OH} + \text{Aq}$, more sol at ordinary temp Insol in conc $\text{NH}_4\text{OH} + \text{Aq}$ (Divers, Chem Soc (2) 8 171, 259, and 364)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

Insol in alcohol
Insol in CS_2 (Aictowski, Z anorg 1894, 6 257)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

100 g pure glycerine dissolve 20 g $(\text{NH}_4)_2\text{CO}_3$ at 15° (Ossendowski, Pharm J 1907, 79 575)

Ammonium hydrogen carbonate, NH_4HCO_3

Sol at 15° in about 8 pts H_2O (Berthollet, J Phys 66 168)

Sol at 12.8° in about 6 pts H_2O (J Davy, N Edmb J 16 245)

Solution decomp on air or by gentle heat or by addition of the solid salt (Berthollet)

100 pts H_2O dissolve at 0° , 11.9 pts, at 10° , 15.85 pts, at 20° , 21 pts, at 30° , 27 pts NH_4HCO_3 (Dibbitts J pr (2) 10 417)

Solubility of NH_4HCO_3 in $\text{NH}_4\text{Cl} -$ with CO_2 , at t° 1, sat

t	g per 100 g H_2O		Sp gr	of saturation
	NH_4Cl	NH_4HCO_3		
0°	0 29 08	11 9 3 6	1	77
15°	0 2 99 6 06 8 51 11 68 18 30 26 93 33 25 34 35	18 64 16 29 14 22 12 69 11 68 9 33 7 73 6 64 6 42	1 1 1 1 1 1 1 1 1	64 63 62 62 65 69 76 85 85
30°	0 39 7	27 0 9 1		

(Fedotieff, Z phys Ch 1904, 49 1)

Solubility of NH_4HCO_3 in $\text{NaHCC} + \text{Aq}$, sat with CO_2 at t°

t°	g per 100 g H O		Sp gr sol	of saturation
	NaHCO_3	NH_4HCO_3		
0°	0 4 82	11 90 10 94	1	2
15°	0 5 92	18 64 17 06	1 1	4 10
30°	0 7 0	27 0 23 0		

(Fedotieff, Z phys Ch 1904, 49 16)

Solubility of NH_4HCO_3 in $\text{NH}_4\text{NO}_3 + \text{A}$ at t°

t°	g per 100 g H O		Sp gr sol	of saturation
	NH_4NO_3	NH_4HCO_3		
0°	0 118	11 90 4 52	1	25
15°	0 23 26 49 82 103 4 128 9 166 9	18 64 12 91 10 33 8 25 7 79 7 49	1 1 1 1 1 1	4 3 4 2 3 2
30°	0 231 9	26 96 12 57		

(Fedotieff and Koltunoff, Z anorg 191 , 85 251)

Insol in alcohol (J Davy)

Insol in acetone (Eidmann, C C 899, II 1014, Naumann, B 1904, 37 4329)

Ammonium dihydrogen carbonate,

Sol in 5 pts H_2O at 15° , decomp by more H_2O or by heat (Divers, Chem Soc (2) 8 171, 359, and 364)

Sl sol in alcohol

Ammonium hydrogen carbonate carbamate,
 $2\text{NH}_4\text{HCO}_3, \text{NH}_4\text{CONH}_2$ (*Salis of harts-horn*)

1 pt salt dissolves at

13° in 4 pts H_2O

$16\ 7^\circ$ " 3 3 "

$32\ 2^\circ$ " 2 7 "

$40\ 6^\circ$ " 2 4 "

49° " 2 "

(J Davy, N Edinb J 16 245)

Strong alcohol dissolves out carbamate, and the carbonate remains undissolved

$\text{NH}_4\text{HCO}_3, \text{NH}_4\text{CO}_2\text{NH}_2$ (*Commercial carbonate of ammonia*)

Sol at 15° in 4 pts H_2O , at 65° in $1\frac{1}{2}$ pts H_2O (Divers)

30 pts salt + 100 pts H_2O lower temp from $15\ 3^\circ$ to $3\ 2^\circ$ (Rudorff, B 2 68)

Sol in 1 667 pts cold and 0 833 pt hot H_2O (Fourcroy)

100 pts H_2O at 13° dissolve 25 pts

17° 30

37° 37

41° 40

49° 50

(Berzelius)

100 pts H_2O at $1\ 5^\circ$ dissolve 33 pts at 100° 100 pts (Ure's Dict.)

Sol in 2 pts H_2O at $15\ 5^\circ$ and in less than 1 pt boiling H_2O sat solution at $15\ 5^\circ$ contains 33 3% and sat boiling solution 50% (Abl)

Sat aqueous solution at 10 contains 15 7% (Eller)

Sat aqueous solution at (?) contains 6 1% (Muscbrock)

cold as su II % (Fourcroy)
($\text{NH}_4)_2\text{CO}_3$ dis
solves out first and NH_4HCO_3 later (Scanlan)

Sp gr of carbonate of ammonia + Aq at 12°

Deg Tw	Sp gr at 12°	% Carb ammon	Change of sp gr for 1°C
1	1 005	1 66	0 0002
2	1 010	3 18	0 0002
3	1 015	4 66	0 0003
4	1 020	6 04	0 0003
5	1 025	7 49	0 0003
6	1 030	8 93	0 0004
7	1 035	10 35	0 0004
8	1 040	11 86	0 0004
9	1 045	13 36	0 0005
10	1 050	14 83	0 0005
11	1 055	16 16	0 0005
12	1 060	17 70	0 0005
13	1 065	19 18	0 0005
14	1 070	20 70	0 0005
15	1 075	22 25	0 0006
16	1 080	23 78	0 0006
17	1 085	25 31	0 0006

Sp gr of carbonate of ammonia + Aq at 12° —*Continued*

Deg Tw	Sp gr at 12°	% Carb ammon	Change of sp gr for 1°C
18	1 090	26 82	0 0007
19	1 095	28 33	0 0007
20	1 100	29 93	0 0007
21	1 105	31 77	0 0007
22	1 110	33 45	0 0007
23	1 115	35 08	0 0007
24	1 120	36 88	0 0007
25	1 125	38 71	0 0007
26	1 130	40 34	0 0007
27	1 135	42 20	0 0007
28	1 140	44 29	0 0007
29	1 144	44 90	0 0007

(Lunge, Chem Ind 1883 2)

Sp gr of aqueous solution of salt with composition 31 3% NH_3 , 56 6% CO_2 , 12 1% H_2O 100 pts of solution contain—

6 58 9 96 14 75 19 83 25 71 pts salt
1 0219 1 0337 1 0497 1 0672 1 0863 sp gr

29 74 35 85 40 23 44 90 pts salt

1 0995 1 1174 1 1297 1 1414 sp gr

(J H Smith, Chem Ind 1883 3)

Conc alcohol dissolves out carbamate and leaves carbonate (Hunefeld, J pr 7 25)

Insol in acetone (Naumann, B 1904, 37 4328)

Ammonium cerous carbonate, $(\text{NH}_4)_2\text{CO}_3,$
 $\text{Ce}_2(\text{CO}_3)_3 + 6\text{H}_2\text{O}$

Ppt Very sl sol in conc $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Meyer Z anorg 1904, 41 104)

Ammonium chromous carbonate, $(\text{NH}_4)_2\text{CO}_3,$
 $\text{CrCO}_3 + \text{H}_2\text{O}$

Decomp by moist air, sol in dil HCl and H_2SO_4 (Baugé, C R 1896, 122 476)

Ammonium cobaltous carbonate, $(\text{NH}_4)_2\text{CO}_3,$
 $\text{CoCO}_3 + 4\text{H}_2\text{O}$

Permanent Sol in H_2O (Deville, A ch (3) 35 460)

$(\text{NH}_4)_2\text{O} 2\text{CoO}, 4\text{CO}_2 + 9\text{H}_2\text{O}$ Quickly decomp on air, sol in H_2O (Deville)
+ $12\text{H}_2\text{O}$ Sol in H_2O

Ammonium didymum carbonate, $(\text{NH}_4)_2\text{CO}_3,$
 $\text{D}_2(\text{CO}_3)_3 + 3\text{H}_2\text{O}$

Insol in H_2O (Clevé)

Ammonium dysprosium carbonate,
 $\text{NH}_4\text{Dy}(\text{CO}_3)_3 + \text{H}_2\text{O}$

Only sl sol in H_2O (Jantsch, B 1911, 44 1277)

Ammonium glucinum carbonate, $2(\text{NH}_4)_2\text{CO}_3 \cdot 3\text{GIC}_3(?)$

Very sol in cold decomp by hot H_2O
 Nearly insol in alcohol (Debray)

Composition is $(\text{NH}_4)_2\text{CO}_3 \cdot 2\text{GIC}_3$,
 $\text{Gl}(\text{OH})_2 + 2\text{H}_2\text{O}$ (Humpidge, Royal Soc
 Proc **39** 1)

Ammonium lanthanum carbonate, $\text{La}_2(\text{CO}_3)_3 \cdot (\text{NH}_4)_2\text{CO}_3 + 4\text{H}_2\text{O}$

Ppt (Meyer, Z anorg 1904, **41** 102)

Ammonium magnesium carbonate, $(\text{NH}_4)_2\text{Mg}(\text{CO}_3)_2 + 4\text{H}_2\text{O}$

Sol in 71 pts H_2O with decomp, more
 sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Divers, Chem Soc **51**
 196)

H_2O containing $(\text{NH}_4)_2\text{CO}_3$ dissolves very
 slightly, more sol in H_2O containing NH_4Cl
 (Favre, A ch (3) **10** 473)

Ammonium magnesium hydrogen carbonate, $(\text{NH}_4)_2\text{Mg}_2\text{H}_2(\text{CO}_3)_4 + 8\text{H}_2\text{O}$, or $12\text{H}_2\text{O}$

Decomp on air (Deville, A ch (3) **35**
 454)

Ammonium neodymium carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{Nd}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Ppt Sl sol in conc $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$
 (Meyer, Z anorg 1904, **41** 106)

Ammonium nickel carbonate, $\text{NH}_4\text{HCO}_3 \cdot \text{NiCO}_3 + 4\text{H}_2\text{O}$

Insol in H_2O (Deville, A ch (3) **35** 452)

Ammonium praseodymium carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{Pr}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Ppt Insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Meyer
 Z anorg 1904, **41** 105)

Ammonium samarium carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{Sm}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Ppt

Ammonium scandium carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot 2\text{Sc}_2(\text{CO}_3)_3 + 6\text{H}_2\text{O}$

Difficultly sol in H_2O Sol in cold alkali-
 carbonate + Aq, less sol in hot (R Meyer,
 Z anorg 1910, **67** 410)

Ammonium tin (stannous) carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot 2\text{SnCO}_3 + 3\text{H}_2\text{O}$

Decomp by cold H_2O (Deville, A ch (3)
35 456)

Ammonium uranyl carbonate, $2(\text{NH}_4)_2\text{CO}_3 \cdot \text{UO}_2\text{CO}_3$

Sol at 15° in 20 pts H_2O more abundantly
 in H_2O containing $(\text{NH}_4)_2\text{CO}_3$ (Ebelmen)

Insol in pure H_2O , sol in H_2O containing
 $(\text{NH}_4)_2\text{CO}_3$ Solution is decomp by boiling
 (Berzelius)

Sol in $\text{SO}_2 + \text{Aq}$ (Berthier A ch (3) **7**
 76)
 $3(\text{NH}_4)_2\text{CO}_3 \cdot 2(\text{UO}_2)_2\text{CO}_3 + 4\text{H}_2\text{O}$ S in
 H_2O (Giollitti C C **1905**, II 227)

Ammonium vanadyl carbonate, $3(\text{NH}_4)_2\text{O} \cdot 7\text{VO}_2 \cdot 5\text{CO}_2 + 16\text{H}_2\text{O}$

Sl sol in H_2O

Sol in acids and alkalies (Kopp, Z
 anorg **1905**, **45** 350)

Ammonium yttrium carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{Y}_2(\text{CO}_3)_3 + 2\text{H}_2\text{O}$

Insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Mosand)

Ammonium zinc carbonate, basic, $\text{NH}_4\text{OH} \cdot 2\text{CO}_2 + \text{H}_2\text{O}$

Insol in H_2O (Kassner, Arch Pharm (3)
27 673)

Ammonium zinc carbonate, $(\text{NH}_4)_2\text{CO}_3 \cdot \text{ZnCO}_3$

Insol in H_2O (Deville)

Quite sol in H_2O , more sol than
 $(\text{NH}_4)_2\text{CO}_3$, MgCO_3 Tolerably perm
 in the air Slowly decomp by cold, r
 idly by hot H_2O

Very sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Not att
 ked by alcohol (Favre, A ch (3) **10** 481)

Barium carbonate, BaCO_3

Sol in 4304 pts cold, and 2304 pts b ling
 H_2O (Fourcroy)

Sol in 47 620 pts H_2O (Bineau, A ch
 (3) **51** 290)

Sol in 14,137 pts H_2O at $16-20^\circ$ and
 15,421 pts at 100° (Fresenius)

Sol in 12 027 pts H_2O at 15° (Kre
 iers, Pogg **85** 247)

Calculated from electrical conductivity of
 solution, 1 pt BaCO_3 is sol in 64,070 pts H_2O
 at 8° and 45,566 pts at 24° (Holler
 mann, Z phys Ch **12** 125)

Solubility in H_2O at t°

t°	g sol in 100 g H_2O
14	4.32×10^{-1}
18	4.57×10^{-1}
25	4.89×10^{-1}
27	5.22×10^{-1}
32	5.69×10^{-1}
38	6.27×10^{-1}

(Weissenberger, Z phys Ch **1914**, **88** 10)

"Solubility product" = 8.1×10^{-10} m l
 (McCoy and Smith, J Am Chem Soc **31**,
33 473)

Sol in $\text{H}_2\text{CO}_3 + \text{Aq}$ (See barium hydrogen
 carbonate)

Easily sol in dil acids Not acted up
 by conc $\text{HNO}_3 + \text{Aq}$

Not decomp by 1 pt $\text{H}_2\text{SO}_4 + 6$ pt ab-
 solute alcohol Slowly decomp by pt

HNO₃+6 pts absolute alcohol Slowly decomp by 1 pt H₂C₂O₄+6 pts absolute alcohol

Not decomp by absolute alcoholic solutions of racemic, tartaric, citric, or glacial acetic acids (Babington and Phillips, 1816)

Almost completely insol in H₂O containing NH₄OH and (NH₄)₂CO₃ when digested in such a solution and allowed to stand 1 pt BaCO₃ dissolves in 141 000 pts of such a solution (Fresenius)

Not more sol in NaCl+Aq than in H₂O (Karsten)

Sol in cold NH₄Cl, NH₄NO₃, or NH₄ succinate+Aq (Vogel, J pr 7 453)

2 mols NH₄Cl dissolved in H₂O dissolve 1 mol BaCO₃ by continued boiling (Smith, Phil Mag J 9 540)

Solubility in H₂O increases by addition of NH₄Cl, at first strongly, then less strongly and finally strongly again (D'Agustino and Pellegrino, Gazz ch it 1908 38 (1) 532)

Somewhat sol in K₂CO₃+Aq (Wackenroder, A 24 30)

Solubility of BaCO₃ in KCl+Aq at bpt of solution

g KCl per 100 g solution	g BaCO ₃ per 1000 cc sat solution
0 15	0 0847
1	0 1781
3	0 2667
10	0 4274
30	0 5550

(Cantoni and Goguelia, Bull Soc 1905, (3) 33 13)

Solubility of BaCO₃ in NaCl+Aq at bpt of solution

g NaCl per 100 g solution	g BaCO ₃ per 1000 cc sat solution
0 15	0 0587
1	0 0787
3	0 1056
10	0 1575
30	0 2784

(Cantoni and Goguelia, l c)

Solubility of BaCO₃ in 10% KCl+Aq at t°

t°	g BaCO ₃ per 1000 cc sat solution
10	0 2175
20	0 2408
40	0 2972
60	0 3491
80	0 4049

(Cantoni and Goguelia, l c)

Solubility of BaCO₃ in 10% NaCl+Aq at t°

t°	g BaCO ₃ per 1000 cc sat solution
10	0 1085
20	0 1126
40	0 1231
60	0 1303
80	0 1418

(Cantoni and Goguelia, l c)

Slowly sol in conc Na₂SO₄, MgSO₄, ZnSO₄, Ca(NO₃)₂, or CaCl₂+Aq, but insol in ZnCl₂+Aq (Karsten)

Sl decomp by boiling K₂SO₄+Aq

Sl decomp in the cold by 1 pt K₂SO₄+2 pts Na₂SO₄+Aq

Decomp by salts of Al, Mn, Cr, Fe, U, Bi, Cd, Cu, Hg, Pb, Sn^{II}, Sn^{IV}, Hg₂, Rh, Ir, Au, with pptn of oxide of metal (Rose, Tr)

Pptn of BaCO₃ is hindered by presence of alkali citrates or metaphosphates

Sol in solutions of various salts, as in the case of calcium carbonate (see *Calcium carbonate*) The solvent power of these solutions for barium carbonate is somewhat less than for calcium carbonate

Insol in acetone (Naumann B 1904, 37 4329)

Insol in methyl acetate (Naumann, B B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Min *Witherite*

Barium hydrogen carbonate, BaH₂(CO₃)₂(?)

100 pts H₂O containing CO₂ dissolve 0 079 pt BaCO₃ (Bineau)

100 pts H₂O containing CO₂ dissolve 0 17 pt BaCO₃ (Lassaigne)

100 pts H₂O sat with CO₂ under a pressure of 4-6 atmospheres dissolve 0 725 pt BaCO₃ Upon evaporating, BaCO₃ is deposited (Wagner, Z anal 6 167)

BaCO₃ is sol in 833 pts H₂O sat with CO₂ at 10° (Lassaigne)

BaCO₃ is sol in 830 pts H₂O sat with CO at 10° (Fourcroy)

BaCO₃ is sol in 1550 pts H₂O sat with CO at 10° (Bergman)

100 cc H₂O sat with CO₂ dissolve 0 73 g BaH(CO₃)₂ (McCoy and Smith, J Am Chem Soc 1911, 33 473)

Barium calcium carbonate, BaCO₃, CaCO₃

Min *Barytocalcite* *Bromilite* Sol in dil acids

Barium uranyl carbonate, BaUO₄, 2UO₃, 2CO₂+5H₂O Decomp by H₂O (Blinkoff Dissert 1900)

+8H₂O Decomp by H₂O (Blinkoff)

Bismuth carbonate, basic, $(\text{BiO})_2\text{CO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O , sol in acids Insol in $\text{CO}_2 + \text{Aq}$ (Bergman)

Completely sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, sl sol in $\text{K}_2\text{CO}_3 + \text{Aq}$, insol in $\text{Na}_2\text{CO}_3 + \text{Aq}$ (Lau-gier)

Absolutely insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ unless H_3PO_4 or H_3AsO_4 are present (Berzelius)

Insol in $(\text{NH}_4)_2\text{CO}_3$, K_2CO_3 , or $\text{Na}_2\text{CO}_3 + \text{Aq}$ (Rose)

Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Wackenroder) Insol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Sol in $\text{CaCl}_2 + \text{Aq}$ (Pearson)

Min *Bismuthosphaerite*

$3\text{Bi}_2\text{O}_3$, CO_2 Min *Bismuthite* Easily sol in acids

$4\text{Bi}_2\text{O}_3$, $3\text{CO}_2 + 4\frac{1}{2}\text{H}_2\text{O}$ Min *Bismuth spar* Easily sol in acids

Bismuth potassium carbonate, $\text{Bi}_2\text{OK}_4(\text{CO}_3)_4 + \text{H}_2\text{O}$

Decomp by large quantities of H_2O (Reynolds, Chem Soc 1898, 73 266)

Cadmium carbonate, CdCO_3

Insol in H_2O , easily sol in acids, insol in K_2CO_3 , and $\text{Na}_2\text{CO}_3 + \text{Aq}$, very sl sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Fresenius)

Easily sol in NH_4 sulphate, nitrate, and succinate + Aq (Wittstein)

Sol in $\text{KCN} + \text{Aq}$, sol in cold $\text{NH}_4\text{Cl} + \text{Aq}$, less sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett, 1837)

Not prevented from pptn by non-volatile organic substances (Rose)

Not pptd from solutions containing sodium citrate (Spiller)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329)

$+ \frac{1}{2}\text{H}_2\text{O}$ (Lefort, J B 1847 346)

(Kraut, Z anorg 1897, 13 14)

Cadmium carbonate hydrazine, $\text{CdCO}_3 \cdot 2\text{N}_2\text{H}_4$

Easily sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 281)

Cæsium carbonate, Cs_2CO_3

Very deliquescent, and sol in H_2O

100 pts absolute alcohol dissolve 11.1 pts Cs_2CO_3 at 19° , 20.1 pts Cs_2CO_3 at boiling temp (Bunsen)

Cæsium hydrogen carbonate, CsHCO_3

Not deliquescent Sol in H_2O

Calcium carbonate basic, $\text{CaO} \cdot \text{CaCO}_3 + \text{H}_2\text{O}$

Hardened by H_2O , but not dissolved (Raoult, C R 92 189)

Calcium carbonate, CaCO_3

More sol in cold than in hot H_2O (Gmelin) When recently pptd sol in 8834 pts boiling water, 10 601 pts cold H_2O much less sol in H_2O (NH₄OH and $(\text{NH}_4)_2\text{CO}_3$: 65 246 pts of which 1 pt CaCO_3 (Fresenius (1846) A 59 122) Sol in 16 000 pts pure H_2O (Brandes 1 5) Sol in 12 858 pts pure H_2O at 15° (Krem 85 247) Sol in 16 000–24 000 pts pure H_2O (Buehl 2)

1 l H_2O dissolves 34 mg CaCO_3 (Hevallet, Z anal 8 91, Hoffmann, Z anal 414)

1 l H_2O may contain 0.016 g CaCO_3 (Birch 51 290) 1 pt is sol in 62 500 pts H_2O (Birch 51 290)

1 l H_2O dissolves 0.02 g CaCO_3 , 1 pt CaCO_3 is sol in 50 000 pts H_2O (Ligot)

Solubility is much affected by CO_2 of the air 1 l H_2O at 16° dissolves 13.1 mg CaCO_3 (Schlesing, C R 74 1552)

Calculated from electrical conductivity of $\text{CaCO}_3 + \text{Aq}$, 1 pt CaCO_3 is sol in 99,000 pts H_2O at 8° , and 80,040 pts at 23.8° (Holle-mann, Z phys Ch 12 125)

By continued boiling $\text{CaH}_2(\text{CO}_3)_2$, CaCO_3 remains in solution (Weltzien, 136 165)

Solubility in H_2O at different pressures

Pressure in atmos	Solubility
1	1079
2	1403
4	1820
6	2109

(Engel, C R 101 949)

100 pts H_2O dissolve 0.0005 pt (calculated as CaO) from pptd CaCO_3 and 0.007 pt from calc spar (Lubavin, J russ S 389)

1 l H_2O dissolves 13 mg CaCO_3 (Kohlrausch, Z phys Ch 1893, 12 24)

1 l CO_2 free water dissolves 17.4 mg CaO or 31.0 mg CaCO_3 (Gothé Ch Z 1915, 39 305)

CaCO_3 dissolves in 9662 pts H_2O (Pollacci C C 1896, II 946)

1 l H_2O free from CO_2 dissolves 9 mg CaCO_3 (McCoy and Smith J Am Soc 1911, 33 473)

Found dissolved in 10,000 pts sea water (Davy)

Pptd amorphous CaCO_3 dissolves in 1600 pts sea water Pptd crystalline CaCO_3 dissolves in 8000 pts sea water (Irwin and Young, Chem Soc 56 344)

Artificial sea water sat with CO_2 dissolves CaCO_3 corresponding to 57.27 mg of combined CO_2 per litre at 15°

Sea water which contains 52–55 mg nitril combined CO_2 per litre must be sat with CaCO_3 (Cohen Chem Soc 1900, 2 725)

For action of $\text{H}_2\text{CO}_3 + \text{Aq}$, see *Calcium hydrogen carbonate*

Sol in H_2SO_4 , even when native Sol in acids generally When treated with acids in closed vessels effervescence ceases on increase of pressure, but is renewed at once on removing it (Link, 1814)

Unacted upon by conc HNO_3 , even when boiling, as $Ca(NC_3)_2$ is insol in conc HNO_3

Not decomp by mixture of 1 pt H_2SO_4 and 6 pts absolute alcohol, but immediately by HNO_3 +absolute alcohol

Not decomp by absolute alcoholic solutions of oxalic, racemic, tartaric, citric, or glacial acetic acids (Babington and Phillips, 1816)

Unacted upon by glacial $HC_2H_3O_2$, even when boiling

Freshly pptd $CaCO_3$ is sol in cold NH_4Cl +Aq, but the solution becomes cloudy on exposure to air, a portion, however, of $CaCO_3$ remains dissolved, which cannot be pptd even by boiling If ppt is washed and allowed to stand 24 hours, it is not as sol in NH_4Cl as at first, but natural $CaCO_3$ is not wholly insol in NH_4Cl +Aq, it is, however, much less sol than $MgCO_3$ (Vogel, J pr 7 453)

Sol in boiling NH_4Cl +Aq with evolution of NH_3 (Demarcay, 1834)

When NH_4OH +Aq, incompletely sat with CO_2 , is mixed with $CaCl_2$ +Aq, no ppt occurs even during several days if kept in a closed vessel, and only a slight ppt if the mixture is exposed to the air, but $CaCO_3$ is pptd if the solution is boiled

NH_4OH +Aq wholly sat with CO_2 produces ppt when mixed with $CaCl_2$ +Aq, but pptn is not complete until heat is applied Also when an excess of $CaCl_2$ +Aq is added to a solution of crystallized carbonate of ammonia, only a portion of the $CaCO_3$ is pptd until the solution is boiled (Vogel, 1814)

When $CaCl_2$ +Aq mixed with NH_4OH +Aq is exposed to an atmos of pure CO_2 , no ppt occurs for several hours, but $CaCO_3$ is completely pptd in several days (Vogel)

When recently pptd, readily sol in NH_4Cl , and NH_4NO_3 +Aq (Brett 1837, Wackenroder, A 41 315)

When recently pptd, readily sol in $(NH_4)_2CO_3$, $(NH_4)_2SO_4$, NH_4NO_3 , NH_4Cl , and NH_4 succinate+Aq (Wittstein)

Sol in $NH_4C_2H_3O_2$ +Aq (Thomson)

More sol in NH_4Cl , or NH_4NO_3 +Aq, or in neutral potassium, or sodium salts+Aq than in H_2O (Fresenius)

From solutions in NH_4 salts, NH_4OH , and $(NH_4)_2CO_3$ +Aq precipitate $CaCO_3$ more completely than in $BaCO_3$ (Fresenius)

When boiled with NH_4Cl +Aq, $CaCO_3$ is dissolved, and $(NH_4)_2CO_3$ given off (D Smith)

$CaCl_2$ +Aq prevents pptn of $CaCO_3$ in the cold as do also NH_4Cl , KCl , or $NaCl$ +Aq, but it is pptd when boiled, if the latter solutions are not too conc K_2SO_4 , KNO_3 , $(NH_4)_2SO_4$, or Na_2SO_4 +Aq have a similar effect A large excess of $(NH_4)_2CO_3$ +Aq when quickly added to $CaCl_2$ +Aq produces

no ppt in the cold Na_2CO_3 , or K_2CO_3 +Aq act likewise (Storer, Am J Sci (2) 25 41)

1 g $CaCO_3$ requires 13.98 g NH_4Cl , 8.380 g $(NH_4)_2SO_4$, or 14.438 g NH_4NO_3 to effect solution (Bertrand, Monit Sci (3) 10 477)

Less sol in Na than in NH_4 salts, but more than in K salts (Berthelot)

When NH_4OH +Aq, partially neutralized by CO_2 , is mixed with CaO_2H_2 +Aq, no cloudiness appears until the mixture is boiled, when more CO_2 has been added to NH_4OH +Aq a ppt appears at first, which disappears and only reappears on addition of much CaO_2H_2 +Aq, but NH_4OH +Aq does not dissolve pptd $CaCO_3$ (Vogel)

Solubility in NH_4 salts+Aq at 25°

NH_4 salt	Millimols NH_4 salt per l	Millimols CaO dissolved per l
NH_4Cl	1000	6 770
	500	5 008
	250	3 724
	125	2 743
NH_4NO_3	500	5 267
	250	3 830
	125	2 779
	62.5	2 004
Triammonium citrate	500	66 87
	250	39 80
	125	22 64
	62.5	14 92

(Rindell, Z phys Ch 1909, 70 454)

Solubility of $CaCO_3$ in NH_4Cl +Aq at 12-18°
Time, 98 days

g per l of sat solution	
NH_4Cl	$CaCO_3$
53.5	0.423
100	0.609
200	0.645

(Cantoni and Goguelia, Bull Soc 1905, (3) 33 27)

Solubility of $CaCO_3$ in NH_4NO_3 +Aq at 18°

g per l of sat solution	
NH_4NO_3	$CaCO_3$
0	0.131
5	0.211
10	0.258
20	0.340
40	0.462
80	0.584

(Berju and Kosminiko, Landw Vers Sta 1904, 60 422)

$\text{CaO}_2\text{H}_2 + \text{Aq}$ dissolves a little CaCO_3 (Welter and Berthollet, 1789)

$\text{CaO}_2\text{H}_2 + \text{Aq}$ retains a little CaCO_3 in solution at ordinary temperature, which is pptd on boiling (Eliot and Storer, Proc Am Acad 1860, 5 63)

$\text{CaO}_2\text{H}_2 + \text{Aq}$, mixed with dil NaOH , KOH , or $\text{NH}_4\text{OH} + \text{Aq}$, gives no immediate ppt when CO_2 is passed through it, unless boiled

Sol in boiling $\text{MgCl}_2 + \text{Aq}$ even when dilute (Cousté)

Not decomp when boiled with K_2SO_4 , Na_2SO_4 , CaSO_4 , MgSO_4 , and $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$, but partially decomp by boiling with $(\text{NH}_4)_2\text{SO}_4$, K_2SO_4 , Na_2SO_3 , $(\text{NH}_4)_2\text{SO}_3$, Na_2HPO_4 , $(\text{NH}_4)_2\text{HPO}_4$, K_2HPO_3 , Na_2HPO_3 , $(\text{NH}_4)_2\text{HPO}_3$, K_2HASO_4 , Na_3AsO_4 , $\text{K}_2\text{C}_2\text{O}_4$, $(\text{NH}_4)_2\text{C}_2\text{O}_4$, NaF , and $\text{K}_2\text{CrO}_4 + \text{Aq}$. With the NH_4 salts the decomposition is complete (Dulong, A ch 82 286)

Not decomp by alkali sulphates + Aq (Malaguti)

Precipitation of CaCO_3 is much hindered by alkali citrates or metaphosphates

Solubility in $\text{KCl} + \text{Aq}$ at 25°

Sp gr $25^\circ/25^\circ$	% KCl	% CaCO_3
1 000	0 00	0 0013
1 024	3 90	0 0078
1 046	7 23	0 0078
1 072	11 10	0 0076
1 092	13 82	0 0072
1 101	15 49	0 0076
1 122	18 21	0 0070
1 133	19 84	0 0072
1 179	26 00	0 0060

(Cameron and Robinson, J phys Chem 1907, 11 578)

Solubility in $\text{NaCl} + \text{Aq}$ in contact with CO_2 free air at 25°

Sp gr $25^\circ/25^\circ$	g per 100 g H_2O	
	NaCl	CaCO_3
1 0079	1 60	0 0079
1 0314	5 18	0 0086
1 0466	9 25	0 0094
1 0734	11 48	0 0104
1 0949	16 66	0 0106
1 1346	22 04	0 0115
1 1794	30 50	0 0119

(Cameron, Bell and Robinson, J phys Chem 1907, 11 396)

Solubility of CaCO_3 in $\text{NaOH} + \text{Aq}$

Solvent	1 litre dissolves	
	at 18	at $95-100$
H_2O	125 mg CaCO_3	207 mg CaCO_3
ca 0.0001 n NaOH	8.7	9.6
ca 0.001 n NaOH	4.2	6.9
ca 0.01 n NaOH	4.3	7.7

(Le Blanc, Z anorg 1906, 51 185)

Solubility in $\text{K}_2\text{SO}_4 + \text{Aq}$ at 25°

Sp gr $25^\circ/25^\circ$	% K_2SO_4	% C	O_3
1 010	1 60	0 04	
1 021	3 15	0 16	
1 033	4 73	0 32	
1 048	6 06	0 48	
1 061	7 85	0 68	
1 069	8 88	0 92	
1 083	10 18	0 92	
1 084	10 48	0 88	

(Cameron and Robinson, J phys Chem 1907, 11 578)

The solubility of CaCO_3 in $\text{Na}_2\text{S} + \text{Aq}$ in equilibrium with air steadily increases with increasing amounts of CaSO_4 in the solution up to saturation point of the CaSO_4 in the presence of solid CaSO_4 the solubility of CaCO_3 is much decreased (Cameron and Seidell, J phys Chem 1902, 6 56)

See under $\text{CaH}_2(\text{CO}_3)$

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ in contact with CO_2 free air at 25°

g per 100 g H_2O	
Na_2SO	CaCO
0 97	0 0151
1 65	0 0180
4 90	0 0262
12 69	0 0313
14 55	0 0322
19 38	0 0346
23 90	0 0360

(Cameron, Bell and Robinson, J phys Chem 1907, 11 396)

Solubility in salts + Aq

g salt added per litre	mg CaCO_3 dissolved per litre
0 000	17 4
0 585 g NaCl	20 0
1 17 g "	24 9
2 93 g "	31 1
0 85 g NaNO_3	24
1 70 "	27 7
4 25 "	34 5
0 805 g Na_2SO_4 , 10H ₂ O	25 9
1 61 g "	31 1
4 03 g "	40 7
0 53 g Na_2CO_3	5 4
1 06 g "	7 2
2 65 g "	4 4
0 55 g CaCl_2 , 6H ₂ O	9 0
1 10 g "	5 4
2 75 g "	8 4

The solubility of CaCO_3 in CO_2 -free water

is therefore increased by the addition of NaCl, NaNO₃ or Na₂SO₄, 10H₂O, but decreased by the addition of Na₂CO₃ or CaCl₂, 6H₂O

(Gothe, Ch Z 1915, 39 306)

Sol in ferric chloride or nitrate + Aq with evolution of CO₂ and pptn of Fe₂O₃H₂ (Fuchs, 1831), also in chlorides or nitrates of Al, Mn, Cr, or U, but not in FeCl₃ + Aq

Sol in cold SnCl₄ + Aq with pptn of SnO₂
Insol in conc Na₂SO₄, MgSO₄, BaCl₂, MgCl₂, Pb(NO₃)₂, or AgNO₃ + Aq (Karsen)

Abundantly sol when freshly precipitated in CaCl + Aq, and MgSO₄ + Aq (Hunt)

Absolutely insol at 15-19° in BaO₂H₂ + Aq, also on boiling

1 l H₂O containing 3-4 g MgSO₄ dissolves 1-2 g CaCO₃, and also 1 g MgCO₃ (Hunt, Am J Sci (2) 26 109)

100 pts NaCl + Aq (2.525% NaCl) dissolve 0.0037 pt (calculated as CaO) pptd CaCO₃, and 0.0053 pt calespar (Lubavin, J russ Soc 24 389)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 827)

Insol in liquid CO. (Buchner, Z phys Ch 1906, 54 674)

Alcohol dissolves traces of CaCO₃ (Grischow)

Sol in Na citrate + Aq (Spiller)

Sol in Ca succinate + Aq (Barreswill)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in acetone and in methylal (Eidmann, C C 1899, 11 1014)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Amorphous Solubility in H₂O cannot be determined because of its instability (Kendall Phil Mag 1912, (6) 23 972)

Minerals In contact with air free from CO₂ 1 l H₂O dissolves at

25° 50° 100°
0.01433 0.01504 0.01779 g calcite

(Kendall, Phil Mag 1912, (6) 23 964)

In contact with air containing 3.7 pts CO₂ per 10,000 the solubility of calcite in H₂O was found to be 0.04608 g per l at 25° and 0.02925 g per l at 50° (Kendall, Phil Mag 1912 (6) 23 973)

Min Aragonite In contact with air free from CO₂ 1 l H₂O dissolves at

25° 50° 100°
0.01528 0.01617 0.01902 g aragonite

(Kendall, Phil Mag 1912, (6) 23 964)

+5H₂O Efflorescent

+6H₂O (Pelouze)

Calcium hydrogen carbonate, CaH₂(CO₃)₂

Known only in aqueous solution

CaCO₃ dissolves in CO₂ + Aq

CaCO₃ is sol in 1428 pts H₂O sat with CO at 0° and 1136 pts at 10° (Lassaigne J ch med 4 312)

Bineau could dissolve even r quantities of H₂O sat with CO only 1/5 (CO to form CaH₂(CO₃)₂)

Chalk dissolves in 994.5 pts H₂O sat with CO₂ while Iceland spar requires 3149 pts (Bischof)

CaCO₃ is sol in 1015 pts H₂O sat with CO at 21° and 748.3 mm (Warren Chem Soc 6 296)

Solubility of CaCO₃ in CO₂ + Aq at p pressure in atmospheres CaO + CO₂ = mg CO₂ and CaC dissolved, corresponding to CaCO₃ = mg CaCO₃

p	CaO + CO ₂	CaCO ₃
0 000504	60 96	74 6
0 000808	72 11	85 0
0 00333	123	137 2
0 03187	218 4	223 1
0 0282	310 4	296 5
0 05008	408 5	360
0 1422		533
0 2538	1072	663 4
0 4167	1500	787 5
0 5533	1846	885 5
0 7297	2270	972
0 9841	2864	1086

(Schlosing, C R 74 1522)

With high pressure, 1 l H₂O containing CO₂ dissolves at most 3 g CaCO₃. This maximum is reached at 5° under 4 atmospheres' pressure, at 10-13° under 5 atmospheres, and at 20° under 7 atmospheres (Caro, Arch Pharm (3) 4 145)

CaCO₃ is sol in about 1000 pts H₂CC₃ + Aq, and solubility is considerably increased by Na₂SO₄ or MgSO₄

1000 pts H₂O sat with CO₂ dissolve pts Carrara marble at t°, and B = height of barometer in millimetres

t°	B	Pts CaCO ₃	t	B	Pts CaCO ₃
7 5	754	1 224	22 0	746	0 920
8 5	752	1 202	26 0	740	0 875
9 5	754	1 115	26 5	743	0 860
20 5	741	0 975	27 0	741	0 885
21 5	744	0 935	28 0	737	0 770

Or, from 7.5-9.5°, 1000 pts H₂O sat with CO₂ dissolve 1.181 pts CaCO₃, from 20.5-22°, 0.9487 pt CaCO₃, from 26-28°, 0.855 pt CaCO₃

Other varieties of CaCO_3 are dissolved as follows in 1000 pts H_2O sat with CO_2

Variety	t°	B	Pts CaCO_3
Lunenburg chalk	18	740	0 835
Pptd CaCO_3	18	740	0 950
Iceland spar	18	735	1 970
Calcite	12	754	1 223
Traversella	12	754	212
Dolomite, semi-transparent	11 5	749	0 654
Dolomite, opaque, in small crystals	11 5	755	0 725
Dolomite, opaque, in large crystals	11	746	224
Dolomite, transparent, in large crystals	11	749	1 073
Oolitic limestone	15	747	252
Dolomitic limestone	15 5	740	573

(Cossa, Z anal 8 145)

Solubility of CaCO_3 in H_2O containing CO_2 at various pressures

CO_2 pressure in atm	1	2	4	6
Solubility	1079	1403	1820	2109

(Engel, C R 1885, 101 951)

1 l H_2O dissolves 0.3850 g $\text{CaH}_2(\text{CO}_3)_2$ at 15° (Treadwell, Z anorg 1898, 17 186)

1 l of sat $\text{CaH}_2(\text{CO}_3)_2 + \text{Aq}$, obtained from pure or impure limestone, contains 1.13-1.17 g CaCO_3 at 15° (Treadwell, Z anorg 1898, 17 189)

Solubility of $\text{CaH}_2(\text{CO}_3)_2$ in H_2O containing CO_2 at 15°

% carbonic acid in gas at 0 and 760 mm	Hg partial pressure mm	Free carbonic acid mg	mg $\text{CaH}_2(\text{CO}_3)_2$ in 100 cc of the solution	mg Ca
8.94	67.9	157.4	187.2	46.2
6.04	45.9	86.3	175.5	43.3
5.45	41.4	52.8	159.7	39.4
2.18	16.6	48.5	154.0	38.0
1.89	14.4	34.7	149.2	36.8
1.72	13.1	24.3	133.1	32.9
0.79	6.0	14.5	124.9	30.8
0.41	3.1	4.7	82.1	20.3
0.25	1.9	2.9	59.5	14.7
0.08	0.6		40.2	9.9
			38.5	9.5
			38.5	9.5
			38.5	9.5

(Treadwell and Reuter, Z anorg 1898, 17 185)

1 l H_2O sat with carbonic acid dissolves 1.30 g CaCO_3 at 13.2°, 1.45 g at 2.8° (Treadwell, Z anorg 1898, 17 189)

At 30° C in equilibrium with the more than 3 per cent of the calcium is combined as CaCO_3 . At lower temperatures and lesser concentrations the percentage of normal carbonate is even less, and practically all the calcium present is combined as $\text{Ca}(\text{HCO}_3)_2$ (Cameron and Briggs, J phys Chem 1901, 5 549)

With pressures less than 4.5 atmospheres of CO_2 no other than normal calcium carbonate or a hydrate of the normal carbonate can exist as the solid phase at 0° (Cameron, J phys Chem 1908, 12 566)

Solubility in H_2O in contact with air containing CO_2 with varying partial pressures at t°

P = partial pressure of CO_2

P	g per l	
	t = 15	
	CaCO_3	CO_2
0.8	0.193	0.11
1.5	0.193	0.15
1.7	0.238	0.15
6.8	0.445	0.35
9.9	0.627	0.45
13.6	0.723	0.56
14.6	0.686	0.65
31.6	1.050	1.11

P	g per l	
	t = 25	
	CaCO_3	(C)
0.7	0.159	0.09
1.6	0.177	0.11
4.6	0.341	0.20
7.8	0.446	0.30
16.5	0.539	0.52
30.1	0.743	0.71
35.5	0.755	0.80

P	g per l	
	t = 40	
	CaCO_3	(C)
0.6	0.136	0.07
1.7	0.143	0.08
2.9	0.175	0.10
3.5	0.232	0.16
7	0.284	0.23
14.9	0.354	0.29
22.2	0.427	0.33
31.7	0.480	0.47

Similar results at 20°, 30°, and 35° are also given

(Leather and Sen, Mem Dept Agric (India) Chem Ser 1909, 1 117, Seidell, Solubilities, 1919)

Solubility of calcite in H_2O at 25° , in contact with CO_2 under varying pressures
 P = approximate pressure of CO_2 in atmospheres

P	g per l sat solution		Solid phase
	H_2CO_3	$Ca(HCO_3)_2$	
0.1	0.22	0.67	$CaCO_3$
1.1	2.3	1.58	"
9.9	20.6	3.62	"
13.2	27.5	4.04	"
16.3	34.1	4.21	$Ca(HCO_3)_2$
25.4	53.2	4.22	"

(McCoy and Smith, J Am Chem Soc 1911, 33 468)

1 l H_2O dissolves 2.3374 g $CaCO_3$ at 5° under a CO_2 pressure of 2 atmos (Ehlert, Z Elektrochem 1912, 18 727)

Solubility data for calcite in H_2O containing CO_2 , with and without the presence of salts are given by Seyler and Lloyd (Chem Soc 1909, 95 346)

A critical analysis and recalculation of results of Schloesing and others is given by Johnston (J Am Chem Soc 1915, 37 2001)

$CaCO_3$ is not dissolved by CO_2 and H_2O in presence of $MgCO_3$ (Leather and Sen, C A 1915 181)

1 l of 1/10-normal $NaCl + Aq$ dissolves 0.3320 g $CaH_2(CO_3)_2$ at 15° (Treadwell and Ruter, Z anorg 1898, 17 193)

Solubility of $CaH_2(CO_3)_2$ in $NaCl + Aq$ sat with carbonic acid at 15° , containing 5 g $NaCl$ per l of $NaCl + Aq$

% carbonic acid in gas at 0 and 760 mm	mm Hg = partial pressure	mg $CaCO_3$ free	mg $CaH_2(CO_3)_2$ in solution	mg Ca
16.9	128.8	132.5	218.4	53.9
11.47	87.2	110.1	214.3	52.9
6.07	46.1	23.5	149.2	36.8
3.16	24.0	13.5	118.3	29.2
0.50	3.5	2.7	73.9	18.2
0.41	3.4	0.3	49.0	12.1
			34.9	8.6
			33.7	8.3
			32.9	8.1
			33.2	8.2

(Treadwell and Ruter, Z anorg 1898, 17 193)

Solubility in $NaCl + Aq$ at $25^\circ C$ and in equilibrium with air

$Ca(HCO_3)_2$		$NaCl$	
Grams per liter	Reacting wts per liter	Grams per liter	Reacting wts per liter
0.1046	0.00065	0.000	0.000
0.1770	0.00110	9.720	0.168
0.2051	0.00128	21.010	0.362
0.2152	0.00134	30.301	0.522
0.2252	0.00140	50.620	0.872
0.2212	0.00138	69.370	1.195
0.2172	0.00135	98.400	1.695
0.1971	0.00123	147.400	2.540
0.1569	0.00095	234.500	4.040
0.1227	0.00076	262.300	4.520

(Cameron and Seidell, J phys Chem 1902, 6 51)

Solubility in various salts + Aq under a CO_2 pressure of 2 atmos at 5°

Salt	g salt per 1000 g H_2O	g $CaCO_3$ sol in 1 l of solvent
H_2O		2.3374
$MgCl_2 + 6H_2O$	6.08	2.3518
	50.0	3.4045
	86.0	4.0826
	350.0	3.3009
	700.0	2.7357
	1150.0	2.2054
	1725.0	1.7058
	2300 (sat)	1.4060
$NaCl$	27.96	3.2796
	50.0	3.7399
	86.0	3.7828
	106.9	3.6900
	175.6	3.3495
	263.4	2.8107
	351.2	2.1625 at 8°
$MgSO_4 + 7H_2O$	105.3 (14°)	2.1768
	sat at 14°	0.91356
$Na_2SO_4 + 10H_2O$	137.7 (14°)	1.4060
	sat at 14°	1.9199

(Ehlert and Hempel, Z Elektrochem 1912, 18 727)

Solubility of $CaCO_3$ in $KCl + Aq$ at 25° sat with CO_2 at atmospheric pressure

% KCl	% $CaCO_3$
3.90	0.145
7.23	0.150
11.10	0.166
13.82	0.165
15.49	0.167
18.21	0.154
19.84	0.140
26.00	0.126

(Cameron and Robinson, J phys Chem 1907, 11 579)

Solubility in NaCl+Aq in contact with CO₂
at atmospheric pressure at 25°

g per 100 g H ₂ O	
NaCl	CaCO ₃
1 45	0 150
5 69	0 160
11 08	0 174
15 83	0 172
19 62	0 159
29 89	0 123
35 85	0 103

(Cameron, Bell and Robinson, J phys Ch
1907, 11 396)

Solubility in K₂SO₄+Aq, sat with CO₂ at
atmospheric pressure and 25° temp

% SO ₂	% CaO
0 69	0 69
1 37	0 69
1 67	0 47 *
2 18	0 30 *
2 99	0 24 *

* Solid phase, CaSO₄, K₂SO₄
(Cameron and Robinson)

Solubility in Na₂SO₄+Aq at 24° in equi-
librium with air

Total Ca calc as Ca(HCO ₃) ₂ Grams per liter	Ca actually dissolved as Ca(HCO ₃) ₂ Grams per liter	Na ₂ SO ₄ Grams per liter
0 0925	0 0925	0 000
0 1488	0 1488	2 800
0 1729	0 1729 +	5 235
0 2330	0 2210	11 730
0 3240	0 3020	36 860
0 3960	0 3440	74 010
0 4580	0 3660	116 100
0 5630	0 3940	184 200
0 5910	0 4060	213 700
0 6650	0 4300	255 900

(Cameron and Seidell, J phys Chem 1902,
6 53)

Data are also given for solubility of CaCO₃
in NaCl+Na₂SO₄+Aq, and CaCO₃+CaSO₄
in NaCl+Na₂SO₄+Aq (Cameron, Bell and
Robinson)

Calcium copper uranium carbonate, CaCO₃,
3CuCO₃, 4U(CO₃)₂+24H₂O
Sol in acids

Calcium lead carbonate, xCaCO₃, yPbCO₃
Min *Plumbocalcite*

Calcium magnesium carbonate, CaCO₃,
MgCO₃

Min *Dolomite* 1 l H₂O sat with CO₂ at
18° and 750 mm dissolves 0.31 g dolomite
(Cossa, B 2 697)

Not obtained by evaporating solution but
can be crystallized from CO₂+Aq between
100° and 200° (Hoppe-Seyler)

Dolomite is dissolved by CO₂ and H₂O,
but solution is prevented partially by CaCO₃,
and wholly by MgCO₃ (Leather and Sen,
C A 1915 181)

Insol in cold dil acids (Dolomite, J
Phys 39 1)

Insol in cold acetic acid (Forchhammer)

Calcium potassium carbonate, CaK₂(CO₃)₂

Decomp by H₂O (Reynolds, Chem Soc
1898, 73 265, Butschli, C A 1907 23)
2CaCO₃, 3K₂CO₃+6H₂O (Butschli)

Calcium sodium carbonate, CaNa₂(CO₃)₂

Anhydrous Decomp by H₂O
+2H₂O (Butschli, C A 1907 222)
+5H₂O Min *Gaylussite* Sparngl sol
in H₂O

Calcium uranyl carbonate, CaCO₃, UO₂CO₃+
20H₂O

Min *Liebigite* Sol in HCl+Aq
+xH₂O Decomp by H₂O (Blinkoff,
Dissert 1900)

2CaO, 4UO₃, 3CO₂+24H₂O Decomp by
H₂O (Blinkoff, Dissert 1900)

Calcium carbonate chloride, CaCO₃, CaCl₂+
6H₂O

Sol in H₂O with immediate decomp
(Fritzsche, J pr 83 213)

Cerous carbonate, Ce(CO₃)₃+5, and 9H₂O

Insol in H₂O, and solution of CO₂ in H₂O
(Vauquelin)

Somewhat sol in (NH₄) CO₃+Aq (John)

Insol in neutral salt solutions and neutral
alkali carbonates+Aq, easily sol in HCl+Aq
(Berthier A ch (3) 7 77)

Ceric carbonate, Ce(CO₃)₃+12H₂O

Precipitate (Hisinger, A ch 94 108)

Insol in H₂O Sol in slight trace in
Na₂CO₃+Aq, sl sol in NaHCO₃+Aq, and
in (NH₄) CO₃+Aq (Rosc)

Cerous lanthanum carbonate fluoride

Min *Bathasite*, *Hamantite* *Hydrofluorite*
Slowly decomp by HCl+Aq easily by
H₂SO₄

Cerous potassium carbonate, Ce(CO₃)₃,
K CO₃+3H₂O

Ppt (John)

Ce₂(CO₃)₃, K CO₃+12H₂O Ppt
Sol in 30% K₂CO₃+Aq (Meyer, Z
anorg 1904, 41 103)

Percevic potassium carbonate, $\text{Ce}_2\text{O}_3(\text{CO}_3)_3$, $4\text{K}_2\text{CO}_3 + 12\text{H}_2\text{O}$

Crystalline Sl sol in H_2O containing K_2CO_3 , sol in dil H_2SO_4 with decomp (Job, C R 1899, **128** 1098)

Cerous sodium carbonate, $\text{Ce}_2(\text{CO}_3)_3$, $2\text{Na}_2\text{CO}_3 + 2\text{H}_2\text{O}$

Ppt (John)
 $2\text{Ce}_2(\text{CO}_3)_3$, $3\text{Na}_2\text{CO}_3 + 24\text{H}_2\text{O}(?)$ Ppt
Easily decomp (Meyer, Z anorg 1904, **41** 103)

Chromous carbonate, CrCO_3

Sol in much H_2O , sl sol in $\text{KHCO}_3 + \text{Aq}$ (Moberg, J pr **44** 328, Moissan, A ch (5) **21** 199)

Chromic carbonate, basic, Cr_2O_3 , 2CO_2

Precipitate (Parkmann, Sill Am J (2) **34** 321)

Cr_2O_3 , $\text{CO}_2 + 4\text{H}_2\text{O}$ Insol in H_2O , sol in acids, when freshly pptd is sol in K_2CO_3 , or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, and still more sol in $\text{KOH} + \text{Aq}$ (Meissner)

Insol in ethyl acetate (Naumann, B 1910, **43** 314), methyl acetate (Naumann, B 1909, **42** 3790)

$2\text{Cr}_2\text{O}_3$, $\text{CO}_2 + 6\text{H}_2\text{O}$ Precipitate (Langlois, A ch (3) **48** 502)

Chromous potassium carbonate,

CrCO_3 , $\text{K}_2\text{CO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O when freshly prepared, slowly polymerizes stable in dry air, decomp in moist air sol in acids with decomp (Baugé, C R 1895, **126** 1568)

Chromous sodium carbonate, $\text{Cr}_2\text{Na}_2(\text{CO}_3)_2 + \text{H}_2\text{O}$

Decomp when heated In Aq solution, passes into the hydrate containing 10 mols H_2O (Baugé C R 1897 **125** 1179)

+10 H_2O Very sol in cold H_2O , Aq solution decomp below 100° effloresces in the air, sol in $\text{HCl} + \text{Aq}$ and $\text{H}_2\text{SO}_4 + \text{Aq}$ (Baugé, C R 1897, **125** 1178)

Cobaltous carbonate, basic, CoCO_3 , $2\text{CO}_2 + 4\text{H}_2\text{O}$

Insol in H_2O sol in $(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{CO}_3$, NH_4NO_3 , and $\text{NH}_4\text{Cl} + \text{Aq}$

Sol in cold NH_4NO_3 and $\text{NH}_4\text{Cl} + \text{Aq}$ (Beetz **1837**)

Sol in $\text{CO}_2 + \text{Aq}$ and acid alkali carbonates + Aq from which it is pptd on boiling Very sol in conc Na_2CO_3 , or $\text{K}_2\text{CO}_3 + \text{Aq}$, largely sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, and partly sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Berzelius)

Not pptd from solutions containing Na citrate (Spillier)

4CoCO_3 , $\text{CO}_2 + 4\text{H}_2\text{O}$ Ppt (Beetz)
+ $31\frac{1}{2}\text{H}_2\text{O}$ (Meigen, C C **1905**, I 1363)

Cobaltous carbonate, basic, 3CoO , $\text{CO}_2 + 2\text{H}_2\text{O}$

(Meigen, C C **1905**, I 1363)

$3\text{H}_2\text{O}$ (Rose, Pogg **84** 551)

3CoO , $2\text{CO}_2 + 4\text{H}_2\text{O}$ (Bratin, Z anal **6** 76)

2CoO , $\text{CO}_2 + 3\frac{1}{2}\text{H}_2\text{O}$ Converted into 5CoO , $2\text{CO}_2 + 4\text{H}_2\text{O}$ by H_2O (Beetz)

Cobaltous carbonate, CoCO_3

Anhydrous Not attacked by cold conc HCl , or $\text{HNO}_3 + \text{Aq}$ (Senarmont, A ch (3) **30** 129)

Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 827)

Min *Sphaerocobaltite* Sl attacked by cold HNO_3 , or $\text{HCl} + \text{Aq}$

+ $\frac{2}{3}\text{H}_2\text{O}$ Sol in acids (Deville, A ch (3) **33** 95)

+ $6\text{H}_2\text{O}$ (Deville)

Decomp by H_2O with formation of a basic carbonate (Berzelius)

Cobaltous potassium carbonate, CoCO_3 , $\text{K}_2\text{CO}_3 + 4\text{H}_2\text{O}$

Decomp by H_2O (Deville, A ch (5) **33** 90)

Ppt Decomp by H_2O (Reynolds, Chem Soc 1898, **73** 264)

CoCO_3 , $\text{KHCO}_3 + 4\text{H}_2\text{O}$ Decomp by H_2O (Deville)

Cobaltous sodium carbonate, CoCO_3 , $\text{Na}_2\text{CO}_3 + 4\text{H}_2\text{O}$, and $10\text{H}_2\text{O}$

Decomp by H_2O (Deville, A ch (3) **33** 75)

Cupric carbonate, basic

The compounds produced by pptn of copper solutions by carbonates are unstable and possess varying solubilities in solutions of CO_2 . On treatment with solutions of CO_2 these subst mcs pass over into an apparently stable compound possessing a definite solubility in solutions of CO_2 of definite concentration, which solubility increases with the concentration of CO_2 . Solubility of this compound in various salts— Aq is recorded (Lecc, J Am Chem Soc 1908, **30** 1374)

8CuO , $\text{CO}_2 + 5\text{H}_2\text{O}$ (Deville, A ch (3) **33** 75)

6CuO , CO_2 (Fidd, Chem Soc **14** 70)

3CuO , $\text{CO}_2 + 2\text{H}_2\text{O}$ (Favre, A ch (5) **10** 119)

5CuO , $2\text{CO}_2 + 6\text{H}_2\text{O}$ (Struve)

2CuO , $\text{CO}_2 + \text{H}_2\text{O}$ Insol in H_2O , easily sol in acids, even $\text{H}_2\text{SO}_4 + \text{Aq}$, sl sol in $\text{H}_2\text{CO}_3 + \text{Aq}$, 30,720 pts of the solution containing 1 pt of CuO (John) Sol in 4690 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 4-6 atmos pressure (Wagner) Sol in 3833 pts sat $\text{H}_2\text{CO}_3 + \text{Aq}$ (Lussaigne, J ch mcd **4** 312)

Sol in NH_4 salts + Aq Partially sol in Na_2CO_3 , or $\text{K}_2\text{CO}_3 + \text{Aq}$, and more sol in

NaHCO_3 , or $\text{KHCO}_3 + \text{Aq}$, sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Favre, A ch (3) 10 18)

Less sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ than CuO in $\text{NH}_4\text{OH} + \text{Aq}$ (Thomson, 1831) Sol in $\text{KCN} + \text{Aq}$ (Berzelius) Sol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Sol in ferric salts with pptn of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$
Insol in liq NH_3 (Franklin and Kraus, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329, Erdmann, C C 1899, II 1014)

Sol in ethyl amine carbonate + Aq (Wurtz)

Sol in cane sugar + Aq (Pescher, Repert 1820, 6 85)

Not pptd from solutions containing sodium citrate (Spiller)

Insol in pyridine (Schroeder, Dissert 1901)

Min *Malachite* Sol in acids, and $\text{NH}_4\text{OH} + \text{Aq}$

+ $2\text{H}_2\text{O}$ (Favre)

8CuO , $5\text{CO}_2 + 7\text{H}_2\text{O}$ (Groger, Z anorg 1900, 24 137)

3CuO , $2\text{CO}_2 + \text{H}_2\text{O}$ Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$, also in hot conc $\text{NaHCO}_3 + \text{Aq}$

Min *Azurite*

opper potassium carbonate, basic, 8CuO , $2\text{K}_2\text{CO}_3$, $7\text{CO}_2 + 17\text{H}_2\text{O}$

Ppt, decomp by H_2O (Groger, B 1901, 34 430)

Mixture (Wood and Jones, C A 1907 2667)

5CuO , 4CO_2 , $\text{K}_2\text{CO}_3 + 10\text{H}_2\text{O}$ Decomp by H_2O (Deville, A ch (3) 33 102)

Cupric potassium carbonate, CuCO_3 , K_2CO_3
Decomp by H_2O (Wood and Jones, C A 1907 2667)

+ H_2O (Wood and Jones)

+ $4\text{H}_2\text{O}$ Decomp by H_2O (Reynolds, Chem Soc 1898, 73 263)

Could not be obtained (Wood and Jones)
 2CuCO_3 , $\text{K}_2\text{CO}_3 + 4\text{H}_2\text{O}$ Decomp by H_2O (Wood and Jones)

Cupric sodium carbonate, CuCO_3 , Na_2CO_3

Not decomp by cold H_2O (Debray, C R 49 218)

+ $3\text{H}_2\text{O}$

Cupric zinc carbonate, 2CuO , 3ZnO , $2\text{CO}_2 + 3\text{H}_2\text{O}$, or 3CuO , 9ZnO , $4\text{CO}_2 + 8\text{H}_2\text{O}$

Min *Aurichalcite* Easily sol in $\text{HCl} + \text{Aq}$

Cupric carbonate ammonia (cuprammonium carbonate), CuCO_3 , 2NH_3

Decomp by H_2O Insol in alcohol and ether Sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Favre, A ch (3) 10 116)

Didymium carbonate, $\text{D}_{12}(\text{CO}_3)_3 + \text{H}_2\text{O}$, or $6\text{H}_2\text{O}$

Insol in H_2O Only traces dissolve in $\text{H}_2\text{O} + \text{Aq}$ Insol in solutions of alkali carbonates or bicarbonates + Aq (Marignac, A ch (3) 38 166) Very sl sol in conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)

Insol in acetone (Naumann, B 1904, 7 4329)

+ $8\text{H}_2\text{O}$ (Cleve, Bull Soc (2) 43 363)

Didymium potassium carbonate, $\text{D}_{12}(\text{CO}_3)_3$, $\text{K}_2\text{CO}_3 + 4\text{H}_2\text{O}$

Insol in H_2O (Cleve, Bull Soc (2) 3 363)

+ $12\text{H}_2\text{O}$ (Cleve)

Didymium sodium carbonate, $2\text{D}_{12}(\text{CO}_3)_3$, $3\text{Na}_2\text{CO}_3 + 9\text{H}_2\text{O}$

Ppt (Cleve)

$\text{D}_{12}(\text{CO}_3)_3$, $2\text{Na}_2\text{CO}_3 + 8\text{H}_2\text{O}$ Ppt (Cleve)

Dysprosium carbonate, $\text{Dy}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Insol in H_2O (Jantsch, B 1911, 4 1277)

Erbium carbonate, Er_2O_3 , $2\text{CO}_2 + 2\text{H}_2\text{O}$

Insol in H_2O (Hoglund)

Erbium sodium carbonate, $\text{Er}_2(\text{CO}_3)_3$, $5\text{Na}_2\text{CO}_3 + 36\text{H}_2\text{O}$

Efflorescent Decomp by H_2O

Gadolinium carbonate, basic, $\text{Gd}(\text{OH})\text{CO}_3 + \text{H}_2\text{O}$

Ppt (Benedicks, Z anorg 1900, 22 41)

Glucinum carbonate, basic, 3GdO , CO_2 , 4GdO , CO_2 , 5GdO , $\text{CO}_2 + 5\text{H}_2\text{O}$, etc

Not perceptibly sol in H_2O or $\text{H}_2\text{CO}_3 + \text{H}_2\text{O}$

Decomp by boiling H_2O Easily sol in $\text{H}_2\text{O} + \text{Aq}$

Sol in NH_4 salts, and KOH , or $\text{NaOH} + \text{Aq}$

Sol in alkali carbonates, especially $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Vauquelin) Sl sol in $\text{K}_2\text{CO}_3 + \text{Aq}$ When solution in $(\text{NH}_4)_2\text{CO}_3$ is boiled, a more basic carbonate is pptd (Rose)

Glucinum carbonate, $\text{GdCO}_3 + 4\text{H}_2\text{O}$

Efflorescent Sol in 278 pts H_2O (Klatz, J pr 106 242)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

No definite carbonate of glucinum exists (Cameron, J phys Chem 1908, 12 572)

Glucinum potassium carbonate, $3\text{GIClO}_3 \cdot 2\text{K}_2\text{CO}_3$

Easily sol in H_2O , but decomp by boiling (Debray) Less easily sol in alcohol

Indium carbonate, $\text{In}_2(\text{CO}_3)_3$

Ppt Insol in K_2CO_3 , or $\text{Na}_2\text{CO}_3 + \text{Aq}$
Sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Winkler, J pr 94 1)

Iron (ferric) carbonate, basic

$9\text{Fe}_2\text{O}_3 \cdot \text{CO}_2 + 12\text{H}_2\text{O}$ (Wallace, Chem Gaz 1858 410)
 $3\text{Fe}_2\text{O}_3 \cdot \text{CO}_2 + 4\text{H}_2\text{O}$, and $8\text{H}_2\text{O}$ (Barrat, C N 1 110)
 $+ 6\text{H}_2\text{O}$ (Wallace)
 $2\text{Fe}_2\text{O}_3 \cdot \text{CO}_2 + 1\frac{1}{2}\text{H}_2\text{O}$ (Rother, Pharm J Trans (3) 4 576)
 $\text{Fe}_2\text{O}_3 \cdot \text{CO}_2$ (Parkmann, Sill Am J (2) 34 321)

These and other similar basic salts are ppts, easily decomp on standing into $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$

Iron (ferrous) carbonate, FeCO_3

Insol in H_2O
Sol in acids, even in $\text{H}_2\text{CO}_3 + \text{Aq}$
See **Carbonate, ferrous hydrogen**
Min *Siderite Spathic ore* SI attacked by dil acids Sol in $\text{H}_2\text{CO}_3 + \text{Aq}$ under pressure
Insol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)
 $+ \text{H}_2\text{O}$ SI sol in H_2O , easily sol in acids, sol in $\text{H}_2\text{CO}_3 + \text{Aq}$
Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Sol in ferric salts + Aq with evolution of CO_2 and pptn of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$
Soluble in an aqueous solution of cane sugar

Solubility in salts + Aq free from CO_2

Salt	g salt per 1000 g H_2O	1 l of solvent dissolves g FeCO_3
NaCl	351 2	0 35042
$\text{MgCl}_2 + 6\text{H}_2\text{O}$	2300 0	4 2049
$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	137 7 sat at $+14^\circ$	0 70085 0 93444
$\text{MgSO}_4 + 7\text{H}_2\text{O}$	105 3 sat at $+18^\circ$	1 4667 2 9334

(Fhlert, Z Elektrochem 1912, 18 728)

Iron (ferrous) hydrogen carbonate,
 $\text{FeH}_2(\text{CO}_3)_2(?)$

known only in aqueous solution
By conducting CO_2 at ordinary pressure through H_2O , in which Fe is suspended, a solution containing 9.1 pts FeCO_3 to 10,000 pts H_2O is obtained (v Hauer, J pr 81 391)

100 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ dissolve 0.72 pt FeCO_3 (Wagner)

FeCO_3 dissolves in 1381 pts H_2O saturated with CO_2 , under a pressure of 4-6 atmospheres (Wagner, J B 1867 135)

1 l H_2O dissolves 6.1907 g FeCO_3 (pure) under a CO_2 pressure of 2 atmos (Ehlert, Z Elektrochem 1912, 18 728)

Solubility in various salts + Aq in presence of CO_2 under pressure of 2 atmos

Salt	With CO_2 of 2 atmos pressure	
	g salt per 1000 g H_2O	1 l of solvent dissolves g FeCO_3
H_2O		6.1907
NaCl	50 106 9 175 6 263 4 351 2	
$\text{MgCl}_2 + 6\text{H}_2\text{O}$	86 9 700 0 1150 0 1437 5 1725 0 2300 0	5.8403 4.5553 4.4587 4.6934 5.3975 9.0524
$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	137 7 sat at $+14^\circ$	7.9428 9.5780
$\text{MgSO}_4 + 7\text{H}_2\text{O}$	105 3 sat at $+18^\circ$	6.2423 7.3922

(Ehlert, Z Elektrochem 1912, 18 728)

A bicarbonate of ferrous iron is not formed under pressures of CO_2 up to 5 atmospheres at 0° (Cameron, J phys Chem 1908, 12 571)

Iron (ferrous) magnesium carbonate, $\text{FeCO}_3 \cdot \text{MgCO}_3$

Min *Pistomesite*
 $\text{FeCO}_3 \cdot 2\text{MgCO}_3$ Min *Mesitite*

Iron (ferrous) potassium carbonate,
 $\text{FeK}(\text{CO}_3)_2 + 4\text{H}_2\text{O}$

Ppt Decomp by H_2O (Reynolds Chem Soc 1898, 73 265)

Lanthanum carbonate, $\text{La}(\text{CO}_3)_3 + \text{H}_2\text{O}$,
 $3\text{H}_2\text{O}$, and $8\text{H}_2\text{O}$

Insol in H_2O $\text{CO}_2 + \text{Aq}$ dissolves traces
Insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$

Insol in acetone (Naumann, B 1904, 37 4329)

Min *Lanthanite*

Lanthanum potassium carbonate, $\text{La}_2(\text{CO}_3)_3$, $\text{K CO}_3 + 12\text{H}_2\text{O}$

Sol in 30% $\text{K}_2\text{CO}_3 + \text{Aq}$ (Meyer, Z anorg 1904, 41 101)

Lanthanum sodium carbonate, $2\text{La}_2(\text{CO}_3)_3$, $3\text{Na}_2\text{CO}_3 + 20\text{H}_2\text{O} (?)$

Ppt Easily decomp (Meyer, Z anorg 1904, 41 102)

Lead carbonate, basic, 2PbCO_3 , PbO_2H_2 , 5PbCO_3 , $3\text{PbO}_2\text{H}_2$, 3PbCO_3 , PbO_2H_2 , 5PbCO_3 , PbO_2H_2

White Lead Insol in H_2O Nearly insol in $\text{H}_2\text{CO}_3 + \text{Aq}$, even under pressure Sol in dil, insol in conc $\text{KOH} + \text{Aq}$ Insol in normal, or acid alkali carbonates + Aq (Bottger)

Sol in cold dil $\text{NH}_4\text{Cl} + \text{Aq}$ (Brett)
 PbCO_3 , PbO_2H_2 Very sl sol in H_2O (Yorke)

2PbCO_3 , PbO_2H_2
Solubility is less than 0.0002 millimol Pb in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)

When not exposed to air, sol in 32,000 pts $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (0.2 g per l), 26,000 pts $\text{KNO}_3 + \text{Aq}$ (0.2 g per l), 23,000 pts $\text{CaCl}_2 + \text{Aq}$ (0.2 g per l), 4600 pts $\text{NH}_4\text{NO}_3 + \text{Aq}$ (0.2 g per l), 4300 pts H_2O sat with CO_2 .

When exposed to air in beakers, sol in 43,000 pts $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (0.2 g per l), 43,000 pts $\text{KNO}_3 + \text{Aq}$ (0.2 g per l), 26,000 pts $\text{CaCl}_2 + \text{Aq}$ (0.2 g per l), 26,000 pts $\text{NH}_4\text{NO}_3 + \text{Aq}$ (0.2 g per l), 4300 pts H_2O sat with CO_2 (0.2 g per l) (Murr, Chem Soc 31 664)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

3PbO , $4\text{PbCO}_3 + 2\text{H}_2\text{O}$ Ppt (Stromholm, Z anorg 1904, 38 446)

Lead carbonate, PbCO_3

Sol in 50,551 pts H_2O at ordinary temp

Sol in 23,450 pts H_2O with little ammonium acetate, carbonate and free ammonia, and in somewhat less H_2O , containing much ammonium nitrate with carbonate and free ammonia (Fresenius, A 59 124)

Calculated from electrical conductivity of $\text{PbCO}_3 + \text{Aq}$, 1 l H_2O dissolves 3 mg PbCO_3 at 10° (Kohlrausch and Rose, Z phys Ch 12 241)

Solubility is 0.0002 millimol Pb in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)

Sl sol in H_2O 1.5×10^{-4} g are contained in 1 l of sat solution at 20° (Bottger, Z phys Ch 1903, 46 604)

Easily sol in acids, even $\text{HCl} \cdot \text{H}_2\text{O}_2$, but not decomp by conc $\text{HNO}_3 + \text{Aq}$ on account of insolubility of $\text{Pb}(\text{NO}_3)_2$ in $\text{HNO}_3 + \text{Aq}$ Insol in a mixture of 1 pt H_2SO_4 and 6 pts absolute alcohol, or in an alcoholic solution of racemic or tartaric acids

Insol in $\text{H}_2\text{CO}_3 + \text{Aq}$ (Jahn, A 28 117)
Very sl sol in $\text{H}_2\text{CO}_3 + \text{Aq}$, but soln is prevented by traces of various salts (Lassaigne, J ch méd 4 312)
Sol in 7144 pts sat H_2CO_3 with H_2O sat CO_2 under 4-6 atmos pressure dissolve traces of Pb, 1000 pts of solution contain 0.5 pt PbCO_3 (Wagner, Z anal 6 17)

Solubility of PbCO_3 in $\text{H}_2\text{CO}_3 + \text{Aq}$ is 18°

mg per l	
CO	PbCO_3
0	1 75
2 8	6
5 4	7
14 4	8 2
26	9 9
43 5	10 9
106	15 4

(Pleissner, C C 1907, II 1056)

Sol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$, and NH_4Cl (Weppen, 1837) Sol in $\text{KOH} + \text{Aq}$, n absolutely insol at ord temp in an exc s of K_2CO_3 , or $\text{Na}_2\text{CO}_3 + \text{Aq}$, and still more sl at 100° , but absolutely insol in NaCl , KHCO_3 , or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Rose) nsol in $\text{NH}_4\text{OH} + \text{Aq}$, sol in KOH or NaOH Aq, decomp by boiling $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ (Pleissner)

Sl decomp (Persoz), not at all decomp (Malaguti) by alkali sulphates + Aq

Partially decomp by boiling with H_2SO_4 , Na_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$, CaSO_4 , MgSO_4 , Na_2HPO_4 , $\text{NaNH}_4\text{HPO}_4$, K_2SO_4 , N_2SO_3 , $(\text{NH}_4)_2\text{SO}_3$, Na_2HPO_3 , $\text{Na}_2\text{B}_4\text{O}_7$, K_2SO_4 , Na_3AsO_4 , $\text{K}_2\text{C}_2\text{O}_4$, $\text{N}_2\text{C}_2\text{O}_4$, NaF , and $\text{K CrO}_4 + \text{Aq}$ With the NH_4 salts the decomp is complete (Dulong, A 82 290)

Easily sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$ (Pleissner, Rose)

When 1 mol PbCO_3 is boiled with 1 mol $\text{K}_2\text{C}_2\text{O}_4$, 15% of the PbCO_3 is decomp with 1 mol K CO_3 , 93.28% is decomp (Malaguti)

Not decomp by $\text{K SO}_4 + \text{Aq}$ (Rose)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sol in an aqueous solution of acetates (Meyer, 1844)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Not pptd in presence of NaCl (Spillner)

Min *crassula*

Lead sodium carbonate, 4PbCO_3 , Na_2CO_3

Insol in H_2O (Pleissner, Pogg 47 19)

Lead carbonate bromide, PbCO_3 , PbBr

Insol in H_2O (Storer's Dict)

Lead carbonate chloride, PbCO_3 , PbCl_2

Insol in H_2O (Miller, Chem Soc (2) 8 37)

Min *Phosgenite* Easily sol in acids

Lead carbonate iodide, PbCO_3 , PbI_2

Insol in H_2O (Poggiale)

Lead carbonate sulphate, PbCO_3 , PbSO_4

Min *Lanarkite* Sol in $\text{HNO}_3 + \text{Aq}$ with residue of PbSO_4
 3PbCO_3 , PbSO_4 Min *Leadhillite* As above

Lithium carbonate, Li_2CO_3

100 pts H_2O dissolve 1 pt Li_2CO_3 (Vauquelin, A ch 7 284)

100 pts H_2O at 13° dissolve 0.769 pt Li_2CO_3 , at 102° , 0.778 pt Li_2CO_3 (Kremers, Pogg 99 48)

100 pts H_2O , cold or hot, dissolve 1.2 pts Li_2CO_3 (Troost, A ch (3) 51 103)

100 pts H_2O dissolve 1.4787 pts at 15° , 0.7162 pt at 100° (Draper, C N 55 169)

100 pts H_2O dissolve pts Li_2CO_3 at t°

t	Pts Li_2CO_3	t°	Pts Li_2CO_3
0	1 539	75	0 866
10	1 406	100	0 728
20	1 329	102	0 796
50	1 181		

0.796 pt is dissolved at 102° in less than $\frac{1}{4}$ hour, and 0.955 in 1 hour (Beketow, J russ Soc 1884 591)

Sat solution at 15° has sp gr 1.014, and contains 1 g Li_2CO_3 to 70 g H_2O , while solution sat at 0° has sp gr 1.0168 and contains 1 g Li_2CO_3 in 64.6 g H_2O . By long spontaneous evaporation at 15° a solution can be obtained of 1.0278 sp gr containing 1 g Li_2CO_3 in 45.57 g H_2O (Flückiger, Arch Pharm (3) 25 549)

By boiling for an instant with H_2O a solution is obtained, which has sp gr 1.0074 and contains 1 g Li_2CO_3 to 139 g H_2O (Flückiger, Arch Pharm (3) 26 543)

0.1687 mol is sol in 11 H_2O at 25° (Rothmund, Z phys Ch 1909, 69 531)

Sat $\text{Li}_2\text{CO}_3 + \text{Aq}$ contains at

95° 75°
 0.723 0.833% by wt Li_2CO_3

(Schugriff, Z anorg 1914, 86 159)

Sat solution boils at 102° (Kremers)

More sol in $\text{CO} + \text{Aq}$ than in H_2O 100

pts sat $\text{CO}_2 + \text{Aq}$ dissolve 5.25 pts Li_2CO_3 (Troost) See LiHCO_3
 Sol in NH_4 salts + Aq

Solubility in salts + Aq at 25°

C = concentration of salt solution in g-equiv per l

S = solubility of Li_2CO_3 in g-equiv per l

Salt	C	S
KNO_3	0 25	0 3647
	0 50	0 3688
	0 75	0 3676
	1 00	0 3656
	1 50	0 3490
	2 00	0 3268
KCl	0 10	0 3553
	0 25	0 3590
	0 50	0 3782
	0 75	0 3832
	1 00	0 3835
	1 50	0 3731
NaCl	2 00	0 3558
	0 10	0 3569
	0 25	0 3691
	0 50	0 3867
	0 75	0 3956
	1 00	0 3946
K_2SO_4 2	1 50	0 3901
	2 00	0 3776
	0 25	0 4028
	0 50	0 4356
	1 00	0 4860
Na_2SO_4 2	0 50	0 4411
	1 00	0 4926
	2 00	0 5534
NH_4Cl	0 10	0 3902
	0 25	0 4677
	0 50	0 5659
	0 75	0 6270
	1 00	0 6810
	1 50	0 7463
$(\text{NH}_4)_2\text{SO}_4$ 2	2 00	0 7739
	4 00	0 7881
	0 25	0 5059
	0 50	0 7863
	1 00	0 9804
	1 50	1 109
KClO_4	2 00	1 174
	0 1	0 3500
	0 2	0 3570
	0 4	0 3616

(Griffiths, Z anorg 1905, 43 198)

Insol in liquid NH_3 (Franklin Am Ch J 1898, 20 828)

Solubility in organic compds + Aq at 25°
Solubility in H₂O at 25° = 0.1687 mols/litre

Organic compd	Normality of the solution	Mol L ₂ CO ₃ sol in 1 l
Methyl alcohol	0.250	0.1604
	0.5	0.1529
	1.0	0.1394
Ethyl alcohol	0.125	0.1614
	0.250	0.1555
	0.5	0.1417
	1.0	0.1203
Propyl alcohol	0.125	0.1604
	0.250	0.1524
	0.5	0.1380
	1.0	0.1097
Tertiary amyl alcohol	0.125	0.1564
	0.250	0.1442
	0.5	0.1224
	1.0	0.0899
Acetone	0.125	0.1600
	0.250	0.1515
	0.5	0.1366
	1.0	0.1104
Ether	0.125	0.1580
	0.250	0.1476
	0.5	0.1300
Formaldehyde	0.125	0.1668
	0.250	0.1653
	0.5	0.1606
	1.0	0.1531
Glycol	0.125	0.1660
	0.250	0.1629
	0.5	0.1565
	1.0	0.1472
Glycerine	0.125	0.1670
	0.250	0.1647
	0.5	0.1613
	1.0	0.1532
Mannitol	0.125	0.1705
	0.250	0.1737
	0.5	0.1778
Glucose	0.125	0.1702
	0.250	0.1728
	0.5	0.1752
	1.0	0.1778
Sucrose	0.125	0.1693
	0.250	0.1689
	0.5	0.1661
	1.0	0.1557
Urea	0.125	0.1686
	0.250	0.1673
	0.5	0.1643
	1.0	0.1605

Solubility in organic compds + Aq
at 25°—Continued

Organic compd	Normality of the solution	Mol L sol in 1 l	O ₂ l
Thio-urea	0.125	0.167	
	0.250	0.163	
	0.5	0.163	
	1.0	0.153	
Dimethyl-pyrone	0.125	0.152	
	0.250	0.142	
	0.5	0.124	
	1.0	0.092	
Ammonia	0.125	0.163	
	0.250	0.163	
	0.5	0.157	
	1.0	0.142	
Diethylamine	0.125	0.152	
	0.250	0.141	
	0.5	0.123	
	1.0	0.097	
Pyridine	0.125	0.152	
	0.250	0.153	
	0.5	0.147	
	1.0	0.141	
Piperidine	0.125	0.154	
	0.250	0.148	
	0.5	0.140	
	1.0	0.149	
Urethane	0.125	0.164	
	0.250	0.155	
	0.5	0.147	
	1.0	0.143	
Acetamide	0.250	0.164	
	0.5	0.150	
	1.0	0.148	
Acetonitrile	0.125	0.168	
	0.250	0.166	
	0.5	0.169	
	1.0	0.168	
Mercuric cyanide	0.125	0.167	
	0.250	0.164	

(Rothmund, Z phys Ch 1909, **69** 51)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1904, **37** 3601)

Insol in acetone (Naumann, B 1914, **37** 4329, Eidmann, C C 1899, II 1014)

Lithium hydrogen carbonate, LiHCO₃

100 pts H₂O dissolve 5.501 pts at 13°
(Bewad, B 17 406 R)

Magnesium carbonate, basic, $\text{Mg}_3\text{C}_2\text{O}_7 + 3\text{H}_2\text{O} = 3\text{MgO}, 2\text{CO}_2 + 3\text{H}_2\text{O}$ or $2\text{MgCO}_3, \text{MgO}, \text{H}_2\text{O} + 2\text{H}_2\text{O}$ (Fritzsch, Pogg 37 310)

Magnesia alba, $3\text{MgCO}_3, \text{Mg}(\text{OH})_2 + 4\text{H}_2\text{O}, 4\text{MgCO}_3, \text{Mg}(\text{OH})_2 + 5\text{H}_2\text{O}$, or $5\text{MgCO}_3, 2\text{Mg}(\text{OH})_2 + 7\text{H}_2\text{O}$

Very sl sol in H_2O Sol in 10,000 pts hot or cold H_2O (Bineau)

Sol in 2500 pts cold, and 9000 pts hot H_2O (Fyfe)

Sol in H_2O containing CO_2

Very easily sol in acids

Easily sol in dil $\text{HCl} + \text{Aq}$

Easily sol in NH_4 sulphate, nitrate, or succinate + Aq , also in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Wittstein) Sol in cold $\text{Na}_2\text{CO}_3, \text{K}_2\text{CO}_3, \text{K}_2\text{SO}_4, \text{KCl}$, or $\text{KNO}_3 + \text{Aq}$ (Longchamp), also in $\text{NH}_4\text{Cl} + \text{Aq}$, separating out on heating (Vogel, J pr 7 455) Slowly sol in conc $\text{BaCl}_2, \text{CaCl}_2$, or $\text{ZnSO}_4 + \text{Aq}$ (Karsten)

Sol in $\text{MgSO}_4 + \text{Aq}$ (Dulong)

Sol in ferric salts + Aq with evolution of CO_2 and pptn of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (Fuchs)

Sol in boiling $\text{Co}, \text{Ni}, \text{Zn}, \text{Mn}$, or Cu nitrates or chlorides + Aq

Mm *Hydromagnesite*, $4\text{MgO}, 3\text{CO}_2 + 4\text{H}_2\text{O}$

+ $10\text{H}_2\text{O}$ Sol in considerable amount in $\text{H}_2\text{CO}_3 + \text{Aq}$ as $\text{MgH}_2(\text{CO}_3)_2 + \text{Aq}$ (Engel, C R 100 911)

Magnesium carbonate, MgCO_3

A, hydrous Insol in H_2O 1 l H_2O dissolves 106 mg MgCO_3 (Chevalet, Z anal 8 91) Sol in 5071 pts H_2O at 15° (Kremers) MgCO_3 combines with H_2O to form $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$, and + $5\text{H}_2\text{O}$, which are less sol in H_2O than anhydrous salt (Engel, C R 101 814)

Very hygroscopic About 20 g are sol in 1 l H_2O (Engel, C R 1899, 129 598)

0 7156 g are sol in 1 l H_2O at 15°

0 627 g are sol in 1 l H_2O at 15° with vapour pressure of CO_2 equal to zero

6 977 grams are sol in 1 l H_2O at 15° with vapour pressure CO_2 equal to 1 atm (Treadwell and Reuter, Z anorg 1898, 17 202)

94 4 mg are sol in 1 l of CO_2 -free water (Gothe, Ch Z 1915, 39 306)

Solubility in H_2O in equilibrium with $\text{Mg}(\text{HCO}_3)_2$ and CO_2

System $\text{MgCO}_3, \text{Mg}(\text{HCO}_3)_2$ and CO_2 at 30°C

Total Mg (grams per liter)	Mg as MgCO_3 (grams per liter)	Mg as $\text{Mg}(\text{HCO}_3)_2$ (grams per liter)
0 02410	0 01205	0 01205
0 13135	0 06820	0 06314
0 16087	0 08676	0 07411

Solubility in H_2O in equilibrium with $\text{Mg}(\text{HCO}_3)_2$ and CO_2 —*Continued*

System $\text{MgCO}_3, \text{Mg}(\text{HCO}_3)_2$ and CO_2 at 30°C

Total Mg (gram atoms per liter)	Mg as MgCO_3 Per cent	Mg as $\text{Mg}(\text{HCO}_3)_2$ Per cent
0 00100	50 00	50 00
0 00545	51 92	48 08
0 00667	53 93	46 07

Total salts in solution Grams per liter	MgCO_3		$\text{Mg}(\text{HCO}_3)_2$	
	Grams per liter	Per cent	Grams per liter	Per cent
0 1144	0 0418	36 5	0 0726	63 5
0 6174	0 2368	38 2	0 3806	61 7
0 7479	0 3012	40 3	0 4467	59 7

In a solution near the saturation point and in equilibrium with atmospheric air upwards of 50 per cent of the magnesium is in the form of the normal carbonate When the solution is brought in contact with the solid phase, the proportion of the base combined as normal carbonate falls to about 34 per cent, or lower (Cameron and Briggs, J phys Chem 1901, 5 552-3)

For solubility in $\text{H}_2\text{CO}_3 + \text{Aq}$, see *Magnesium hydrogen carbonate*

Scarcely acted upon by $\text{HCl} + \text{Aq}$ (Senarmont)

The solubility of MgCO_3 in $\text{NaCl} + \text{Aq}$ when in contact with ordinary air increases with increasing concentration of NaCl up to a maximum, and then decreases (Cameron and Seidell, J phys Chem 1903, 7 579)

Solubility of MgCO_3 in salts + Aq in equilibrium with an atmosphere free from CO_2

$\text{NaCl} + \text{Aq}, t = 23^\circ$

Weight of liter of solution	Grams NaCl per liter	Grams MgCO_3 per liter	Reacting weights NaCl per liter	Reacting weights MgCO_3 per liter
996 92	0 0	0 176	0 000	0 00210
1016 82	28 0	0 418	0 482	0 00500
1041 09	59 5	0 527	1 025	0 00630
1070 50	106 3	0 585	1 831	0 00699
1094 53	147 4	0 544	2 539	0 00650
1142 48	231 1	0 460	3 981	0 00550
1170 14	272 9	0 393	4 701	0 00470
1199 28	331 4	0 293	5 709	0 00350

(Cameron and Seidell, J phys Chem 1903, 7 585)

Solubility of MgCO_3 in salts + Aq — *Continued* $\text{Na}_2\text{SO}_4 + \text{Aq}$, $t = 24^\circ$

Weight of liter of solution	Grams Na_2SO_4 per liter	Grams MgCO_3 per liter	Reacting wts Na_2SO_4 per liter	Reacting wts MgCO_3 per liter
997 52	0 00	0 216	0 000	0 00258
1021 24	25 12	0 586	0 178	0 00700
1047 60	54 76	0 828	0 388	0 00990
1080 95	95 68	1 020	0 678	0 01219
1133 85	160 80	1 230	1 140	0 01470
1157 34	191 90	1 280	1 360	0 01530
1206 03	254 60	1 338	1 804	0 01600
1223 91	278 50	1 338	1 973	0 01600
1241 99	305 10	1 388	2 162	0 01660

 $t = 35.5^\circ$

Weight of liter of solution	Grams Na_2SO_4 per liter	Grams MgCO_3 per liter	Reacting weights Na_2SO_4 per liter	Reacting weights MgCO_3 per liter
995 15	0 32	0 131	0 000	0 00156
1032 89	41 84	0 577	0 296	0 00689
1067 23	81 84	0 753	0 579	0 00900
1094 77	116 56	0 904	0 826	0 01080
1120 38	148 56	0 962	1 052	0 01149
1151 70	186 70	1 047	1 323	0 01251
1179 82	224 00	1 088	1 587	0 01300
1196 32	249 20	1 100	1 751	0 01314
1236 52	197 20	1 130	2 120	0 01350

(Cameron and Seidell)

 $\text{Na}_2\text{CO}_3 + \text{Aq}$, $t = 25^\circ$

Weight of liter of solution	Grams Na_2CO_3 per liter	Grams MgCO_3 per liter	Reacting weights Na_2CO_3 per liter	Reacting weights MgCO_3 per liter
996 84	0 00	0 223	0 000	0 00266
1019 89	23 12	0 288	0 220	0 00344
1047 72	50 75	0 510	0 482	0 00620
1082 47	86 42	0 879	0 820	0 01027
1118 91	127 30	1 314	1 209	0 01570
1147 66	160 80	1 636	1 526	0 01955
1166 05	181 90	1 972	1 727	0 02357
1189 38	213 20	2 317	2 024	0 02770

(Cameron and Seidell)

Solubility in salts + Aq

g salt added per litre	mg MgCO_3 dissolved per litre
0 0	94 4
0 585 g NaCl	128 3
1 17 g "	134 4
2 93 g "	120 95
0 85 g NaNO_3	122 85
1 70 g "	138 80
4 25 g "	137 20

Solubility in salts + Aq — *Continued*

g salt added per litre	mg MgCO_3 dissolved per litre
0 805 g Na_2SO_4 , $10\text{H}_2\text{O}$	145 05
1 61 g "	162 05
4 03 g "	150 75
0 53 g Na_2CO_3	98 6
1 06 g "	53 5
2 65 g "	15 7
0 51 g MgCl_2 , $6\text{H}_2\text{O}$	47 0
1 02 g "	39 5
2 55 g "	35 3

The solubility of MgCO_3 in CO_2 -free water is increased by the addition of NaCl , NaNO_3 , or Na_2SO_4 , $10\text{H}_2\text{O}$ but decreased by the addition of Na_2CO_3 or MgCl_2 , $6\text{H}_2\text{O}$

(Gothe, Ch Z 1915, 39 306)

Insol in liquid NH_3 (Franklin, Arr Ch J 1898, 20 828)

Insol in acetone (Naumann, B 304, 37 4329)

Insol in acetone and in methylal (Naumann, C C 1899, II 1014)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Min *Magnesia* Very sl attacked by warm conc $\text{HCl} + \text{Aq}$ 100 pts H_2O dissolve 0 0027 pt, calculated as MgO (Lubav)

Solution in H_2O contains 0 018 g Mg and 0 065 g CO_2 per l at 20° (Wells, J Am Chem Soc 1915, 37 1705)

Solution in H_2O containing 27 2 g CaCl_2 per l contains 0 028 g Mg and 0 086 g CO_2 per l at 20° (Wells, J Am Chem Soc 1915, 37 1705)

+ H_2O
+ $2\text{H}_2\text{O}$ Decomp by suspension in H_2O into basic salt (Engel, C R 100 911)

+ $3\text{H}_2\text{O}$ Small quantities of this salt are wholly dissolved by much H_2O (Bine)

The solution contains in 100 pts at—

0° 6 5° 8° 16°
0 15 0 153 0 155 0 179 pts $\text{MgCO}_3 + \text{H}_2\text{O}$ (Noirgaard, 1850)

Decomp by boiling H_2O into a basic salt and CO_2 100 pts H_2O dissolve 0 1518 pt at 19° (Fritzsch, Pogg 37 304)

Sol in 48 pts H_2O , and decomp by large amt (Fourcroy)

100 pts H_2O dissolve 0 1518 pt at 1° , or sol in 658 pts H_2O at 19° (Beckurts, B 1881 212)

100 pts H_2O dissolve 0 0812 pt, calculated as MgO (Lubavin, J russ Soc 24 3)

Solution in H_2O contains 0 36 g Mg and 1 01 g CO_2 per l at 20° (Wells, J Am Chem Soc 1915, 37 1707)

Solubility in H_2O sat with CO_2 has been determined at 20° , 25° , 30° , 34° and

at CO_2 pressures corresponding with 0.5 to 30.3% CO_2 in the gas phase (Leather and Sen, Chem Soc 1915, 108 (2) 13)

Easily sol in acids even when dil

Not decomp by 1 pt $\text{H}_2\text{SO}_4 + 6$ pts alcohol, or by alcoholic solutions of glacial acetic, racemic, or tartaric acids, but is slowly decomp by alcoholic solution of citric acid, or $\text{HNO}_3 + \text{abs}$ alcohol (Butin, 1827)

100 pts $\text{NaCl} + \text{Aq}$ (2.525%) dissolve 0.1250 pt, calculated as MgO (Lubavin)

1% $\text{Na}_2\text{CO}_3 + \text{Aq}$, when mixed with 1% $\text{MgSO}_4 + \text{Aq}$, cause no ppt, but 1.5–2% solutions ppt this salt (Brandes, 1825)

More sol in $\text{NH}_4\text{Cl} + \text{Aq}$ than CaCO_3 Sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$, but less easily than in $\text{NH}_4\text{Cl} + \text{Aq}$

Solubility in $\text{KHCO}_3 + \text{Aq}$ at t°

Values are given in mol/litre

t°	K	Mg	Solid phase
15°	0 0	0 0095	$\text{MgCO}_3 + 3\text{H}_2\text{O}$
	0 0992	0 0131	
	0 1943	0 0167	
	0 3992	0 0211	
	0 2681	0 0192	
			labile
	0 5243	0 0097	$\text{MgCO}_3 + 3\text{H}_2\text{O} + \text{MgCO}_3$ $\text{KHCO}_3 + 4\text{H}_2\text{O}$ $\text{MgCO}_3 \cdot \text{KHCO}_3 + 4\text{H}_2\text{O}$
	0 6792	0 0074	
	0 9810	0 0028	
25°	0 0	0 0087	$\text{MgCO}_3 + 3\text{H}_2\text{O}$
	0 0985	0 0115	
	0 2210	0 0149	
	0 3188	0 0175	
	0 3434	0 0181	
	0 4216	0 0205	labile
	0 4985	0 0207	
	0 3906	0 0196	
	0 5893	0 0128	$\text{MgCO}_3 + 3\text{H}_2\text{O} + \text{MgCO}_3$ $\text{KHCO}_3 + 4\text{H}_2\text{O}$ $\text{MgCO}_3 \cdot \text{KHCO}_3 + 4\text{H}_2\text{O}$
	0 6406	0 0117	
	0 788	0 0089	
	1 125	0 0061	
35°	0 0	0 0071	$\text{MgCO}_3 + 3\text{H}_2\text{O}$
	0 1092	0 0098	
	0 2001	0 0132(?)	
	0 2811	0 0142	
	0 3704	0 016	
	0 4847	0 0177	labile
	0 5867	0 0195	
	0 5088	0 0154	
	0 6231	0 0153	$\text{MgCO}_3 + 3\text{H}_2\text{O} + \text{MgCO}_3$ $\text{KHCO}_3 + 4\text{H}_2\text{O}$ $\text{MgCO}_3 \cdot \text{KHCO}_3 + 4\text{H}_2\text{O}$
	0 8435	0 0119	

The experiments were performed in such a way as to prevent, as far as possible, loss of CO from the solutions

(Auerbach, Z Elektrochem 1904, 10 164)

11 H_2O , containing 6% $\text{MgSO}_4 + 7\text{H}_2\text{O}$ and

a little NaCl , dissolves 5 g MgCO_3 (Hunt, Sil Am J (2) 42 49)

More sol in cold alkali borates + Aq than in hot (Wittstein)

Sol in $\text{Na}_2\text{citrate} + \text{Aq}$

+ $4\text{H}_2\text{O}$ Efflorescent

+ $5\text{H}_2\text{O}$ Two modifications

α Plates Sol in 600 pts H_2O at $0-7^\circ$, solution gradually separates out $\text{MgCO}_3 + 2\text{H}_2\text{O}$ $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 3–4 atmos pressure dissolves 9% at $0-4^\circ$ $\text{MgSO}_4 + \text{Aq}$ dissolves 4% moist salt at 3–4°, and it is easily sol in Na_2CO_3 , or $\text{NaHCO}_3 + \text{Aq}$ (Norgaard)

β Prisms More efflorescent than α Sol in 600 pts H_2O but not in MgSO_4 , or $\text{Na}_2\text{CO}_3 + \text{Aq}$ Both forms are decomp by boiling H_2O (Norgaard)

Magnesium hydrogen carbonate,

$\text{MgH}_2(\text{CO}_3)_2(?)$

Known only in solution

1 l $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 1 atmos pressure dissolves 23.5 g MgCO_3 (Bineau)

1 l carbonic acid water dissolves 0.115 g magnesite at 18° and 0.75 m pressure (Cossa, B 2 697)

1 pt MgCO_3 dissolves in H_2O saturated with CO_2 at 5° and a pressure of—

1 2 3 4 5 6 atmospheres
in 161 144 134 100.7 110 76 pts H_2O

(Merkel, Techn J B 1867 213)

$\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 3–4 atmos pressure and $0-4^\circ$ dissolved 9% $\text{MgCO}_3 + 5\text{H}_2\text{O}$ (Norgaard)

$\text{MgCO}_3 + 3\text{H}_2\text{O}$ is sol in 72.4 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 20° and ord pressure, 30.5 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 2 atmos pressure, 26.0 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 3 atmos pressure, 21.1 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 4 atmos pressure, 17.09 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 5 atmos pressure (Beckurts, J B 1881 212)

1 H_2O sat with CO_2 at p pressure and t° dissolves p MgCO_3

p atmos	t	MgCO_3	p mm	t°	MgCO_3
1 0	19 5	27 79	751	13 4	28 45
2 1	19 5	33 11	760	19 5	25 79
3 2	19 7	37 3	762	29 3	21 95
4 7	19 0	43 5	764	46	15 7
5 6	19 2	46 2	764	62	10 4
6 2	19 2	48 51	765	70	8 1
7 5	19 5	51 2	765	82	4 9
9 0	18 7	56 5	765	91	2 4
			765	100	0 0

(Engel and Ville, C R 93 34)

The low figures of other observers are due to their using basic carbonates By very careful experiments it was found that 1 l H_2O

sat with CO_2 at 1 atmos pressure and t° dissolved the following amts of MgCO_3

t°	MgCO_3	t°	MgCO_3	t°	MgCO_3
3 5	35 6	18	22 1	40	22 1
12	26 5	30	15 8	50	9 5

(Engel, C R 100 444)

1 9540 g are sol 1 l H_2O at 15° (Treadwell and Reuter, Z anorg 1898, 17 202)

$\text{MgH}_2(\text{CO}_3)_2$ is not stable except in the presence of free CO_2

At 15° and 760 mm, a solution having the partial pressure of $\text{CO}_2=0$, contains 1 9540 g $\text{MgH}_2(\text{CO}_3)_2$ and 0 7156 g MgCO_3 per liter (Treadwell and Reuter, Z anorg 1898, 17 204)

Solubility of $\text{MgH}_2(\text{CO}_3)_2$ in H_2O containing carbonic acid, at 15°

% carbonic acid in the gas at 0° and 760 mm	partial pressure mm Hg	mg free CO_2	mg $\text{MgH}_2(\text{CO}_3)_2$ in 100 cc of the solution	mg MgCO_3 in 100 cc of the solution	mg Mg
18 86	143 3	119 0	1210 5		201 6
5 47	41 6	86 6	1210 5		201 6
4 45	33 8	223 5	1210 5		201 6
1 54	11 7		1076 6	77 3	201 6
1 35	10 3		762 9	76 5	149 2
1 07	8 2		595 2	80 7	122 4
0 62	4 7		366 3	70 1	86 5
0 60	4 6		341 7	75 8	78 8
0 33	2 5		263 2	74 8	65 5
0 21	1 6		222 9	77 1	59 4
0 14	1 1		216 9	71 0	56 6
0 03	0 3		203 6	71 1	54 5
			203 3	68 5	53 6
			196 0	70 2	52 9
			203 6	62 5	52 0
			195 4	61 6	51 1
			195 4	64 1	51 8

(Treadwell and Reuter, Z anorg 1898, 17 200)

No bicarbonate of magnesium is formed under pressures of CO_2 up to five atmospheres at 0° (Cameron, J phys Chem 1908, 12 570)

A critical analysis and recalculation of results of Engel and others is given by Johnston (J Am Chem Soc 1915, 37 2001)

Solubility in $\text{NaCl}+\text{Aq}$ at 23°C in equilibrium with an atmosphere of CO_2

g NaCl per liter	g $\text{Mg}(\text{HCO}_3)_2$ per liter
7 0	30 64
56 5	30 18
119 7	27 88
163 9	24 96
224 8	20 78
306 6	10 75

(Cameron and Seidell, J phys Chem 1903, 7 582)

Solubility in $\text{Na}_2\text{SO}_4+\text{Aq}$ at 23°C in equilibrium with an atmosphere of CO_2

Strength of $\text{Na}_2\text{SO}_4+\text{Aq}$	g $\text{Mg}(\text{HCO}_3)_2$ in 100 m
0 0	1 463
12%	1 916
saturated	1 612

(Cameron and Seidell)

Magnesium potassium carbonate,
 $\text{MgK}_2(\text{CO}_3)_2+4\text{H}_2\text{O}$

Quickly decom by cold H_2O (Dele, A ch (3) 33 87)

Ppt Decom by H_2O (Reynolds, C m Soc 1898, 73, 264)

$\text{MgKH}(\text{CO}_3)_2+4\text{H}_2\text{O}$ Insol in H_2O but decom thereby into an insol basic Mg carbonate, and $\text{MgH}_2(\text{CO}_3)_2$ and KHCO_3 , which dissolve (Berzelius)

Magnesium rubidium hydrogen carbonate,
 $\text{MgRbH}(\text{CO}_3)_2+4\text{H}_2\text{O}$

Decomp in the air (Erdmann, A 97, 294 75)

Magnesium sodium carbonate, MgCO_3
 Na_2CO_3

Quickly decom with H_2O (Deville, A ch (3) 33 89)

+15 H_2O (Norgaard)

Magnesium sodium carbonate sodium chloride, MgCO_3 , Na_2CO_3 , NaCl

Decomp by H_2O (de Schulten, C R 1896, 122 1427)

Manganous carbonate, MnCO_3

Permanent Practically insol in H_2O sol in $\text{H}_2\text{CO}_3+\text{Aq}$ and in acids generally

1 l H_2O dissolves 0 065 g at 25° (A no and Valla, Att Accad Linc 1911 20, II 6)

Insol in liquid NH_3 (Franklin, Am J 1898, 20 828)

Insol in ethyl acetate (Naumann B 1910, 43 314)

Min *Rhodochroste*

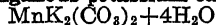
+ $\frac{1}{2}$, or 1 H_2O Insol in H_2O So in acids Sol in $\text{H}_2\text{CO}_3+\text{Aq}$ 1 pt MnCO_3 requires 2000 pts $\text{H}_2\text{CO}_3+\text{Aq}$ for solution

(Lassaigne) Sol in 7680 pts H_2O , and 3840 pts H_2O containing CO_2 (Jahn) When freshly precipitated is sol in NH_4 salts + Aq (Wittstein) Not more sol in H_2O containing Na_2CO_3 or K_2CO_3 than in pure H_2O (Ebelmen) Insol in NH_4Cl , or NH_4NO_3 + Aq (Brett)

Sol in ferric salts + Aq, with evolution of CO_2 and pptn of $Fe_2C_6H_5$ (Fuchs)

Not pptd in presence of Na citrate (Spiller)

Manganous potassium carbonate,



Ppt Decomp by H_2O alone

Sl sol in $Mn(C_2H_3O_2)_2$ + Aq or K_2CO_3 + Aq (Reynolds, Chem Soc 1898, 73 264)

Manganous carbonate hydroxylamine,



Ppt Sol in acids (Goldschmidt and Syngros, Z anorg 5 138)

Mercurous carbonate, Hg_2CO_3

Ppt Decomp by hot H_2O Sol in hot or warm NH_4Cl + Aq, but less easily than mercuric carbonate, less sol in NH_4NO_3 + Aq (Brett, 1837)

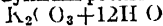
Sl sol in K_2CO_3 + Aq, partially sol with decomp in NH_4OH + Aq (Wittstein)

Mercuric carbonate, basic, $4HgO, CO$

Can be washed with cold H_2O without decomp (Millon, A ch (3) 19 368)

$3HgO, CO_2$ Insol in cold H_2O Sol in CO_2 + Aq, sl sol in K_2CO_3 + Aq Easily sol in NH_4Cl + Aq (Berzelius)

Neodymium potassium carbonate, $Nd_2(CO_3)_3, K_2O$



Ppt Sol in 30% K_2CO_3 + Aq (Meyer, Z anorg 1904, 41 105)

Neodymium sodium carbonate, $2Nd_2(CO_3)_3, 3Na_2CO_3 + 22H_2O(?)$

Ppt Easily decomp

Sl sol in conc Na_2CO_3 + Aq (Meyer, Z anorg 1904, 41 106)

Nickel carbonate, basic, $3NiO, CO_2 + 5H_2O$

Min Zarautic Easily sol in HCl + Aq

Pptd nickel carbonate is a basic salt of varying composition Insol in H_2O or H_2CO_3 + Aq Sol in acids Sol in $(NH_4)_2CO_3$ + Aq,

very sl sol in Na_2CO_3 + Aq, sol in warm NH_4Cl + Aq, and KCN + Aq (Rose)

Not pptd in presence of Na citrate (Spiller)

Nickel carbonate, $NiCO_3$

1 l H_2O dissolves 0.0925 g at 25% (Agno and Valla, Att Accad Linc 1911, 20, II 706)

Not attacked by cold conc HCl , or HNO_3 + Aq (Senarmont, A ch (3) 30 138)

+ $6H_2O$ Sol in acids (Deville, A ch (3) 35 446)

See also Carbonate, nickel, basic

Nickel potassium carbonate, $NiCO_3, K_2CO_3 + 4H_2O$

Ppt (Deville, A ch (3) 33 96)

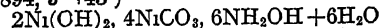
$NiCO_3, KHCO_3 + 4H_2O$ Decomp by H_2O , but may be washed by $KHCO_3$ + Aq without decomp (Rose, Pogg 84 566)

Nickel sodium carbonate, $NiCO_3, Na_2CO_3 + 10H_2O$

Ppt (Deville)

Nickel carbonate hydroxylamine, $2Ni(OH)_2, 4NiCO_3, 5NH_3OH + 7H_2O$

Ppt (Goldschmidt and Syngros, Z anorg 1894, 5 143)



Ppt (Goldschmidt and Syngros)

Palladium carbonate, $PdCO_3, 9PdO + 10H_2O$

Insol in H_2O , partly sol in NH_4OH + Aq, sl sol in Na_2CO_3 + Aq, sol in acids (Kane, 1842)

Potassium carbonate, K_2CO_3

Deliquescent Verv sol in H_2O with evolution of heat

Sol in 1.05 pts H_2O at 3 0.962 pt at 6 0.900 pt at 12.6 0.747 pt at 26 and 0.490 pt at 70 (Osann)

Sol in 0.92 pt H_2O (M R and P)

Sol in 0.922 pt H_2O at 15 (Gerlach)

Sol in 1 pt H_2O (Ahl)

100 pts H_2O at 15 dissolves 100 pts K_2CO_3 (Ure's Dict)

Solubility in 100 pts H_2O at t°

t°	100 pts K_2CO_3	t	100 pts K_2CO_3	t	100 pts K_2CO_3
0	83 12	40	106 20	80	134 25
10	88 72	50	112 90	90	143 18
20	94 06	60	119 24	100	153 66
30	100 09	70	127 16	135	205 11

(Poggiale, A ch (3) 8 468)

Solubility in 100 pts H_2O at t°

t°	Pts K CO ₃	t°	Pts K CO ₃	t°	Pts K CO ₃
0	89.4	46	119	91	148
1	94	47	120	92	149
2	97	48	120	93	150
3	100	49	121	94	151
4	102	50	121	95	151
5	104	51	122	96	152
6	105	52	122	97	153
7	106	53	123	98	154
8	107	54	124	99	155
9	108	55	124	100	156
10	109	56	125	101	157
11	109	57	125	102	158
12	109	58	126	103	159
13	110	59	127	104	160
14	110	60	127	105	161
15	110	61	128	106	162
16	111	62	128	107	163
17	111	63	129	108	164
18	111	64	130	109	166
19	111	65	130	110	167
20	112	66	131	111	168
21	112	67	132	112	169
22	112	68	132	113	171
23	112	69	133	114	172
24	112	70	133	115	173
25	113	71	134	116	175
26	113	72	135	117	176
27	113	73	135	118	178
28	113	74	136	119	179
29	114	75	137	120	181
30	114	76	137	121	182
31	114	77	138	122	184
32	114	78	139	123	185
33	115	79	139	124	187
34	115	80	140	125	188
35	115	81	141	126	190
36	115	82	141	127	191
37	116	83	142	128	193
38	116	84	143	129	195
39	116	85	144	130	196
40	117	86	144	131	198
41	117	87	145	132	200
42	117	88	146	133	201
43	118	89	147	134	203
44	118	90	147	135	205
45	119				

(Mulder, Scheik Verhandel 1864 97)

112 g are sol in 100 g H_2O at 20° (Frankforter, J Am Chem Soc 1914, 36 1106)Sp gr of K CO₃ + Aq at 15

% K CO ₃	Sp gr	% K CO ₃	Sp gr
0.489	1.0048	11.748	1.1282
0.979	1.0098	12.727	1.1400
1.958	1.0108	13.706	1.1520
2.934	1.0299	14.685	1.1642
3.916	1.0401	15.664	1.1766
4.895	1.0505	16.643	1.1892
5.874	1.0611	17.622	1.2020
6.853	1.0719	18.601	1.2150
7.832	1.0829	19.580	1.2282
8.811	1.0940	20.559	1.2417
9.790	1.1052	21.538	1.2554
10.769	1.1166	22.517	1.2694

Sp gr of K₂CO₃ + Aq at 15° —Continued

% K CO ₃	Sp gr	% K CO ₃	Sp
23.496	1.2836	33.286	1.410
24.475	1.2980	34.265	1.430
25.454	1.3078	35.244	1.447
26.432	1.3177	36.223	1.465
27.412	1.3277	37.202	1.484
28.391	1.3378	38.181	1.504
29.360	1.3480	39.160	1.526
30.349	1.3585	40.139	1.550
31.328	1.3692	40.504	1.572
32.807	1.3803		

(Tünnerman)

Sp gr and boiling point of K₂CO₃ + Aq

% K ₂ CO ₃	Sp gr	B pt	% K ₂ CO ₃	Sp gr	B
4.7	1.06	100.56°	43.3	1.46	109
9.0	1.11	100.56	45.8	1.50	111
13.2	1.15	101.11	48.8	1.54	112
16.8	1.19	101.11	52.1	1.58	114
20.5	1.22	101.66	56.0	1.63	116
24.0	1.25	102.22	60.4	1.70	117
27.3	1.28	102.78	65.5	1.80	119
30.5	1.31	103.33	71.8	1.95	122
33.6	1.34	104.44	79.2	2.15	125
36.2	1.38	105.56	84.4	2.40	129
39.0	1.41	107.22	100.0	2.60	137
41.7	1.44	108.33			

(Dalton)

Sp gr of K₂CO₃ + Aq at 17.5°

% K CO ₃	Sp gr	% K ₂ CO ₃	Sp gr	% K ₂ CO ₃	Sp
1	1.009	19	1.182	36	1.33
2	1.018	20	1.192	37	1.35
3	1.027	21	1.203	38	1.37
4	1.036	22	1.213	39	1.40
5	1.045	23	1.224	40	1.42
6	1.054	24	1.235	41	1.44
7	1.064	25	1.245	42	1.46
8	1.073	26	1.256	43	1.48
9	1.082	27	1.267	44	1.50
10	1.092	28	1.278	45	1.52
11	1.102	29	1.289	46	1.54
12	1.112	30	1.300	47	1.56
13	1.122	31	1.312	48	1.58
14	1.132	32	1.323	49	0.5
15	1.141	33	1.334	50	1.54
16	1.151	34	1.345	51	1.56
17	1.161	35	1.357	52	1.58
18	1.172				

(Hager, Comm 1883)

The sp. gr. increases or diminishes between 8° and 20° by a decrease or increase of temperature of 1° by the following amounts—

% K CO ₃	Corr
40-50	0.0007
30-40	0.0005
20-30	0.0003
10-20	0.0002

(Hager)

Sp gr of $K_2CO_3 + Aq$ at 15°

% K_2CO_3	Sp gr	% K_2CO_3	Sp gr
1	1 00914	28	1 27893
2	1 01829	29	1 28999
3	1 02743	30	1 30105
4	1 03658	31	1 31261
5	1 04572	32	1 32417
6	1 05513	33	1 33573
7	1 06354	34	1 34729
8	1 07396	35	1 35885
9	1 08337	36	1 37082
10	1 09278	37	1 38279
11	1 10258	38	1 39476
12	1 11238	39	1 40673
13	1 12219	40	1 41870
14	1 13199	41	1 43104
15	1 14179	42	1 44388
16	1 15200	43	1 44573
17	1 16222	44	1 46807
18	1 17243	45	1 48041
19	1 18265	46	1 49314
20	1 19286	47	1 50588
21	1 20344	48	1 51861
22	1 21402	49	1 53135
23	1 22459	50	1 54408
24	1 23517	51	1 55728
25	1 24575	52	1 57048
26	1 25681	52 024	1 57079
27	1 26787		

(Gerlach, Z anal 8 279)

Sp gr of $K_2CO_3 + Aq$ at 15°

K CO	Sp gr	K CO	Sp gr
5	1 0419	30	1 3002
10	1 0919	40	1 4170
20	1 1920	50	1 5428

(Kohlrausch, W Ann 1879 1)

 $K_2CO_3 + Aq$ containing 10% K_2CO_3 boils at 100.8 $K_2CO_3 + Aq$ containing 20% K_2CO_3 boils at 102.2 $K_2CO_3 + Aq$ containing 30% K_2CO_3 boils at 104.5 $K_2CO_3 + Aq$ containing 40% K_2CO_3 boils at 108.6 $K_2CO_3 + Aq$ containing 50% K_2CO_3 boils at 115.2

(Gerlach)

Sat $K_2CO_3 + Aq$ containing 158 pts K_2CO_3 to 100 pts H_2O forms a crust at 126° , highest temp observed 149 (Gerlach, Z anal 26 427)

B-pt of $K_2CO_3 + Aq$ containing pts K_2CO_3 to 100 pts H_2O G=according to Gerlach (Z anal 26 459), L=according to Legrand (A ch (2) 59 438)

B pt	G	L
101°	11 5	13
102	22 5	22 5
103	32	31
104	40	38 8
105	47 5	46 1
106	54 5	53 1
107	61	59 6
108	67	65 9
109	73	71 9
110	78 5	77 6
111	83 5	83 0
112	88 5	88 2
113	93 5	93 2
114	98 5	98 0
115	103 5	102 8
116	108 5	107 5
117	113 5	112 3
118	117 5	117 1
119	122 5	122 0
120	127 5	127 0
121	132 5	132 0
122	137 5	137 0
123	142 5	142 0
124	147 5	147 1
125	152 5	152 2
126	158	157 3
127	163 5	162 5
128	169 5	167 7
129	175 5	172 9
130	181 5	178 1
131	187 5	183 4
132	193 5	188 8
133	199 5	194 2
133 3	202 5	
134		199 6
135		205 0

When $K_2CO_3 + Aq$ is sat with NH_3 , two layers form. When K_2CO_3 is added to $NH_4OH + Aq$, it dissolves with formation of two layers and evolution of NH_3 . The same takes place also when sat $K_2CO_3 + Aq$ and $NH_4OH + Aq$ are brought together (Girard, Bull Soc (2) 43 552)

Solubility of $K_2CO_3 + KHCO_3$ in H_2O at 0°

K per 100 cc solution		Sp gr
K_2CO_3	$KHCO_3$	
0 0	21 2	1 133
11 8	15 3	1 182
16 7	12 6	1 200
23 5	10 3	1 241
34 0	7 6	1 298
43 0	5 9	1 350
51 6	4 9	1 398
60 5	3 8	1 448
81 4	0 0	1 542

(Engel A ch 1888, (6) 13 348)

Equilibrium between K_2CO_3 and $KHCO_3$ in H_2O and in contact with the air System K_2CO_3 , $KHCO_3$, and CO_2 at $25^\circ C$

Grams atoms K per liter	Amount of solution used for titration cc	Amount K combined as K_2CO_3 Per cent	Amount K combined as $KHCO_3$ Per cent
0 393	5	77 5	22 5
0 553	2	83 9	16 1
1 025	2	86 8	13 2
1 865	2	91 4	8 6
2 820	2	89 0	11 0
3 710	2	88 6	11 4
4 310	1	89 6	10 4
5 695	1	88 7	11 3

(Cameron and Briggs, J phys Chem 1901, 5 546)

Solubility of $K_2CO_3 + Na_2CO_3$ in H_2O at 25°

g per 100 g solution		g per 100 g H O		Solid phase
K_2CO_3	Na_2CO_3	K_2CO_3	Na_2CO_3	
52 82	0	112	0	$K_2CO_3 \cdot 2H_2O$
52 0	1 0	110 7	2 2	
50 7	2 6	108 7	7 7	
49 0	4 6	107 5	10 0	
46 5	4 3	94 6	8 8	
46 2	5 2	94 8	10 6	$K_2CO_3 \cdot 2H_2O + Na_2CO_3 \cdot 12H_2O$
41 0	6 3	77 6	11 8	
37 7	7 0	68 3	12 6	
31 0	10 5	53 0	17 9	
29 8	11 3	50	19 1	
27 2	14 1	41 4	23 2	$Na_2CO_3 \cdot K_2CO_3 \cdot 12H_2O$
22 4	16 6	36 8	27 3	
19 8	18 7	32 1	30 3	
19 1	19 7	31 2	32 1	
15 1	23 2	24	37 6	
14 5	22 8	23 1	36 4	$Na_2CO_3 \cdot K_2CO_3 \cdot 12H_2O + Na_2CO_3 \cdot 10H_2O$
10 8	22 7	16 2	31 0	
10 7	22 4	16 0	33	
4 7	21 9	6 1	29 8	
0	22 71	0	29 37	

(Osaka, J Ind Chem Soc 1911, 32 870)

Solubility of $K_2CO_3 + Na_2CO_3$ in H_2O at 24°

In 1000 ccm H O		Solid phase
Na_2CO_3	K_2CO_3	
28 35		Na_2CO_3
354 2	150 03	"
369 7	226 6	"
363 0	243 5	$Na_2CO_3, K_2CO_3 \cdot 6H_2O$
330 8	282 7	"
273 8	344 9	"
187 2	483 9	"
130 0	921 5	"
137 9	982 6	"
112 3	1074 0	$Na_2CO_3, K_2CO_3 \cdot 6H_2O + Na_2CO_3$
95 2	1085 1	"
25 5	1108 6	K_2CO_3
	1125 7	"

(Kremann and Zitek, M 1909, 30 3 7)

Solubility of $K_2CO_3 + Na_2CO_3$ in H_2O at 10°

In 1000 ccm H O		Solid phase
Na_2CO_3	K_2CO_3	
119 8		Na_2CO_3
176 4	354 1	"
108	500 1	"
61 19	0052 9	Na_2CO_3, K_2CO_3
	1084 0	K_2CO_3

(Kremann and Zitek, M 1909, 30 3 1)

Solubility of $K_2CO_3 + KNO_3$ in H_2O at 52°

1 l of the solution contains	
Mol K_2CO_3	Mol KNO_3
0 00	3 217
0 59	2 62
1 35	1 97
2 10	1 46
2 70	1 14
3 58	0 79

(Loutch, C R 1900, 131 259)

Solubility of $K_2CO_3 + KNO_3$ in H_2O at 10°

In 1000 ccm H O		Solid phase
KNO_3	K_2CO_3	
208 9		KNO_3
26 62	1076 0	KNO_3, K_2CO_3
	1084 0	K_2CO_3

(Kremann and Zitek, M 1909, 30 3 5)

Solubility of $K_2CO_3 + KNO_3$ in H_2O at 24°

In 1000 com H_2O		Solid phase
KNO_3	K_2CO_3	
376 85		KNO
285 00	130 3	"
161 67	348 4	"
141 80	371 9	"
73 04	688 1	"
38 78	878 3	"
31 11	1112 2	KNO_3, K_2CO_3

(Kremann and Zitek, M 1909, 30 316)

Solubility of $K_2CO_3 + KCl$ in H_2O at 30°

$\% K_2CO_3$	$\% KCl$	Solid phase
53 27	0	$K_2CO_3, 1\frac{1}{2}H_2O$
52 22	1 03	$K_2CO_3, 1\frac{1}{2}H_2O + KCl$
51 66	1 07	KCl
* 1 64	26 22	KCl
0	28 01	"

* Author gives intermediary data
(de Waal, Dissert 1910)Solubility of $K_2CO_3 + KOH$ in H_2O at 30°

$\% KOH$	$\% K_2CO_3$	Solid phase
55 75	0	KOH $2H_2O$
55 14	2 05	KOH $2H_2O + K_2CO_3, 1\frac{1}{2}H_2O$
53 77	2 50	$K_2CO_3, 1\frac{1}{2}H_2O$
* 0	53 27	$K_2CO_3, 1\frac{1}{2}H_2O$

* Author gives intermediary data
(de Waal, Dissert 1910)Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20, 828)

Sol in 9 pts alcohol of 17° B Insol in absolute alcohol

Not decomp by 1 pt $H_2SO_4 + 6$ pts absolute alcohol Not decomp by 1 pt $HNO_3 + 6$ pts absolute alcohol Not decomp by an alcoholic solution of HCl, oxalic, racemic, tartaric, or glacial acetic acids, but is decomp by alcoholic solution of citric acidSolubility in methyl alcohol Composition of liquids in equilibrium with solid K_2CO_3 at t°

t	Upper layer			Lower layer		
	$\% K_2CO_3$	$\% CH_3OH$	$\% H_2O$	$\% K_2CO_3$	$\% CH_3OH$	$\% H_2O$
-30	21 7	42 2	36 1			
-20	13 8	52 1	34 1			
20	12 4			44 2	8 2	47 6
0	7 6	66 3	26 1	46 3	6 7	47
0	7 4			46 6	6 6	46 8
+17	6 2	60 6	24 2	48 3	5 7	46
35	5 0	72 0	22 1		4 3	44 7

(de Bruyn, Z phys Ch 1900, 32 63 and ff)

Solubility in ethyl alcohol Composition of liquids in equilibrium with solid K_2CO_3 at t°

t	Upper layer			Lower layer		
	$\% K_2CO_3$	$\% C_2H_5OH$	$\% H_2O$	$\% K_2CO_3$	$\% C_2H_5OH$	$\% H_2O$
-18	0 03	90 3	9 7	51 2	0 2	48 6
0	0 04	91 2	8 1	51 3	0 2	48 5
+17	0 06	91 5	8 4	52 1	0 2	47 7
35	0 07	90 9	9	53 4	0 2	46 4
50	0 09	91 8	8 1	55 3	0 2	44 5
75	0 12	91 4	8 5	57 9	2 0	40 9

(de Bruyn)

Solubility in ethyl alcohol + Aq at 25°

When K_2CO_3 is dissolved in ethyl alcohol + Aq two layers are formed, the compositions of which are as follows

Upper layer			Lower layer		
$\% alcohol$	$\% H_2O$	$\% K_2CO_3$	$\% alcohol$	$\% H_2O$	$\% K_2CO_3$
81 25	18 61	0 14	0 82	55 42	43 76
71 67	27 91	0 42	1 79	61 61	36 60
56 98	41 55	1 47	4 02	65 73	30 25
53 92	44 13	2 05	4 88	66 87	28 25
50 91	47 94	2 55	5 54	67 06	27 41
4					
3					
28					

(Cuno, W Ann 1909, (4) 28 664)

Solubility of K_2CO_3 in alcohol + Aq at 30°

$\% K_2CO_3$	$\% Alcohol$	$\% H_2O$	Solid phase
53 27	0	46 73	$K_2CO_3, 1\frac{1}{2}H_2O$
53 09	0 1	46 81	"
		*	"
			"
0 13	90 49	9 38	$K_2CO_3, 1\frac{1}{2}H_2O$
			"
			"
0 04	99 92	0 04	$K_2CO_3 + K_2CO_3, 1\frac{1}{2}H_2O$

* Solution separates into two layers
(de Waal, Dissert Leiden, 1910)A full discussion of the solubility of K_2CO_3 in methyl, ethyl, propyl, isopropyl, and allyl alcohols is given by Frankforter and Frary (J phys Ch 1913, 17 402), and Frankforter and Temple (J Am Chem Soc 1915, 37 2697)

K_2CO_3 will "salt out" acetone from aqueous solution. The table shows the composition of the solutions at the points at which inhomogeneous solutions of K_2CO_3 , acetone and H_2O just become homogeneous at 20° 100 g of the solution contain

K_2CO_3	H_2O	acetone	K_2CO_3	H_2O	acetone
18 84	73 22	7 94	2 43	55 36	42 21
13 32	71 38	15 30	22 29	72 81	4 90
11 83	70 34	17 83	17 86	73 12	9 02
10 13	69 03	20 84	15 81	72 53	11 66
8 24	67 31	24 45	14 39	71 89	13 72
7 22	65 99	26 79	10 29	69 46	20 25
6 04	64 39	29 57	1 91	54 05	44 04
28 87	69 08	2 05	1 76	52 86	45 38
23 94	71 98	4 08	1 60	51 60	46 80
21 52	72 75	5 33	1 29	49 57	49 14
19 60	73 10	7 70	1 08	47 86	51 06
6 46	65 34	28 20	0 94	46 73	52 33
5 91	64 65	29 44	0 75	44 72	54 53
5 60	63 93	30 47	0 66	43 31	56 03
5 04	62 80	32 16	0 60	42 49	56 91
4 50	61 48	34 02	0 54	41 73	57 73
3 80	59 79	36 41	0 50	40 69	58 81
3 18	57 95	38 87	0 46	40 48	60 06
2 73	56 50	40 77			

(Frankforter and Cohen, J Am Chem Soc 1914, **36** 1121)

Insol in benzonitrile (Naumann, B 1914, **47** 1370)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1910, **34** 314)

Sol in phenol

Sol in 13.5 pts glycerine of 1.225 sp gr (Vogel, N Rept 16 557)

100 g sat K_2CO_3 + sugar + Aq contains 22.44 g K_2CO_3 and 56 g sugar at 31.25° (Kohler, Z Ver Zuckind 1897, **47** 447)

+ H_2O

+ $1\frac{1}{2}H_2O$ Very deliquescent (Pohl)

Deliquescent only in very moist air (Stedeler)

Sol in H_2O with evolution of heat (Pohl)

Sol at 17.6° with absorption of heat, at 32° with evolution of heat, and at 25° with neither absorption nor evolution of heat (Berthelot, C R **78** 1722)

Sat solution of $K_2CO_3 + 1\frac{1}{2}H_2O$ in H_2O contains 53.27 g anhydrous K_2CO_3 in 100 g solution at 30° (de Wail, Dissert 1910)

+ $2H_2O$ Salt usually given as containing $1\frac{1}{2}H_2O$ contains $2H_2O$ (Gerlach, Z anal **26** 460)

Sat solution of $K_2CO_3 + 2H_2O$ contains 112 g anhydrous K_2CO_3 in 100 g H_2O at 25° (Osaki, J Tok Ch Soc 1911, **32** 870)

+ $4H_2O$ Not deliquescent in closed vessels (Gerlach, l c)

Potassium hydrogen carbonate, $KHCO_3$

Not deliquescent

Sol in 3.5 pts H_2O at 15° (Redwood) Sol in 4 pts H_2O at moderate temperatures (Bergmann in 0.8333 pt boiling H_2O (Pelletier) in 4 pts col 1.2 pts boiling H_2O (M R and P s Pharm) 4 pts H_2O at 18.75° (Abt) 100 pts H_2O at dissolve 30 pts and at 100 83 pts (Ure's Diet 100 pts H_2O at 10-11.2° dissolve 26.1 pts K and the sp gr of solution is 1.1536 (Anthon 161 216)

100 pts H_2O dissolve at—

0°	10°	20°	30°
19 61	23 23	26 91	30 57 pts $KHCO_3$
40°	50°	60°	70°
34 15	37 92	41 35	45 24 pts $KHCO_3$

(Poggiale, A ch (3) 8 468)

100 pts H_2O dissolve pts $KHCO_3$ at

t°	Pts $KHCO_3$	t°	Pts K ₂	O ₃
0	22 4	40	45	
20	33 2	60	46	

(Dibbitts, J pr (2) 10 417)

Sp gr of $KHCO_3$ + Aq at 15° contains 5% $KHCO_3$ = 1.0328, containing 10% K_2CO_3 = 1.0674 (Kohlrausch, Z anal **28** 472)

Sol in 1200 pts boiling alcohol (Berthelot) Insol in alcohol (Dumas)

100 pts H_2O dissolve 19.3 pts $KHCO_3$ and 8.3 pts $NaHCO_3$ if the sat solution of is sat with former, and 26.1 pts $KHCO_3$ and 6.0 pts $NaHCO_3$ if the sat solution of the former is sat with the latter, all at 10° (Mulder, J B **1866** 67)

Insol in sat K_2CO_3 + Aq (Engel, C R **102** 365)

Solubility of $KHCO_3 + KNO_3$ in H_2O in atmosphere of CO_2

1 litre of the solution contains			
at 11°		at 20°	
Mol $KHCO_3$	Mol KNO_3	Mol $KHCO_3$	Mol KNO_3
0 60	2 33	0 00	3
0 39	2 17	0 59	2
0 76	2 03	1 53	2
1 16	1 92	1 91	2
1 55	1 81		

This case is complicated by the fact that KNO_3 is more sol in H_2O sat with CO_2 than in pure H_2O

(Louden, C R 1900, **131** 261)

Insol in benzonitrile (Naumann, B **47** 1370)

Insol in methyl acetate (Naumann, B 1909, **42** 3790) ethyl acetate (Naumann, B 1910, **43** 314)

Potassium praseodymium carbonate, K_2O_3 , $Pr(CO_3)_3 + 12H_2O$

Ppt Sol in 0% K_2CO_3 + Aq (Mey, Z inorg 1904, **41** 104)

Potassium samarium carbonate, K_2CO_3 , $Sm_2(CO_3)_3 + 12H_2O$
(Cleve)

Potassium silver carbonate, $KAgCO_3$
Decomp by H_2O (de Schulten, C R 105 811)

Ppt Decomp by H_2O (Reynolds, Chem Soc 1898, 73 265)

Potassium sodium carbonate, $KNaCO_3 + 6H_2O$

Slightly efflorescent Sol in 0.75 pt H_2O at 12.5° , in 0.54 pt H_2O at 15°

Sat solution at 15° has sp gr = 1.366 (Stolba, J pr 94 406)

Decomp by recrystallizing from H_2O , but crystallizes undecomposed from sat $K_2CO_3 + Aq$

Sol in H_2O (Osaka, C A 1911 2601)

See $K_2CO_3 + Na_2CO_3$ under $Na_2CO_3 + 3H_2O$ (Kremann and Zitek, M 1909

30 317) Does not exist (Osaka)

$K_2CO_3, 2Na_2CO_3 + 18H_2O$ Sl efflorescent Very sol in H_2O (Marignac)

Potassium stannous carbonate, K_2CO_3 , $2SnCO_3 + 2H_2O$

Decomp by H_2O (Deville)

Potassium uranyl carbonate, $2K_2CO_3$, $(UO_2)_2CO_3$

Sol without decomp in 13.5 pts H_2O at 15° , and in somewhat less warm H_2O Sol in boiling H_2O with decomp

More sol in K_2CO_3 , or $KHCO_3 + Aq$ than in H_2O (Rose)

Insol in alcohol (Ebelmen, A ch (3) 5 189)

Potassium zinc carbonate, $4K_2O$, $6ZnO$, $11CO_2 + 8H_2O$

Can be washed with cold H_2O without decomp (Deville, A ch (3) 33 99)

Praseodymium carbonate, $Pr_2(CO_3)_3 + 8H_2O$

Sol in H_2O (von Schule, Z anorg 1898, 18 362)

Praseodymium sodium carbonate, $2Pr_2(CO_3)_3, 3Na_2CO_3 + 22H_2O(?)$

Ppt Easily decomp (Meyer, Z anorg 1904, 41 105)

Radium carbonate

Less sol in H_2O than corresponding Ba comp (Curie, Dissert 1903)

Rubidium carbonate, Rb_2CO_3

Very deliquescent, and sol in H_2O 100 pts absolute alcohol dissolve 0.74 pt Rb_2CO_3 (Bunsen)

Rubidium hydrogen carbonate, $RbHCO_3$

Not deliquescent Easily sol in H_2O (Bunsen)

Samarium carbonate, $Sm(CO_3)_3 + 3H_2O$

Insol in H_2O (Cleve, Bull Soc (2) 43 168)

Samarium sodium carbonate, $Sm(CO_3)_3, Na_2CO_3 + 16H_2O$

Ppt (Cleve)

Scandium carbonate, $Sc(CO_3)_3 + 12H_2O$

(Crookes, Roy Soc Proc 1908, 80, A 518)

Scandium sodium carbonate, $Sc_2(CO_3)_3, 4Na_2CO_3 + 6H_2O$

Difficultly sol in H_2O

Sol in cold, less sol in hot alkali carbonates + Aq (R Meyer, Z anorg 1910, 67 410)

Silver carbonate, Ag_2CO_3

Somewhat sol in H_2O Sol in 31,978 pts H_2O at 15° (Kremers, Pogg 85 243) 1 g Ag_2CO_3 dissolves in 2 l boiling H_2O (Joulin, A ch (4) 30 260)

Solubility in H_2O at $25^\circ = 1.16 \times 10^{-4}$ mol/l (Spencer and Le Pla, Z anorg 1910, 65 14)

1 l H_2O at 25° dissolves 1.2×10^{-4} gram atoms of silver (Abegg and Cox, Z phys Ch 1903, 46 11)

Insol in $H_2CO_3 + Aq$ (Bergman) Sol in 961 pts $H_2CO_3 + Aq$ (Lassaigne) 1 l sat $H_2CO_3 + Aq$ dissolves 0.846 g Ag_2CO_3 at 15° (Johnson, C N 54 75)

Sol in $(NH_4)_2CO_3 + Aq$ or $NH_4OH + Aq$, sl sol in $K_2CO_3 + Aq$ (Wittstein) Easily sol in $Na_2S_2O_3 + Aq$ (Herschel, 1819) Sol in hot $NH_4Cl + Aq$, and sl sol in $NH_4NO_3 + Aq$ (Brett, 1837) Not pptd in presence of Na citrate (Spiller) Decomp by $HCl + Aq$, and chlorides + Aq

Somewhat sol in conc $NaNO_3 + Aq$ (de Coninck, Belg Acad Bull 1909, 333)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Insol in alcohol

Insol in methyl acetate (Naumann B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Silver carbonate ammonia

Easily sol in H_2O Sol in $NH_4OH + Aq$ from which it is precipitated by absolute alcohol (Berzelius)

$Ag_2CO_3, 4NH_3$ Ppt Insol in alcohol (Keen, C N 31 231)

Sodium carbonate, Na_2CO_3

Anhydrous Sol in H_2O with evolution of heat

Sol in 967 pts H_2O at 15° (Fuchs, 100 pt H_2O at 14.6° dissolve 7.74 pts Na_2CO_3 or 20.64 pt $Na_2CO_3, 10H_2O$ is sol in rather less than 1 pt boiling H_2O (Thomson 1831)
Sol in 2 pts H_2O (Berzeman)
Sol in 2 pts H_2O at 18.7° (Abel)

Solubility in 100 pts H₂O at t°

t°	Pts Na ₂ CO ₃	Pts Na ₂ CO ₃ + 10H ₂ O	t°	Pts Na ₂ CO ₃	Pts Na ₂ CO ₃ + 10H ₂ O
0	7 08	21 52	25	35 90	171 33
10	16 66	61 98	30	35 90	241 57
20	30 83	123 12	104 6	48 50	420 68

(Poggiale A ch (3) 8 468)

Possesses four different degrees of solubility, according to different states of mole constitution and degrees of hydration (Lowel, A ch (3) 44 330)

Little more sol at 34-38° than at 104° maximum of solubility is probably at (Lowel) 5°

Solubility of Na₂CO₃, Na₂CO₃+10H₂O, Na₂CO₃+7H₂O (a), and Na₂CO₃+7H₂O (b) in 20

t°	Sat solution of Na ₂ CO ₃ +10H ₂ O contains—		Sat solution of Na ₂ CO ₃ +7H ₂ O (b) contains—			Sat solution of Na ₂ CO ₃ +7H ₂ O (a) contains—			+ m H ₂ O
	Pts	Pts Na ₂ CO ₃ + 10H ₂ O in 100 pts H ₂ O	Pts Na ₂ CO ₃ in 100 pts H ₂ O	Pts Na ₂ CO ₃ + 7H ₂ O (b) in 100 pts H ₂ O	Pts Na ₂ CO ₃ + 10H ₂ O in 100 pts H ₂ O	Pts Na ₂ CO ₃ in 100 pts H ₂ O	Pts Na ₂ CO ₃ + 7H ₂ O (a) in 100 pts H ₂ O	Pts Na ₂ CO ₃ + 10H ₂ O in 100 pts H ₂ O	
0	6 97	21 33	20 39	58 93	84 28	31 93	112 94	188 7	
10	12 06	40 94	26 33	83 94	128 57	37 85	150 77	286 3	
15	16 20	63 20	29 58	100 00	160 51	41 55	179 90	381 9	
20	21 71	92 82	38 55	122 25	210 58	45 79	220 20	556 1	
25	28 50	149 13	38 07	152 36	290 91				
30	37 24	273 64	43 45	196 93	447 93				
38	51 67	1142 17							
104	45 47	539 63							

(Lowel, A ch (3) 33 382)

100 pts H₂O at 14° dissolve 60 4 pts Na₂CO₃+10H₂O, at 36°, 833 pts, at 104°, 445 pts Solubility increases to 36°, then diminishes (Payen, A ch (3) 43 233)

There are apparently two maxima of solubility, the one occurring at 15°, or even lower, as warm solutions cool, the other at 34-38°, when cold solutions are warmed (Payen, A ch (3) 44 330)

Solubility in 100 pts H₂O at t°

t°	Pts Na ₂ CO ₃	t	Pts Na ₂ CO ₃	t	Pts Na ₂ CO ₃
0	7 1	22	23 8	43	46 2
1	7 5	23	25 1	44	46 2
2	7 8	24	26 5	45	46 2
3	8 4	25	28 0	46	46 2
4	8 9	26	29 7	47	46 2
5	9 5	27	31 6	48	46 2
6	10 0	28	33 6	49	46 2
7	10 6	29	35 8	50	46 2
8	11 2	30	38 1	51	46 2
9	11 9	31	41 1	52	46 2
10	12 6	32	46 2	53	46 2
11	13 3	32 5	59 0	54	46 2
12	14 0	33	46 2	55	46 2
13	14 8	34	46 2	56	46 2
14	15 6	35	46 2	57	46 2
15	16 5	36	46 2	58	46 2
16	17 4	37	46 2	59	46 2
17	18 3	38	46 2	60	46 2
18	19 3	39	46 2	61	46 2
19	20 3	40	46 2	62	46 2
20	21 4	41	46 2	63	46 2
21	22 6	42	46 2	64	46 2

Solubility in 100 pts H₂O at t°—Continued

t	Pts Na ₂ CO ₃	t°	Pts Na ₂ CO ₃	t°	N ₂ O ₃
65	46 2	79	46 2	93	4 6
66	46 2	80	46 1	94	4 6
67	46 2	81	46 1	95	4 6
68	46 2	82	46 1	96	4 6
69	46 2	83	46 0	97	4 5
70	46 2	84	46 0	98	4 5
71	46 2	85	45 9	99	4 5
72	46 2	86	45 9	100	4 4
73	46 2	87	45 8	101	4 4
74	46 2	88	45 8	102	4 3
75	46 2	89	45 8	103	4 3
76	46 2	90	45 7	104	4 2
77	46 2	91	45 7	105	4 1
78	46 2	92	45 7		

(Mulder, Schenk Verhandl 1864 120)

Unable to form supersaturated solution
Supersat Na₂CO₃+Aq (2 pts Na₂CO₃+10H₂O 1 pt H₂O) may be kept in a closed vessel with cotton wool (Schroder) ask

When supersat Na₂CO₃+Aq is exposed to low temperatures, the 10H₂O salt crystallizes out, but under other circumstances two other salts are formed, each containing 7H₂O one is four times as sol at 10° as the 10H₂O salt, and the other twice as sol See above (Lowel, A ch (3) 33 337)

See also Na₂CO₃+H₂O, 7H₂O, and 10 H₂O

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 15°

% Na_2CO_3	Sp gr	% Na_2CO_3	Sp gr
0 372	1 0040	7 812	1 0892
0 744	1 0081	8 184	1 0937
1 116	1 0121	8 556	1 0982
1 488	1 0163	8 928	1 1028
1 850	1 0204	9 300	1 1074
2 232	1 0245	9 672	1 1120
2 504	1 0286	10 044	1 1167
2 976	1 0327	10 416	1 1214
3 348	1 0368	10 788	1 1261
3 720	1 0410	11 160	1 1308
4 090	1 0452	11 532	1 1356
4 464	1 0494	11 904	1 1404
4 836	1 0537	12 276	1 1452
5 208	1 0576	12 648	1 1500
5 580	1 0625	13 020	1 1549
5 972	1 0669	13 392	1 1598
6 324	1 0713	13 764	1 1648
6 396	1 0757	14 136	1 1698
6 768	1 0802	14 508	1 1748
7 440	1 0847	14 880	1 1816

(Tinnerman)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 15°

%	Sp gr if % is Na_2CO_3	Sp gr if % is $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$
1	1 0105	1 004
2	1 0210	1 008
3	1 0315	1 012
4	1 0420	1 016
5	1 0525	1 020
6	1 0631	1 023
7	1 0737	1 027
8	1 0843	1 031
9	1 0950	1 035
10	1 1057	1 039
11	1 1165	1 043
12	1 1274	1 047
13	1 1384	1 050
14	1 1495	1 054
15		1 058
16		1 062
17		1 066
18		1 070
19		1 074
20		1 078
21		1 082
22		1 086
23		1 090
24		1 094
25		1 099
26		1 103
27		1 106
28		1 110
29		1 114
30		1 119
31		1 123
32		1 126
33		1 130
34		1 135
35		1 139
36		1 143
37		1 147
38		1 150

(Gerlach, Z anal 8 279)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 17.5°

% Na_2CO_3	% $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$	Sp gr	% Na_2CO_3	% $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$	Sp gr
1	2 70	1 010	9	24 30	1 095
2	5 40	1 020	10	27 00	1 105
3	8 10	1 031	11	29 70	1 116
4	10 18	1 041	12	32 40	1 127
5	13 50	1 052	13	35 10	1 137
6	16 20	1 063	14	37 80	1 148
7	18 90	1 073	15	40 50	1 157
8	21 60	1 084			

(Hager)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ increases or diminishes by a change of temperature of 1° by the following amounts—

Corr	% Na_2CO_3
0 0004	13-15
0 00033	8-12
0 00026	3-7

(Hager, Comm 1883)

Sp gr of conc $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 30°

Sp gr	% Na_2CO_3	% Na_2CO_3 in 1 l	Sp gr	% Na_2CO_3	% Na_2CO_3 in 1 l
1 310	28 13	368 5	1 220	20 47	249 7
1 300	27 30	354 9	1 210	19 61	237 3
1 290	26 46	341 3	1 200	18 76	225 1
1 280	25 62	327 9	1 190	17 90	214 0
1 270	24 78	314 7	1 180	17 04	201 1
1 260	23 93	301 5	1 170	16 18	189 3
1 250	23 08	288 5	1 160	15 32	177 7
1 240	22 21	275 4	1 150	14 47	166 4
1 230	21 33	262 3	1 140	13 62	155 3

(Lunge, Chem Ind 1882 320)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 23°

% $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$	% Na_2CO_3	Sp gr	% $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$	% Na_2CO_3	Sp gr
1	0 370	1 0038	16	5 929	1 0628
2	0 741	1 0076	17	6 299	1 0668
3	1 112	1 0114	18	6 670	1 0708
4	1 482	1 0153	19	7 041	1 0748
5	1 853	1 0192	20	7 412	1 0789
6	2 223	1 0231	21	7 782	1 0836
7	2 594	1 0271	22	8 153	1 0871
8	2 965	1 0309	23	8 523	1 0912
9	3 335	1 0348	24	8 894	1 0953
10	3 706	1 0388	25	9 264	1 0994
11	4 076	1 0428	26	9 635	1 1035
12	4 447	1 0468	27	10 005	1 1076
13	4 817	1 0508	28	10 376	1 1117
14	5 188	1 0548	29	10 746	1 1158
15	5 558	1 0588	30	11 118	1 1200

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 23° —Continued

$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	Sp gr
31	11 488	1 1242	41	15 195	1 1662
32	11 859	1 1284	42	15 556	1 1704
33	12 230	1 1326	43	15 936	1 1746
34	12 600	1 1368	44	16 307	1 1788
35	12 971	1 1410	45	16 677	1 1830
36	13 341	1 1452	46	17 048	1 1873
37	13 712	1 1494	47	17 418	1 1916
38	14 082	1 1536	48	17 789	1 1959
39	14 530	1 1578	49	18 159	1 2002
40	14 824	1 1620	50	18 530	1 2045

(Schuff, A 113 186)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 23° a = number of grms $\times \frac{1}{2}$ mol wt, dissolved in 1000 grms H_2O , b = sp gr if $a = \text{Na}_2\text{CO}_3$, $10\text{H}_2\text{O}$ ($\frac{1}{2}$ mol wt = 143), c = sp gr if $a = \text{Na}_2\text{CO}_3$ ($\frac{1}{2}$ mol wt = 53)

a	b	c	a	b	c
1	1 048	1 052	5	1 163	1 226
2	1 086	1 100	6	1 182	
3	1 117	1 145	7	1 198	
4	1 142	1 187			

(Favre and Valson, C R 79 968)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 18°

$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{Na}_2\text{CO}_3}{+10\text{H}_2\text{O}}$	Sp gr
5	1 0511	15	1 1590
10	1 1044		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$

$\frac{\text{g equivalents}}{\text{Na}_2\text{CO}_3 \text{ per l}}$	t	Sp gr t/t
0 002524	16 004	1 0001418
0 005041	16 026	1 0002844
0 01006	16 049	1 000568
0 02501	16 028	1 001413
0 04954	16 050	1 002789
0 10188	16 030	1 005699
0 24646	16 041	1 013598
0 002628	16 051	1 0001473
0 003948	16 088	1 0002216
0 009182	16 081	1 0005181
0 01830	16 089	1 001033
0 10842	16 042	1 006048
0 21570	16 055	1 011910
0 4297	15 14	1 02346
2 5015	16 05	1 12533

(Kohlrausch, W Ann 1894, 53 26)

Sp gr of $\text{Na}_2\text{CO}_3 + \text{Aq}$ at t° H_2O at t° = 1

t°	$\% \text{Na}_2\text{CO}_3$	Sp gr
60°	28 74	1 297
	25 20	1 254
	22 25	1 219
	18 23	1 174
	14 06	1 127
80°	28 59	1 280
	18 26	1 160

(Wegscheider, M 1905, 26 690)

Sp gr of dil $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 20 004°
 Conc = g equiv Na_2CO_3 per l at 20 04°
 and 730 mm

Sp gr compared with H_2O at 20 004 - 1

Conc	Sp gr
0 0000	1 000,000,0
0 0001	1 000,005,6
0 0002	1 000,011,2
0 0004	1 000,022,5
0 0005	1 000,028,1
0 0010	1 000,056,3
0 0020	1 000,112,7
0 0040	1 000,225,8
0 0050	1 000,282,4
0 0100	1 000,564,8

(Lamb and Lee, J Am Chem Soc 1913 15 1685)

$\text{Na}_2\text{CO}_3 + \text{Aq}$ containing 5% Na_2CO_3 l at 100 5°, 10% Na_2CO_3 at 101 1°, 1% Na_2CO_3 at 101 8° (Gerlach)

Sat solution boils at 104 4° (Griffiths, 1825), 106° (Kremers), 104° (Payen)

Sat solution forms a crust at 104 1°, and contains 42 2 pts Na_2CO_3 to 100 pts H_2O , highest temperature observed, 105° (Gerlach, Z anal 26 427)

B-pt of $\text{Na}_2\text{CO}_3 + \text{Aq}$ containing pts Na_2CO_3 to 100 pts H_2O G = according to Gerlach (Z anal 26 458), L = according to Legrand (A ch (2) 59 426)

B pt	G	L	B pt	C	
100 5°	5 2	7 5	103 5°	36 2	4 0
101 0	10 4	14 4	104 0	41 2	4 7
101 5	15 6	20 8	104 5	46 2	4 9
102 0	20 8	26 7	104 6 3		4 5
102 5	26 0	32 0	105 0	51 2	
103 0	31 1	36 8			

Less sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ than in H_2O (Fresenius)

See also under Ammonia

Solubility of $\text{Na}_2\text{CO}_3 + \text{NH}_4\text{Cl}$ See un r

Ammonium Chloride

Solubility of $\text{Na}_2\text{CO}_3 + \text{K}_2\text{CO}_3$ See un r

Carbonate, potassium

The reciprocal solubility of sodium carbonate and sodium hydrogen carbonate in H_2O has been determined (de Paepe, C A 1911, 2603, and 1912, 2723)

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$ in H_2O at 25°

g per 100 g H_2O		Solid phase
NaHCO_3	Na_2CO_3	
0	28.3	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
2.1	27.3	"
4.2	26.5	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} + \text{NaHCO}_3$
5.7	19.2	NaHCO_3
7.3	12.4	"
9.0	6.2	"
10.1	1.0	"

(de Paepe, Bull Soc Chim Belg 1911, 25 174)

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$ in H_2O at 25°

g per l		Solid phase
NaHCO_3	Na_2CO_3	
98.7	0.0	NaHCO_3
50.8	216.6	$\text{NaHCO}_3 + \text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$
27.6	276.3	$\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
0.0	276.4	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

(McCoy and Test, J Am Chem Soc 1911, 33 474)

Equilibrium between Na_2CO_3 , NaHCO_3 and CO_2 . See under **Carbonate, sodium hydrogen**

Solubility of NaNO_3 in $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 10°

In 1000 ccm H_2O		Solid phase
NaNO_3	Na_2CO_3	
805.0		NaNO_3
704.8	87.5	$\text{NaNO}_3 + \text{Na}_2\text{CO}_3$
	119.8	Na_2CO_3

(Kremann, M 1909, 30 325)

Solubility of NaNO_3 in $\text{Na}_2\text{CO}_3 + \text{Aq}$ at 24.2°

In 1000 ccm H_2O		Solid phase
NaNO_3	Na_2CO_3	
913.58		NaNO_3
844.50	59.61	"
627.75	217.85	$\text{NaNO}_3 + \text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
544.3	246.30	$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
459.6	263.30	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
	28.55	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

(Kremann)

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaBr}$ in H_2O at 30°

Na_2CO_3	NaBr	Solid phase
27.98	0	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
27.54	2.41	
26.72	4.06	
26.23	6.26	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
23.40	11.00	$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
22.68	12.22	
19.86	16.88	
19.57	16.95	$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
18.11	19.32	$\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
8.45	33.39	
6.90	36.13	
3.04	44.75	
2.99	45.31	$\text{NaBr} \cdot 2\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$
2.60	45.68	$\text{NaBr} \cdot 2\text{H}_2\text{O}$
0	49.40	

(Cocheret, Dissert 1911)

Solubility in $\text{NaCl} + \text{Aq}$ 100 pts H_2O dissolve pts NaCl and pts $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$, when that salt is in excess at 15°

Pts NaCl	Pts $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$	Pts NaCl	Pts $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$
0.00	61.42	23.70	39.06
4.03	53.86	27.93	39.73
8.02	48.00	31.65	41.44
12.02	43.78	35.46	43.77
16.05	40.96	sat	
19.82	39.46	37.27	45.32

Solubility of anhydrous Na_2CO_3 in 100 pts $\text{NaCl} + \text{Aq}$ containing % NaCl at 15°

% NaCl	Pts Na_2CO_3	% NaCl	Pts Na_2CO_3
0	16.408	12	10.488
1	15.717	13	10.244
2	15.060	14	10.041
3	14.438	15	9.880
4	13.851	16	9.762
5	13.299	17	9.686
6	12.783	18	9.655
7	12.305	19	9.667
8	11.864	20	9.725
9	11.461	21	9.828
10	11.097	22	9.997
11	10.773		

(Reich, W A B 99, 2b 433)

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaCl}$ in H_2O at 30°

Na_2CO_3	NaCl	Solid phase
27.98	0	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
27.48	0.9	
27.12	3.33	
26.82	4.15	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
25.59	5.17	$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$
24.26	5.93	

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaCl}$ in H_2O at 30° —*Continued*

% Na_2CO_3	% NaCl	Solid phase
22 75	10 24	Na CO $7\text{H}_2\text{O}$ + Na $\text{CO}_3 \cdot \text{H}_2\text{O}$ Na $2\text{CO}_3 \cdot \text{H}_2\text{O}$ NaCl + Na $2\text{CO}_3 \cdot \text{H}_2\text{O}$ NaCl
20 72	11 49	
18 00	14 12	
14 81	16 26	
9 71	18 76	
5 05	21 94	
0	26 47	

(Cocheret, Dissert 1911)

Solubility of $\text{Na}_2\text{CO}_3 + \text{NaI}$ in H_2O at 30°

% Na_2CO_3	% NaI	Solid phase
27 4	0	Na $2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
26 5	2 4	
25 5	4 7	
25 2	5 2	
24 4	8 6	Na $2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ + Na $\text{CO}_3 \cdot 7\text{H}_2\text{O}$ Na $\text{CO}_3 \cdot 7\text{H}_2\text{O}$
24 3	9 5	
23 0	11 2	
20 8	14 0	
20 0	15 7	Na $\text{CO}_3 \cdot 7\text{H}_2\text{O}$ + Na $2\text{CO}_3 \cdot \text{H}_2\text{O}$ Na $\text{CO}_3 \cdot \text{H}_2\text{O}$
18 7	18 4	
15 3	25 4	
13 1	29 1	
10 4	33 3	
6 4	40 4	
4 2	46 0	
3 1	49 5	
2 7	51 0	
1 5	54 6	
0 9	57 6	
0 6	61 2	
0 3	65 6	Na $2\text{H}_2\text{O}$ + Na $\text{CO}_3 \cdot \text{H}_2\text{O}$ NaI $2\text{H}_2\text{O}$
0 0	65 5	

(Cocheret, Dissert 1911)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)Insol in liquid NH_3 (Franklin, Am Ch J 1893, 20 829)

Insol in alcohol (Fresenius)

Sl sol in absolute alcohol, apparently insol in an alcoholic solution of soap (Duffy, Chem Soc 5 305)

Solubility of Na_2CO_3 in ethyl alcohol at 20°

Alcohol wt percent	g Na_2CO_3 per 100 g solution
44	1 7
46	1 13
48	0 9
50	0 84
54	0 80

(Linebarger, A Ch J 1892, 14 380)

Solubility of Na_2CO_3 in alcohol + H_2O at 30°

% Na_2CO_3	% alcohol	Solid phase
27 4	0	Na $2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
26 61	2 64	
{ 26 14*	{ 3 41 }	
{ 1 38	{ 44 81 }	
0 62	52 99	Na $\text{CO}_3 \cdot 10\text{H}_2\text{O}$ + Na $2\text{CO}_3 \cdot 7\text{H}_2\text{O}$ Na $\text{CO}_3 \cdot 7\text{H}_2\text{O}$
0 61	53 26	
0 53	55 70	
0 51	56 56	
0 47	62 61	
0 40	63 20	
0 15	72 80	Na $2\text{CO}_3 \cdot 7\text{H}_2\text{O}$ + Na $2\text{CO}_3 \cdot \text{H}_2\text{O}$ Na $\text{CO}_3 \cdot \text{H}_2\text{O}$
0 11	73 06	
0 07	78 19	
0 07	82 26	
0 06	86 76	Na $\text{CO}_3 \cdot \text{H}_2\text{O}$ + Na 2CO_3 Na CO_3
0 06	90 95	
0 04	93 09	
0 03	95 06	
	95 65	
	98 46	

* Conjugated liquid phases
(Cocheret, Dissert 1911)See also under Na $2\text{CO}_3 + \text{H}_2\text{O}$, + $7\text{H}_2\text{O}$ at 1 + $10\text{H}_2\text{O}$ Not decomp by 1 pt H_2SO_4 + 6 pts absolute alcoholNot decomp by alcoholic solutions of racemic, tartaric, or glacial acetic acids, slowly decomp by HNO_3 + absolute alcoholSolubility of $\text{Na}_2\text{CO}_3 + \text{NaBr}$, NaCl and NaI in alcohol Numerical data given by Cocheret (Dissert 1911), reported in *Tableaux annuelles internationales des Constantes*, et for 1911Solubility of Na_2CO_3 in propyl alcohol at 20°

Alcohol wt percent	g Na_2CO_3 per 100 g solution
28	1 4
38	2 7
44	1 7
46	1 5
48	1 3
50	1 2
54	0 9
62	0 4

(Linebarger, A Ch J 1892, 14 380)

A full discussion of the solubility of NaCl in propyl and allyl alcohol is given by Franforter and Temple (J Am Ch Soc 1915, 3 2697)Insol in CS_2 (Arctowski, Z inorg 189, 6 257)

Insol in benzonitrile (Naumann, B 191, 47 1370)

Insol in methyl acetate (Naumann, 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602)

Solubility in mixtures of pyridine and H_2O from -65° to $+200^\circ$. Solubility curves are given (Lambosch, Chem Soc 1909, **96** (2), 472)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

100 g glycerine (sp gr = 1.262) dissolve 98.3 g Na_2CO_3 at $15-16^\circ$ (Ossendowski, Pharm J 1907, **79** 575)

100 g sat solution in glycol contain 3.28-3.4 g Na_2CO_3 (de Coninck, Bull Soc Belg 1907, **21** 141)

100 g sat Na_2CO_3 + sugar + Aq contain 6.89 g Na_2CO_3 + 64.73 g sugar at 31.25° (Kohler, Z Ver Zuckerind 1897, **47** 447)

+ H_2O . Takes up H_2O from the air. Less sol in H_2O at 104° than at 38° , at $15-20^\circ$, 100 pts H_2O dissolve 52.4 pts of this salt, calculated as Na_2CO_3 . Insol in alcohol (Lowell)

Solubility in 100 pts H_2O at t°

Corrected t° (Hydrogen scale)	Pts anhydrous salt
29 86	50 53
29 89	50 75
31 80	50 31
35 17	49 63
35 37	49 67
35 66	49 37
35 86	49 44
36 45	49 36
36 90	49 29
37 91	49 11
38 92	49 09
40 94	48 51
40 93	48 52
43 94	47 98

(Wells and McAdam, J Am Chem Soc 1907, **29** 726)

Solubility in alcohol + Aq

Composition of the alcohol and water layers in contact with the solid phase $Na_2CO_3 + H_2O$

t°	Alcohol layer			Water layer		
	c_1 alcohol	c_2 alt	% water	% alcohol	% salt	% water
68	55 8	0 9	43 3	2 3	28 8	68 9
49	61 0	0 4	38 6	1 2	31 5	67 3
40	61 0	0 4	38 6	1 2	31 9	66 9
36	62 0	0 3	37 7	1 1	32 1	66 8
35	62 9	0 3	36 8	1 0	32 4	66 6

(Ketner, Z phys Ch 1902, **39** 651)

+ 3H₂O (Schuckendantz, A 155 359)

+ 5H₂O (Persoz, Pogg 32 303)

Not efflorescent Sol in H_2O

+ 6H₂O (Mitscherlich, Pogg 8 441)

+ 7H₂O Efflorescent Two salts, 7H₂O

(b) (= + 8H₂O of Thomson), and 7H₂O

(a) See also under Na_2CO_3

Solubility in 100 pts H_2O at t°

Corrected t° (Hydrogen scale)	Pts anhydrous salt
30 35	43 50
31 82	45 16
32 86	46 28
34 37	48 22
34 76	48 98
35 15	49 23
35 17	49 34
35 62	50 08

(Wells and McAdam, J Am Chem Soc 1907, **29** 726)

Composition of the solutions which can be in equilibrium with $Na_2CO_3 + 7H_2O$ at different temperatures

t°	% Na_2CO_3
32 1	31 8
32 5	32 1
33 3	32 7
33 9	33 0
34 5	33 9

(Ketner, Z phys Ch 1902, **39** 646)

Composition of the alcohol and water layers in contact with the solid phase, $Na_2CO_3 + 7H_2O$, at different temperatures

t°	Alcohol layer			Water layer		
	c_1 alcohol	% salt	% water	% al cobol	% salt	c_2 water
33 2	58 1	0 5	42 4	1 4	31 0	67 6
32 3	56 1	0 6	43 3	1 5	30 2	68 3
31 9	54 8	0 7	44 5	1 7	29 8	68 5
31 45	53 5	0 7	45 8		29 3	
31 2	52 4	0 8	46 8		29 3	

(Ketner)

Composition of the two liquid layers which at different temperatures can be in metastable equilibrium with $Na_2CO_3 + 7H_2O$

t	Alcohol layer			Water layer		
	c_1 alcohol	% salt	% water	c_2 al cobol	c_1 salt	c_2 water
28 9	46 9	1 3	51 8	2 3	26 3	71 4
26 6	39 1	1 3	59 6	3 3	25 4	71 3
23 0	24 5	6 7	68 8	7 0	20 2	72 8

(Ketner)

+ 10H₂O Efflorescent Sol in 105 pts H_2O at 23° , and sat solution has sp gr 1.1995 (Scheff, A 109 326)

Melts in crystal H_2O at 34° (Tilden, Chem Soc 45 409)

See above under Na_2CO_3 for further data

Solubility in 100 pts H₂O at t°

Corrected t° (Hydrogen scale)	Pts anhydrous salt
27 84	34 20
29 33	37 40
29 85	38 89
30 35	40 12
31 45	43 25
31 66	43 95
31 72	44 21
32 06	45 64

(Wells and McAdam, J Am Chem Soc 1907, 29 726)

Sat solution at 25° contains 29 37 g anhyd Na₂CO₃ in 100 g H₂O (Osaka, J Tok Ch Soc 1911, 32 870)

Sat solution at 25° contains 28 3 g anhyd Na₂CO₃ in 100 g H₂O (de Paepe, Bull Soc Chim Belg 1911, 25 174)

Sat solution at 30° contains 27 4-27 98 g anhyd Na₂CO₃ in 100 g of the solution (Cocheret, Dissert 1911)

Sat solution at 25° contains 27 64 g anhyd Na₂CO₃ in 100 cc of the solution (McCoy and Test, J Am Chem Soc 1911, 33 474)

Solubility in alcohol

Composition of the alcohol and water layers in contact with the solid phase, Na₂CO₃+10H₂O, at different temperatures

t	Alcohol layer			Water layer		
	% alcohol	% salt	% water	% alcohol	% salt	% water
30 6	47 8	1 2	51 0	2 3	27 8	69 9
29 7	40 0	2 1	57 9	2 9	25 5	71 6
29 0	32 7	3 8	63 5	4 3	22 7	73 0
28 2	23 5	7 3	69 2	7 9	18 6	73 5

(Ketner, Z phys Ch 1902, 39 651)

Solubility in alcohol+Aq

Liquids which can be in equilibrium with Na₂CO₃+10H₂O at 21°

% alcohol	% salt	% water
0	18 5	81 5
6 2	12 7	81 1
15 3	6 9	77 8
26 1	3 2	70 7
39 2	1 2	59 6
58 2	0 2	41 6
67 1	0 1	32 8
73 3	0 06	26 64

(Ketner)

Composition of the alcohol liquids which be in equilibrium with Na₂CO₃+1 and Na₂CO₃+7H₂O at different temperatures

t°	% alcohol	% salt	% water
29°	62 3	0 3	37 4
26°	67 8	0 1	32 1
21°	73 3	0 06	26 6

(Ketner)

See also under Na₂CO₃+15H₂O (Jacquelin, A 80 241)

Sodium hydrogen carbonate, NaHCO₃

100 pts cold H₂O dissolve 7 7 pts NaHCO₃ (Schw J 6 52)

100 pts H₂O at 11 25° dissolve 8 27 pts NaHCO₃ form solution of 1 0613 sp gr (Anthon Dingl 216)

100 pts H₂O dissolve at—

0°	10°	20°	30°
8 95	10 04	11 15	12 24
40°	50°	60°	70°
13 35	14 45	15 57	16 69

pts NaHCO₃ (Poggiale, A ch (3) 8 468)

100 pts H₂O dissolve pts NaHCO₃ at °

t°	Pts NaHCO ₃	t°	Pts NaHCO ₃	t°	Pts NaHCO ₃
0	6 90	21	9 75	42	13 05
1	7 00	22	9 90	43	13 10
2	7 10	23	10 05	44	13 15
3	7 20	24	10 20	45	13 20
4	7 35	25	10 35	46	13 25
5	7 45	26	10 50	47	13 30
6	7 60	27	10 65	48	14 0
7	7 70	28	10 80	49	14 0
8	7 85	29	10 95	50	14 5
9	8 00	30	11 10	51	14 5
10	8 15	31	11 25	52	14 5
11	8 25	32	11 40	53	15 0
12	8 40	33	11 55	54	15 0
13	8 55	34	11 70	55	15 0
14	8 70	35	11 90	56	15 0
15	8 85	36	12 05	57	15 0
16	9 00	37	12 20	58	16 0
17	9 15	38	12 35	59	16 0
18	9 30	39	12 50	60	16 0
19	9 40	40	12 70		
20	9 60	41	12 90		

(Dibbitts, J pr (2) 10 417)

Experiments with solutions of sodium hydrogen carbonate show that they gradually decompose after a time (Freudwoll Z and 1898, 17 204)

The source of error of many solubility determinations of this substance is due to loss of CO₂. Solutions exposed to the air lose CO₂ (McCoy, Am Ch J 1903, 29 435)

1 l sat solution at 25° contains 98 4 g NaHCO₃ (McCoy and Test, J Am Chem Soc 1911, 33 474)

$\text{NaHCO}_3 + \text{Aq}$ sat at 16° has sp gr = 1.06904 (Stolba)
 Nearly insol in sat NaCl , or $\text{Na}_2\text{SO}_4 + \text{Aq}$ (Balmain, B 5 121)

Equilibrium between Na_2CO_3 and NaHCO_3 in H_2O and in contact with the air
 System Na_2CO_3 , NaHCO_3 , and CO_2
 Temperature, 25°C

Gram atoms Na per liter	Amount solution used for titration cc	Amount Na combined as Na_2CO_3 Per cent	Amount Na combined as NaHCO_3 Per cent
0.0044	50	8.7	91.3
0.0143	50		
	20	20.0	80.0
0.0562	20		
	10	37.3	62.7
0.2248	10		
	10	59.3	40.7
0.8847	2	64.0	36.0
	2		
	3		

Temperature, 37°C

Gram atoms Na per liter	Amount solution used for titration cc	Amount Na combined as Na_2CO_3 Per cent	Amount Na combined as NaHCO_3 Per cent
0.0019	50	10.5	89.5
	50		
0.0071	20	21.1	78.9
	20		
0.0276	10	41.3	58.7
	10		
0.030	10	64.5	35.5
	10		
0.421	2	81.9	18.1
	2		
0.815	2	86.5	13.5
	2		
1.795	2+	83.4	16.6
	2		

Temperature, 50°C

Gram atoms Na per liter	Amount solution used for titration cc	Amount Na combined as Na_2CO_3 Per cent	Amount Na combined as NaHCO_3 Per cent
0.0017	50	22.2	77.8
	2		
0.0071	20	32.9	67.1
	20		
0.0266	10	50.7	49.3
	20		
0.1011	10	70.0	30.0
	10		
0.4066	10	81.0	19.0
	2		
0.8068	2	86.8	13.2
	2		
1.7186	2.1	87.1	12.9
	2		

Temperature, 75°C

Gram atoms Na per liter	Amount solution used for titration cc	Amount Na combined as Na_2CO_3 Per cent	Amount Na combined as NaHCO_3 Per cent
0.003	50	25.7	74.3
	25		
0.019	20	34.8	65.2
	20		
0.036	10	55.7	44.3
	10		
0.270	5	79.5	20.5
	5		
0.702	1	85.0	15.0
	1		
6.56	1	84.8	15.2
	1		

System Na_2CO_3 and NaHCO_3 at 25°C

Total salts dissolved grams	Na_2CO_3		NaHCO_3	
	Weight Grams	Per cent	Weight Grams	Per cent
0.3555	0.0203	5.71	0.3352	94.29
1.1053	0.1505	13.62	0.9548	86.38
4.0443	1.1041	27.30	2.9402	72.70
14.6558	7.0212	47.91	7.6346	52.09
56.3982	29.8223	52.88	26.5759	47.12

(Cameron and Briggs, J phys Chem 1901, 5 540)

100 g alcohol of 0.941 sp gr dissolve 1.2 g NaHCO_3 at 15.5°

100 g glycerol dissolve 8 g NaHCO_3 at 15.5° (Ossendowski, Pharm J 1907, 79 575)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Sodium dihydrogen tricarbonatc,
 $\text{Na}_4\text{H}_2(\text{CO}_3)_3 + 3\text{H}_2\text{O}$

More sol than NaHCO_3 , less sol than Na_2CO_3 in H_2O (Rose, Pogg 34 160)

100 pts H_2O dissolve, calculated as $2\text{Na}_2\text{O}$, 3CO_2 —

at 0°	12.63 pts	at 60°	29.68 pts
" 10°	15.50 "	" 70°	32.55 "
" 20°	18.30 "	" 80°	35.8 "
" 30°	21.15 "	" 90°	38.63 "
" 40°	23.95 "	" 100°	41.59 "
" 50°	26.78 "		

(Poggiale, A ch (3) 8 468)

Min Froma, Urao Ste $\text{Na}_3\text{H}(\text{CO}_3)_2 + 2\text{H}_2\text{O}$

Sodium hydrogen carbonate, $\text{Na}_2\text{H}(\text{CO}_3)_2 + 2\text{H}_2\text{O}$

Sol in H_2O

True formula of "Trona" and "Urao" (Zepharovich, Zeit Kryst **13** 135, de Mondesir, C R **104** 1505)

Sodium thorium carbonate, $3\text{Na}_2\text{CO}_3, \text{Th}(\text{CO}_3)_2 + 12\text{H}_2\text{O}$

Decomp by H_2O (Cleve)

Sodium uranyl carbonate, $2\text{Na}_2\text{CO}_3, (\text{UO}_2)\text{CO}_3$

Slowly sol in H_2O Solution sat at 15° has sp gr = 1.161 (Anthon, Dingl **156** 207)

Sodium yttrium carbonate, $\text{Na}_2\text{CO}_3, \text{Y}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Ppt Not decomp by cold H_2O (Cleve)

Sodium zinc carbonate, $3\text{Na}_2\text{O}, 8\text{ZnO}, 11\text{CO}_2 + 8\text{H}_2\text{O} = 3\text{Na}_2\text{CO}_3, 8\text{ZnCO}_3 + 8\text{H}_2\text{O}$

Sl decomp by pure H_2O (Wohler)

Less easily decomp by H_2O than most double carbonates (Deville, A ch (3) **33** 101)

$\text{Na}_2\text{O}, 3\text{ZnO}, 4\text{CO}_2 + 3\text{H}_2\text{O}$ (Kraut, Z anorg **1897**, **13** 13)

Sodium carbonate sulphite, $\text{Na}_2\text{CO}_3, 2\text{Na}_2\text{SO}_3 + 21\text{H}_2\text{O}$

Sol in hot H_2O , sl sol in cold H_2O (Johnson, J Soc Chem Ind **1895**, **14** 271)

Strontium carbonate, SrCO_3

Sol in 18,045 pts H_2O at ordinary temp (Fresenius)

Sol in 12,522 pts H_2O at 15° (Kremers, Pogg **85** 247)

Sol in 33,000 pts H_2O (Bineau, C R **41** 511)

Less sol in H_2O than SrSO_4 (Dulong)

Sol in 1536 pts boiling H_2O (Hcpe, Edinb Trans **4** 5)

Calculated from electrical conductivity of $\text{SrCO}_3 + \text{Aq}$, SrCO_3 is sol in 121,760 pts H_2O at 8° and 91,468 pts at 24.3° (Holleman, Z phys Ch **12** 130)

1 l H_2O dissolves 11 mg SrCO_3 at 18° (Kohlrausch and Rose, Z phys Ch **12** 241)
"Solubility product" = 15.67×10^{-10} mol litic (McCoy and Smith, J Am Chem Soc **1911**, **33** 473)

Sol in 833 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ at 10° (Gmelin)

Sol in 56,545 pts H_2O containing NH_4OH and $(\text{NH}_4)_2\text{CO}_3$

Quite sol in $\text{NH}_4\text{Cl} + \text{Aq}$ or $\text{NH}_4\text{NO}_3 + \text{Aq}$, but reprecipitated on addition of NH_4OH and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Fresenius)

Partially decomp by boiling with aqueous solutions of K_2SO_4 , Na_2SO_4 , CaSO_4 , $(\text{NH}_4)_2\text{SO}_4$, MgSO_4 , Na_2HPO_4 , $(\text{NH}_4)_2\text{HPO}_4$, K_2SO_3 , Na_2SO_3 , $(\text{NH}_4)_2\text{SO}_3$, $\text{Na}_2\text{B}_4\text{O}_7$,

Na_2AsO_3 , K_2AsO_3 , $\text{K}_2\text{C}_2\text{O}_4$, $\text{Na}_2\text{C}_2\text{O}_4$, NaF and K_2CrO_4 Decomp is complete with the NH_4 salts (Dulong, A ch **82** 286)

Sl decomp by Na_2SO_4 , or $\text{K}_2\text{SO}_4 + \text{Aq}$ (Persoz)

Easily sol in NH_4 chloride, nitrate, or succinate + Aq , but less so than BaCO_3 (Fresenius) Sol in ferric salts + Aq , with pptn of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ Sol in Na citrate + Aq (Spiller) Not decomp by a mixture of 1 pt H_2SO_4 and 6 pts absolute alcohol, or by alcoholic solutions of tartaric, racemic, citric or glacial acetic acids, immediately decomp by HNO_3 + absolute alcohol, or $\text{H}_2\text{C}_2\text{O}_4$ + abs alcohol

Solubility of SrCO_3 in $\text{NH}_4\text{Cl} + \text{Aq}$

% NH_4Cl	% SrCO_3
5 35	0 179
10	0 259
20	0 358

(Cantoni and Goguelia, Bull Soc **1905**, (**33** 13)

Insol in liquid NH_3 (Franklin, Am Cl J **1898**, **20** 829)

Insol in methyl acetate (Naumann, J **1909**, **42** 3790), ethyl acetate (Naumann, B **1904**, **37** 3602)

Insol in acetone (Naumann, B **1904**, **3** 4329)

Insol in acetone and in methylal (Ermann, C C **1899**, II 1014)

Min *Strontianite*

Strontium hydrogen carbonate

SrCO_3 is sol in 850 pts of sat solution of CO_2 in H_2O

Strontium uranyl carbonate, $\text{SrO}, 2\text{UO}_3, 2\text{CO}_2 + 16\text{H}_2\text{O}$

As Ba comp (Blunkoff, Dissert **1900**)

Terbium carbonate

Ppt Insol in excess $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Potratz, C N **1905**, **92** 3)

Thallos carbonate, HlCO_3

100 pts H_2O dissolve pts HlCO_3 (C = according to Crookes, I = according to Lam) at—

15.5°	18°	62°	100°	100°S
4.2	5.23	12.85	27.2	22.4 pts HlCO_3
C	I	L	C	I

Insol in absolute alcohol (I), and ether (C)

Insol in acetone and pyridine (Naumann, B **1904**, **37** 4329)

Insol in methyl acetate (Naumann, B **1909**, **42** 3790)

Thallos carbonate, acid, $\text{HlO}, 2\text{CO}_2$

Rather easily sol in cold H_2O (Carstensen)

TIHCO₃ (Giorgis, Gazz ch it 1894, 24 474-479)

Thallous carbonate platinocyanide, $\text{Ti}_2\text{CO}_3 \cdot \text{Ti}_2\text{Pt}(\text{CN})_4$

Sl sol in hot, insol in cold H_2O (Friswell, Chem Soc (2) 9 461)

Thorium carbonate, basic, $2\text{ThO}_3 \cdot \text{CO}_2 + 3\text{H}_2\text{O}$

Insol in $\text{CO}_2 + \text{Aq}$, but sol in excess of alkali carbonates + Aq , if conc

Tin (stannous) carbonate, 2SnCO_3

Easily decomp on air, insol in H_2O or $\text{H}_2\text{CO}_3 + \text{Aq}$ (Deville, A ch (3) 35 448)

Uranyl carbonate, basic, $5(\text{UO}_2)(\text{OH})_2 \cdot 3(\text{UO}_2)\text{CO}_3 + 6\text{H}_2\text{O}$

Ppt (Seubert and Elten, Z anorg 1893, 4 80)

Ytterbium carbonate, basic, $\text{Yb}(\text{OH})\text{CO}_3 + \text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 146)

Ytterbium carbonate, $\text{Yb}_2(\text{CO}_3)_3 + 4\text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 146)

Yttrium carbonate, $\text{Y}_2(\text{CO}_3)_3 + 3\text{H}_2\text{O}$

Insol in H_2O , very sl sol in $\text{H}_2\text{CO}_3 + \text{Aq}$. Sol in $\text{SO}_2 + \text{Aq}$ and all mineral acids. Sol in NH_4 salts, and alkali carbonates + Aq to some extent. More sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ than in $\text{K}_2\text{CO}_3 + \text{Aq}$ (Berlin). More sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ than cerium, but 5 or 6 times less sol than glucinum carbonate (Vauquelin). Sol in large excess of $\text{KHCO}_3 + \text{Aq}$ (Rose). Slowly sol in NH_4 salts + Aq (Berzelius)

Zinc carbonates, basic, $8\text{ZnO} \cdot \text{CO}_2 + 2\text{H}_2\text{O}$, $5\text{ZnO} \cdot 2\text{CO}_2 + 3$, or $7\text{H}_2\text{O}$, $3\text{ZnO} \cdot \text{CO}_2 + \text{H}_2\text{O}$, $11\text{ZnO} \cdot 4\text{CO}_2 + 14\text{H}_2\text{O}$, $14\text{ZnO} \cdot 5\text{CO}_2 + 9\text{H}_2\text{O}$, $2\text{ZnO} \cdot \text{CO}_2 + \text{H}_2\text{O}$, $8\text{ZnO} \cdot 3\text{CO}_2 + 5\text{H}_2\text{O}$, etc

All ppts formed from Zn salts and carbonates + Aq . Sol in 2000-3000 pts cold H_2O , separates out on heating and does not redissolve on cooling (Schindler). Sol in 20,895 pts H_2O at 15° (Kremers, Pogg 85 248). Sol in 44,600 pts H_2O at ord temp (Fresenius)

Sol in 1428 pts sat $\text{H}_2\text{CO}_3 + \text{Aq}$ (Las saigne). Sol in 189 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 4-6 atmos (Wagner, Z anal 6 107). Easily sol in KOH , NaOH , NH_4OH , $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, and in acids. Somewhat sol in alkali bicarbonates and NH_4 salts + Aq (Fresenius). Sol in hot (Fuchs), also cold (Brett, 1837) $\text{NH}_4\text{Cl} + \text{Aq}$, less sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Sol in all NH_4 salts + Aq excepting $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Terrel, Bull Soc (2) 9 441)

Insol in Na CO_3 , or $\text{K CO}_3 + \text{Aq}$. Sol in ferric salts + Aq with pptn of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (Fuchs, 1831)

The carbonates described by Boussingault, Wackenroder, Rose, and probably all salts between ZnO , CO_2 and $5\text{ZnO} \cdot 2\text{CO}_2$ are mixtures (Kraut, Z anorg 1897, 13 1-15)

$3\text{ZnO} \cdot \text{CO}_2 + 2\text{H}_2\text{O}$ Min *Zinc bloom*, *Hydrozincite*

ZnCO_3 , $3\text{ZnO} \cdot \text{H}_2\text{O}$ Min *urincalcite*

Zinc carbonate, ZnCO_3

1 l H_2O at 15° dissolves 0.01 g, 1 l H_2O dissolves 1.64×10^{-4} mols, or 0.206 g ZnCO_3 at 25° (Ageno and Valla, Att acc Linc 1911, 20, II 706)

1 l 5.85% $\text{NaCl} + \text{Aq}$ dissolves 0.0586 g, 1 l 7.45% $\text{KCl} + \text{Aq}$ dissolves 0.0477 g ZnCO_3 (Essen, Gm -K 4, 1 680)

Sol in acids, $\text{KOH} + \text{Aq}$, and NH_4 salts + Aq

Sol in $\text{H}_2\text{CO}_3 + \text{Aq}$

Solubility in various salts + Aq

Solvent	g ZnCO_3 sol in 1 l of the solvent
10% $\text{NaNO}_3 + \text{Aq}$	0.058981
sat $\text{NaNO}_3 + \text{Aq}$	0.149000
5% $\text{NaCl} + \text{Aq}$	0.021730
10% $\text{NaCl} + \text{Aq}$	0.046564
sat $\text{NaCl} + \text{Aq}$	0.130380
10% $\text{Na}_2\text{SO}_4 + \text{Aq}$	0.009313
sat $\text{Na SO}_4 + \text{Aq}$	0.015521

(Ehlert, Z Elektrochem 1912, 18 728)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Min *Calamine*, *Smithsonite*

Calamine is sol in $\text{NH}_4\text{OH} + \text{Aq}$ only in the presence of NH_4 salts (Brandhorst, Zeit angew Ch 1904, 17 513)

$+ \frac{1}{2}\text{H}_2\text{O}$ (Mikusch, Z anorg 1908, 56 366)

$+ \text{H O}$ (Belar, Zeit kryst 1890, 17 126)

Zinc carbonate ammonia, $\text{ZnCO}_3 \cdot \text{NH}_3$

Slowly decomp by H O , but not on the air or by boiling with alcohol (Favre, A ch (3) 10 474)

Zinc carbonate hydroxylamine, $\text{ZnCO}_3 \cdot 2\text{NH}_2\text{O}$

Insol in H O . Decomp by acids (Goldschmidt and Syngros, Z anorg 5 129)

Zirconium carbonate, $3\text{ZrO} \cdot \text{CO} + 6\text{H}_2\text{O}$

Decomp by hot H O , all CO being given off (Hermann)

Sol in alkali carbonates + Aq

Percarbonic acid*See* Percarbonic acid**Carbonic anhydride, CO₂***See* Carbon dioxide**Carbonophosphoric acid****Potassium carbonophosphate, (K₂HPO₄)₂, 2CO₂, 2KHCO₃**

Known only in solution (Barillé, C R 1903, 137 566)

Carbonyl bromide, COBr₂Decomp by H₂O (Besson, C R 1895, 120 192)**Carbonyl platinumous bromide, CO, PtBr₂**Sol in H₂O with almost instant decomp
Sol in absolute alcohol (Pullinger, Chem Soc 59 603)Quite easily sol in hot C₆H₆, insol in ligroine, and can be crystallized from CCl₄
Very easily sol in HBr+Aq (Mylus and Forster, B 24 2432)**Carbonyl bromochloride, COClBr**

Decomp by H O (Besson)

Carbonyl chloride, COCl₂*Phosgene* Cold H₂O dissolves 1-2 vols COCl₂ gas with slow decomposition Alcohol decomp immediately Immediately absorbed by KOH, or NH₄OH+Aq Very sol in glacial HC₂H₃O₂, benzene, and most liquid hydrocarbons (Berthelot, Bull Soc (2) 13 14)Sol in SCl₂1 vol AsCl₃ absorbs 10 vols COCl₂**Dicarbonyl cuprous chloride, Cu₂Cl₂, 2CO + 4H₂O**

Decomp by air (Jones, Am Ch J 1899, 22 305)

Carbonyl platinumous chloride, 2COCl, PtClSl deliquescent Easily sol in H₂O without decomp, sl sol in alcohol Almost insol in CCl₄ (Pullinger, Chem Soc 59 600)**Monocarbonyl platinumous chloride, CO, PtCl**Decomp by H₂O and alcohol, sol in hot CCl₄ (Schutzenberger, A ch (4) 15 100)

Sol in conc HCl+Aq (Mylus and Forster)

Dicarbonyl platinumous chloride, 2CO, PtCl₂Decomp by H₂O and alcohol Sol in CCl₄ (Schutzenberger)Decomp by conc HCl+Aq into CO and CO, PtCl₂ (Mylus and Forster)**Sesquicarbonyl platinumous chloride, 3CO, 2PtCl₂**Decomp by H₂O or alcohol Much more sol in CCl₄ than 2CO, PtCl.**Carbonyl platinumous iodide, CO, PtI₂**Not hygroscopic Insol in, but slowly decomp by, H₂O Easily sol in benzene ether, also in alcohol, which decomp on warming, sol in HI+Aq (Mylus and Forster)**Carbonyl platinumous sulphide, CO, PtS**

Easily decomp Insol in ordinary solvents (Mylus and Forster)

Carbonyl sulphide, COSH₂O absorbs 1 vol COSAbsorption of COS by H₂O at t°

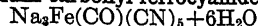
t°	Coefficient of absorption
0	1 333
10	0 835
20	0 561
30	0 403

(Winkler, Z phys Ch 1906, 55 351)

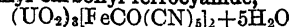
1 ccm H₂O at 13.5° and 756 mm pr dissolves 0.8 ccm COS (Hempel, Z angew ch 1901, 14 867)1 ccm of a hydrochloric acid solution of Cu₂Cl₂ absorbs about 0.2 ccm COS (Hempel)**Carbonyl ferrocyanhydric acid**H₃Fe(CO)(CN)₅Very sol in H₂O, decomp on heating (Muller, A ch (6) 17 94)**Cobalt carbonyl ferrocyanide**Sl sol in H₂O, very sol in dil HNO₃+ (M)**Cupric carbonyl ferrocyanide,**Cu₂[Fe(CO)(CN)₅]Insol in H₂O H₂SO₄ or dil HNO₃+ (M)**Iron (ferric) carbonyl ferrocyanide,**Fe₃[Fe(CO)(CN)₅]Insol in H₂O Sol in HCl O₄+Aq Insol in acetic, lactic, succinic, tartaric, and citric acids+Aq but easily sol in the neutral salts of those acids Insol in KCl, or KNO₃+Aq but sensibly sol in NaHPO₄+Aq Insol even on warming in very dil H₂SO₄ or H₂PO₄+Aq (Muller)**Potassium carbonyl ferrocyanide,**K₃Fe(CO)(CN)₅+3½H₂O100 pts H₂O dissolve 148 pts at 0° (Muller, C R 104 992)

Silver carbonyl ferrocyanide,

Insol in H_2O , sl sol in dil H_2SO_4 , HCl , or HNO_3 +Aq, scarcely attacked by conc HCl , H_2O_2 +Aq (Muller)

Sodium carbonyl ferrocyanide,

Sol in H_2O (Muller)

Uranyl carbonyl ferrocyanide,

Sl sol in H_2O , but more easily if H_2O is acidified with HCl , H_2O_2

Cericotungstic acid**Ammonium cericotungstate, $2(\text{NH}_4)_2\text{O}$, Ce_2O_3 , 16WO_3 + $2\text{H}_2\text{O}$**

Insol in H_2O , but decomp by boiling therewith (Smith, J Am Chem Soc 1904, 26 1481)

Cerium, Ce

Decomp pure H_2O very slowly at ordinary temp Not attacked by cold conc H_2SO_4 or red fuming HNO_3 Sol in dil H_2SO_4 +Aq, HNO_3 +Aq, and conc or dil HCl +Aq (Hillebrand and Norton, Pogg 155 633)

Cerous bromide, CeBr_3

Anhydrous As the chloride (Robinson, Proc Roy Soc 37 150)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Sol in methyl acetate (Naumann, B 1909, 42 379C)

+ $x\text{H}_2\text{O}$ Very deliquescent (John)

Cerium gold bromide, CeBr_3 , AuBr_3 + $8\text{H}_2\text{O}$

See Bromaurate, cerium

Cerium carbide, CeC_2

Decomp by fused alkali nitrates, chlorates, hydroxides and carbonates, and by conc H_2SO_4 on heating Insol in conc HNO_3 , decomp by H_2O and dil acids (Moissan, C R 1896, 122 359)

CeC_3 Not attacked by hot conc acids (Delafontaine, J B 1865 176)

Cerous chloride, CeCl_3

Anhydrous Deliquescent Sol in H_2O with hissing and evolution of heat, sol in alcohol

Sol in acetone (Eidmann, C C 1899, II 1614, Naumann, B 1904, 37 4328)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)

+ $7\text{H}_2\text{O}$ Insol in NH_4OH +Aq (Dennis, Z anorg 1894, 7 260)

+ $7\frac{1}{2}\text{H}_2\text{O}$ Deliquescent (Berzelius)

Decomp by boiling with H_2O Sol in 1 pt H_2O at ord temp and 3-4 pts alcohol (Dumas)

Ceric chloride

Known only in solution, which decomposes by slight heat (Berzelius)

Cerous mercuric chloride

Not deliquescent (v Bonsdorff)

CeCl_3 , 4HgCl_2 + $10\text{H}_2\text{O}$ Permanent, easily sol in H_2O (John, Bull Sec (2) 21 533)

Cerium stannic chloride

See Chlorostannate, cerium

Cerous chloride zinc iodide

Sol in H_2O and alcohol (Holzmann, J pr 84 76)

Cerous fluoride, CeF_3

Insol ppt

+ $\frac{1}{2}\text{H}_2\text{O}$

Ceric fluoride, CeF_4

Insoluble precipitate (Berzelius)

+ H_2O Insol in H_2O (Brauner, B 14 1944)

Ceric cobaltous fluoride, 2CeF_4 , CoF_2 + $7\text{H}_2\text{O}$

Ppt Easily decomp by H_2O (Rumbach, A 1909, 368 107)

Ceric cupric fluoride, 2CeF_4 , CuF_2 + $7\text{H}_2\text{O}$

Ppt Decomp by H_2O (Rumbach, l c)

Ceric nickel fluoride, 2CeF_4 , NiF_2 + $7\text{H}_2\text{O}$

Ppt Decomp by H_2O (Rumbach, l c)

Ceric potassium fluoride, 2CeF_4 , 3KF + $2\text{H}_2\text{O}$

Insol in H_2O (Brauner, B 14 1944, 15 109)

Could not be obtained pure (Rumbach, l c)

Ceric zinc fluoride, 2CeF_4 , ZnF_2 + $7\text{H}_2\text{O}$

Ppt Decomp by H_2O (Rumbach, l c)

Ceroceric fluoride 2CeF_3 , CeF_4

Min Fluocerite

Cerium hydride, CeH_2

Decomp by acids (Winkler, B 24 873)

CeH_3 Decomp in moist air, decomp by hot or cold H_2O , sol in acids with evolution of H_2 Decomp by alkalis (Muthmann, A 1902, 325 266)

Cerous hydroxide, Ce_2O_3 , $x\text{H}_2\text{O}$

Easily sol in acids Insol in excess of alkali hydroxides+Aq Sol in $(\text{NH}_4)_2\text{CO}_3$ +Aq

100 ccm of a solution in glycerine+Aq containing about 60% by vol of glycerine contain 7.9 g Ce_2O_3 (Muller, Z anorg 1905, 43 322)

Exists in two modifications one insol in

cold HCl+Aq, the other sol in cold HCl+Aq (Brauner, C N 1895, 71 283)

Ceric hydroxide, $2\text{CeO}_2, 3\text{H}_2\text{O}$

Sol in HNO_3 or H_2SO_4 , also in HCl+Aq, forming cerous chloride and free chlorine. Insol in hydrofluoric, acetic, or formic acids+Aq. Somewhat sol in dil HNO_3 , or HCl+Aq (Ordway, Am J Sci (2) 26 205). Insol in NH_4OH , KOH, and NaOH+Aq. Sol in alkali carbonates+Aq (Dumas).

Sl sol in $(\text{NH}_4)_2\text{CO}_3$ +Aq (Ordway). 100 cem of a solution in glycerine+Aq containing about 60% by vol of glycerine contain 0.08 g CeO_2 (Muller, Z anorg 1905, 43 232).

Cerous iodide, CeI_3

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4323).

+ $9\text{H}_2\text{O}$. Very deliquescent and sol in H_2O (Lange, J pr 82 134).

Sol in alcohol.

Cerium nitride, CeN

Decomp by H_2O and alkali. Sol in mineral acids with formation of cerous and ammonium salts (Muthmann, A 1902, 325 272).

Cerous oxide, Ce_2O_3

When ignited, insol in HCl+Aq, when long digested with H_2SO_4 , is sol in HCl+Aq with addition of alcohol.

Ceric oxide, CeO_2

When ignited, is only dissolved in traces, even on heating, by HCl or HNO_3 +Aq. Sol in conc H_2SO_4 when warmed. Sol in the cold in a solution of KI in HCl+Aq (Bunsen), in a mixture of HCl and FeCl_2 +Aq, or any reducing substance.

Cerium peroxide, Ce_2O_5

Insol in boiling conc acids. Sol in H_2SO_4 by long digestion (Popp, A 131 361).

Probably does not exist (Rammelsberg, Pogg 108 40).

Ce_2O_5 (Hermann, J pr 30 184).

Probably does not exist (Rammelsberg).

$\text{CeO}_2 + x\text{H}_2\text{O}$. Sol in HCl+Aq (Popp, A 131 361), (Lecoq de Boisbaudran, C R 100 605).

$\text{CeO}_2 + \text{H}_2\text{O}_2$, according to Cleve (Bull Soc (2) 43 57).

Cerium oxycarbide, $\text{CeC}_2, 2\text{CeO}_2$

Stable in the air. Slowly attacked by cold H_2O . With hot H_2O and with acids, it gives unsat hydrocarbons (Sterba, C R 1902, 134 1053).

Cerium oxychloride, CeOCl

Slightly attacked by hot conc HCl+Aq. Slowly sol in conc HNO_3 +Aq (Wohler).

Easily sol in dil acids (Didier, C R 1 1882).

Cerium oxychloride tungsten trioxide, $\text{CeO}_2, \text{WO}_3$

(Didier, C R 102 823).

Cerium selenide

Insol in H_2O , difficultly sol in acids (Berzelius).

Cerium silicide, CeSi_2

Insol in H_2O , by which it is acted upon only very slowly.

Sol in HCl and HF+Aq with evolution of H_2 .

Not attacked by alkalis+Aq or NH_4OH +Aq.

Insol in organic solvents (Sterba, C 1902, 135 170).

Cerium silicide, Ce_2Si_3

Insol in acids (Ullik, W A B 52, 115).

Cerium disulphide, Ce_2S_4

Not decomp by cold H_2O .

Slowly sol in cold dil H_2SO_4 , HCl and acetic acid. Rapidly sol in warm dil H_2SO_4 , HCl and acetic acid with decomp (Biltz, 1908, 41 3342).

Cerium sesquisulphide, Ce_2S_3

Insol in, and not decomp by H_2O , but easily decomp by the weakest acids (M sander), (Didier, C R 100 1161).

Monochloramine, NH_2Cl

Easily sol in H_2O (Ruschig, Ch Z 190 31 926).

Chlorotetraamine comps

See Chlorotetramine comps

Metachlorantimononic acid, $\text{HSbCl}_6 + 4\text{H}_2\text{O}$

Hydroscopic. Sol in H_2O with decomp. Sol in alcohol, acetone, and acetic acid (Weinland, Z anorg 1905 44 1).

Metachlorantimononic acid ammonia, $\text{HSbCl}_6, 2\text{NH}_3$

Sol in H_2O and in alcohol (Weinland and Schmid, Z anorg 1905, 44 59).

Aluminum metachlorantimonate, $\text{AlSbCl}_6 + 15\text{H}_2\text{O}$

Hydroscopic.

Sol in dil HCl+Aq (Weinland, B 190 36 254).

Ammonium metachlorantimonate , $\text{NH}_4\text{SbCl}_6 + \text{H}_2\text{O}$ Hydroscopic Sol in H_2O Solution decomp slowly when cold, rapidly on warming Sol in dil HCl (Weinland, B 1903, 36 251)	Sol in dil $\text{HCl} + \text{Aq}$ (Weinland, B 1903, 36 250)
Cadmium metachlorantimonate ammonia , $\text{Cd}(\text{SbCl}_6)_2 \cdot 7\text{NH}_3$ Ppt (Weinland and Schmid, Z anorg 1905, 44 56)	Rubidium metachlorantimonate , RbSbCl_6 Hydroscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland)
Calcium metachlorantimonate , $\text{Ca}(\text{SbCl}_6)_2 + 9\text{H}_2\text{O}$ Hydroscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland, B 1903, 36 253)	Silver metachlorantimonate ammonia , $\text{AgSbCl}_6 \cdot 2\text{NH}_3$ Decomp by H_2O (Weinland and Schmid)
Chromium metachlorantimonate , $\text{Cr}(\text{SbCl}_6)_3 + 13\text{H}_2\text{O}$ Hydroscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland)	Zinc metachlorantimonate ammonia , $\text{Zn}(\text{SbCl}_6)_2 \cdot 4\text{NH}_3$ (Weinland and Schmid)
Chromium orthochlorantimonate , $\text{CrSbCl}_5 + 10\text{H}_2\text{O}$ Hydroscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland)	Chlorarsenious acid <i>See Arsenyl chloride</i>
Cupric metachlorantimonate ammonia , $\text{Cu}(\text{SbCl}_6)_2 \cdot 5\text{NH}_3$ (Weinland and Schmid, Z anorg 1905, 44 55)	Chlorauric acid , $\text{HAuCl}_4 + 4\text{H}_2\text{O}$ Sol in H_2O , alcohol, and ether Sol in POCl_3 (Walden, Z anorg 1900, 25 212) Difficultly sol in PCl_3 (Walden) Cryst with $3\text{H}_2\text{O}$ as stated by Weber and Schottlander and not with $4\text{H}_2\text{O}$ as stated by Thomsen (Schmidt, C C 1906, II 855)
Glucium metachlorantimonate , $\text{Gl}(\text{SbCl}_6)_2 + 10\text{H}_2\text{O}$ Very hydropscopic Sol in dil HCl (Weinland, B 1903, 36 252)	Chloraurates All chloraurates are easily sol in H_2O and in alcohol (v Bonsdorff, 1829)
Iron (ferric) orthochlorantimonate , $\text{FeSbCl}_5 + 8\text{H}_2\text{O}$ Hydroscopic Can easily be cryst from dil $\text{HCl} + \text{Aq}$ (Weinland)	Ammonium chloraurate , $\text{NH}_4\text{AuCl}_4 + \text{H}_2\text{O}$ Very easily sol in H_2O $+ 2\text{H}_2\text{O}$ Very easily sol in H_2O
Lithium metachlorantimonate , $\text{LiSbCl}_6 + 4\text{H}_2\text{O}$ Very hydropscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland, l c)	Barium chloraurate , $\text{Ba}(\text{AuCl}_4)_2 + x\text{H}_2\text{O}$ Deliquescent in moist air Sol in H_2O and alcohol (v Bonsdorff, Pogg 17 261)
Magnesium pyrochlorantimonate , $\text{MgSbCl}_7 + 9\text{H}_2\text{O}$ Hydroscopic Sol in dil $\text{HCl} + \text{Aq}$ (Weinland)	Cadmium chloraurate Not deliquescent Sol in H_2O and alcohol (v Bonsdorff)
Nickel metachlorantimonate ammonia , $\text{Ni}(\text{SbCl}_6)_2 \cdot 6\text{NH}_3$ Sol in H_2O (Weinland and Schmid, Z anorg 1905, 44 57)	Cæsium chloraurate , CsAuCl_4 100 pts aqueous sat solution contain at 10° 20° 30° 40° 50° 0.5 0.8 1.7 3.2 5.4 pts anhydrous salt, 60° 70° 80° 90° 100° 8.2 12.0 16.3 21.7 27.5 pts anhydrous salt (Rosenblatt, B 19 2538) $+ \frac{1}{2}\text{H}_2\text{O}$ (Wells and Wheeler, Am J (3) 44 157)
Potassium metachlorantimonate , $\text{KSbCl}_6 + \text{H}_2\text{O}$ Hydroscopic Sol in H_2O Solution decomp slowly when cold rapidly when warmed	Calcium chloraurate , $\text{Ca}(\text{AuCl}_4)_2 + 6\text{H}_2\text{O}$ Deliquescent Sol in H_2O and alcohol (v Bonsdorff) Cerium chloraurate , $\text{CeCl}_3, \text{AuCl}_3 + 10\text{H}_2\text{O}$ Extremely deliquescent Easily sol in H_2O and absolute alcohol (Holzmann, C C 1863 206) $+ 13\text{H}_2\text{O}$ (John, Bull Soc (2) 21 534)

Cobalt chloraurate, $\text{Co}(\text{AuCl}_4)_2 + 8\text{H}_2\text{O}$ Sol in H_2O and alcohol (Topsoe)**Didymium chloraurate, $\text{DyCl}_3, \text{AuCl}_3 + 10\text{H}_2\text{O}$**

Very deliquescent (Cleve, Bull Soc (2) 43 361)

 $2\text{DyCl}_3, 3\text{AuCl}_3 + 20\text{H}_2\text{C}$ (Cleve)**Gadolinium chloraurate, $\text{GdCl}_3, \text{AuCl}_3 + 10\text{H}_2\text{O}$** Sol in H_2O (Benedicks, Z anorg 1900, 22 404)**Lanthanum chloraurate, $\text{LaCl}_3, \text{AuCl}_3 + 5\text{H}_2\text{O}$** Deliquescent in moist air Sol in H_2O (Cleve, B 8 128)**Lithium chloraurate, LiAuCl_4**

100 pts aqueous solution contain at

10°	20°	30°	40°
53 1	57 7	62 5	67 3

 pts anhydrous salt,

50°	60°	70°	80°
72 0	76 4	81 0	85 7

 pts anhydrous salt

(Rosenbladt)

+ $2\text{H}_2\text{O}$ (Antony and Lucchesi, Gazz ch it 1890, 20 601)+ $4\text{H}_2\text{O}$ Not stableSol in H_2O and alcohol (Fasbender, C C 1894, I 409)**Magnesium chloraurate, $\text{Mg}(\text{AuCl}_4)_2 + 8\text{H}_2\text{O}$** Somewhat deliquescent Sol in H_2O and alcohol (Topsoe)+ $12\text{H}_2\text{O}$ **Manganese chloraurate, $\text{Mn}(\text{AuCl}_4)_2 + 8\text{H}_2\text{O}$** Deliquescent Sol in H_2O and alcohol (Topsoe)+ $12\text{H}_2\text{O}$ **Nickel chloraurate, $\text{Ni}(\text{AuCl}_4)_2 + 8\text{H}_2\text{O}$** Deliquescent Sol in H_2O and alcohol (Topsoe)**Potassium chloraurate, KAuCl_4**

Anhydrous Very stable (Lainer, W A B 99, 2b 247)

100 pts solution in H_2O contain at

10°	20°	30°
27 7	38 2	43 7

 pts anhydrous salt,

40°	50°	60°
59 2	70 0	80 2

 pts anhydrous salt

(Rosenbladt, B 19 2538)

Sol in H_2O and alcohol, insol in ether (Fasbender, C C 1894, I 409)

1 pt is sol in 4 pts 98% alcohol (Fasbender, C C 1894, II 609)

+ $2\text{H}_2\text{O}$ Efflorescent+ $\frac{1}{2}\text{H}_2\text{O}$ **Praseodymium chloraurate, $\text{PrCl}_3, \text{AuCl}_3 + 10\text{H}_2\text{O}$** Very sol in H_2O , sol in conc HCl (v. Schule Z anorg 1898, 18 354)**Rubidium chloraurate, RbAuCl_4** 100 pts sat $\text{RbAuCl}_4 + \text{Aq}$ contain at

10°	20°	30°	40°	50°
4 6	9 0	13 4	17 7	22 2

 pts anhydrous sal

60°	70°	80°	90°	100°
26 6	31 0	35 3	39 7	44 2

 pts anhydrous sal

(Rosenbladt)

1 pt sol in 54 pts 98% alcohol Insol ether (Fasbender, C C 1894, II 609)

Samarium chloraurate, $\text{SmCl}_3, \text{AuCl}_3 + 10\text{H}_2\text{O}$ Deliquescent Easily sol in H_2O (Clev Bull Soc (2) 43 165)**Scandium chloraurate, $3\text{ScCl}_3, 2\text{AuCl}_3 + 21\text{H}_2\text{O}$**

Very deliquescent (Crookes, Phil Tran 1910, 210 A, 365)

Silver chloraurate, AgAuCl_4

Decomp in the air

Decomp by H_2O , HCl and NH_3 (Hermann, B 1894, 27 597)**Sodium chloraurate, $\text{NaAuCl}_4 + 2\text{H}_2\text{O}$** Easily sol in H_2O and absolute alcohol

100 pts aqueous solution contain at

10°	20°	30°
58 2	60 2	64 0

 pts anhydrous salt,

40°	50°	60°
69 4	77 5	90 0

 pts anhydrous salt

(Rosenbladt)

Easily sol in $\text{NaCl} + \text{Aq}$ Easily sol in H_2O , alcohol and ether (Fasbender, C C 1894, I 409)**Strontium chloraurate**Sol in H_2O (v Bonsdorff)**Thallium chloraurate**

(Carstensen)

Ytterbium chloraurate, $\text{YbCl}_3, \text{AuCl}_3 + 9\text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 138)

Yttrium chloraurate, $\text{YtCl}_3, 2\text{AuCl}_3 + 16\text{H}_2\text{O}$ Very sol in H_2O (Cleve)**Zinc chloraurate, $\text{Zn}(\text{AuCl}_4)_2 + 8\text{H}_2\text{O}$** Sol in H_2O (Topsoe)+ $12\text{H}_2\text{O}$ Sol in H_2O and alcohol (v Bonsdorff)

Chlorauricyanhydric acid**Barium chlorauricyanide**, $\text{Ba}[\text{Au}(\text{CN})_2\text{Cl}_2]_2 + 8\text{H}_2\text{O}$ Very sol in H_2O or alcohol (Lindbom, Lund Univ Arsk 12 No 6)**Potassium chlorauricyanide**, $\text{KAu}(\text{CN})_2\text{Cl}_2 + \text{H}_2\text{O}$ Very sol in H_2O or alcohol**Strontium chlorauricyanide**, $\text{Sr}[\text{Au}(\text{CN})_2\text{Cl}_2]_2 + 8\text{H}_2\text{O}$ Sol in H_2O **Zinc chlorauricyanide**, $\text{Zn}[\text{Au}(\text{CN})_2\text{Cl}_2]_2 + 7\text{H}_2\text{O}$ Very sol in H_2O **Chlorhydric acid, HCl***Liquid* Miscible with liquid CO_2 , and H_2S *Gas* Absorbed by H_2O with production of much heat H_2O absorbs 400–500 vols at ord temp and pressure or a little less than 1 pt. by weight (Dalton)1 vol H_2O absorbs 480 vols at 0° sp gr of sat solution is 1.2109 (Davy)1 vol H_2O absorbs 417 822 vols at 20 the vol in creasing to 1 4138 vols 1 vol of $\text{HCl} + \text{Aq}$ then contains 311 vols HCl has sp gr 1.1958 and contains 40 39% HCl by weight (Thomson 1831)1 vol H_2O absorbs 464 vols and sat solution has 1 21 sp gr and contains 42 4% HCl by weight (Wittstein) H_2O sat at 0 contains 480 times its vol of HCl and sp gr = 1.2109 sat at ord temp contains 38 3% of its weight in HCl and sp gr = 1.192 (Berzelius)1 vol H_2O absorbs 5 vols HCl at t° and 760 mm pressure and the liquid formed has the given sp gr and contains the given per cent HCl

t	V	Sp gr	% HCl
0	25.2	1.2257	45.148
4	494.7	1.2265	44.361
8	480.3	1.218	43.828
12	471.3	1.2148	43.277
16	462.4	1.2074	42.829
18	1.1.2	1.2064	42.344
18.2	1.30.7	1.20.6	42.283
24	1.3.0	1.20.4	41.536

(Ducke Table 119 106)

At 760 mm pressure 1 g H_2O absorbs g HCl at t°

t	g HCl	t	g HCl	t	g HCl
0	0.825	22	0.710	44	0.618
2	0.814	24	0.700	46	0.611
4	0.804	26	0.691	48	0.603
6	0.793	28	0.682	50	0.596
8	0.783	30	0.673	52	0.589
10	0.772	32	0.665	54	0.582
12	0.762	34	0.657	56	0.575
14	0.752	36	0.649	58	0.568
16	0.742	38	0.641	60	0.561
18	0.731	40	0.633		
20	0.721	42	0.626		

(Roscoe and Dittmar)

Conc $\text{HCl} + \text{Aq}$ loses HCl , and dil $\text{HCl} + \text{Aq}$ loses H_2O on warming, until an acid of constant composition is formed, containing 20 18% HCl , with a sp gr of 1.101 at 15° , which can be distilled unchanged at 110° (Bineau, A ch (3) 7 257)

The above is true if barometer is at 760 mm, but the composition changes with the pressure as follows—

Mm Hg	% HCl	Mm Hg	% HCl	Mm Hg	% HCl
50	23.2	800	20.2	1700	18.8
100	22.9	900	19.9	1800	18.7
200	22.3	1000	19.7	1900	18.6
300	21.8	1100	19.5	2000	18.5
400	21.4	1200	19.4	2100	18.4
500	21.1	1300	19.3	2200	18.3
600	20.7	1400	19.1	2300	18.2
700	20.4	1500	19.0	2400	18.1
760	20.24	1600	18.9	2500	18.0

(Roscoe and Dittmar)

Conc $\text{HCl} + \text{Aq}$ gradually gives off HCl on the air until it has a sp gr 1.128 at 15° , and contains 25 2% HCl (Bineau, l c)According to Roscoe and Dittmar, this depends on the temperature. If a current of air is passed through $\text{HCl} + \text{Aq}$, acid or water is given off according as the acid is strong or weak, until an acid of constant composition for a given temperature is formed, as follows—

Temp	% HCl	Temp	% HCl	Temp	% HCl
0°	25.0	35°	23.9	70°	22.6
5	24.9	40	23.8	75	22.3
10	24.7	45	23.6	80	22.0
15	24.6	50	23.4	85	21.7
20	24.4	55	23.2	90	21.4
25	24.3	60	23.0	95	21.1
30	24.1	65	22.8	100	20.7

From the above it is seen that the acid which distils unchanged at a given pressure, that is, boils at a certain constant temperature, is identical with the acid which undergoes no change in composition by a current of dry air at the same temperature, and under the ordinary pressure, thus—

Mm Hg	B pt	% HCl	Temp of air current	% HCl
100	61–62°	22.8	62°	22.9
200	76–77	22.1	77	22.2
300	84–85	21.7	85	21.7
380	91	21.3	91	21.4
490	97	20.9	98	21.1
620	103	20.6		

(Roscoe and Dittmar)

Solubility of HCl in H₂O at 0° under different degrees of pressure P=partial pressure in mm Hg, $\bar{e}$, total pressure minus the tension of aqueous vapour at the given temp., G=grammes of HCl dissolved in 1 g H₂O at the pressure P and 0° temp

P	G	P	G
60	0 613	350	0 751
70	0 628	400	0 763
80	0 640	450	0 772
90	0 649	500	0 782
100	0 657	550	0 791
110	0 664	600	0 800
120	0 670	650	0 808
130	0 676	700	0 817
140	0 681	750	0 824
150	0 686	800	0 831
175	0 697	900	0 844
200	0 707	1000	0 856
225	0 716	1100	0 869
250	0 724	1200	0 882
275	0 732	1300	0 895
300	0 738		

(Roscoe and Dittmar, A 112 334)

1 vol H₂O dissolves 560 vols HCl at -12°

" " 500 " " 0°

" " 440 " " +20°

(Berthelot, C R 76 779)

1 vol H₂O absorbs 480 vols HCl at 15° to form a solution containing 42.85% HCl with a sp gr of 1.215 (Hager)

Solubility of HCl at low temperatures, and 760 mm pressure

t	Pts HCl in 1 pt H ₂ O	t°	Pts HCl in 1 pt H ₂ O
0	0 842	-18	0 957
-5	0 864	-19	0 965
-10	0 898	-20	0 974
-15	0 933	-21	0 983
-17	0 949	-24	1 012

(Rooreboom, R t c 1884, 3 79)

Solubility in H₂O at t°

t	%HCl
50	61 65
45	61 76
40	62 27
35	62 90
30	63 21
20	64 19
15	64 70
10	65 18
5	65 48
0	65 85
-5	66 44
-10	66 71
-50	67 29
-20	67 65

(Rupert, J Am Chem Soc 1909, 31 860)

Sp gr of HCl+Ag

Sp gr	% HCl	Sp gr	% HCl	Sp gr	% H
1 203	40 66	1 1285	27 21	1 0960	20
1 179	37 00	1 1197	25 52	1 0902	19
1 162	33 95	1 1127	24 03	1 0860	18
1 149	31 35	1 1060	22 70	1 0820	17
1 139	29 13	1 1008	21 51	1 0780	17

(Thomson in his System 2 189)

Sp gr of HCl+Ag

Sp gr	% HCl	Sp gr	% HCl
1 21	12 43	1 10	20 20
1 20	40 60	1 09	18 18
1 19	38 38	1 08	16 16
1 18	36 36	1 07	14 14
1 17	34 34	1 06	12 12
1 16	32 32	1 05	10 10
1 15	30 30	1 04	8 08
1 14	28 28	1 03	6 06
1 13	26 26	1 02	4 04
1 12	24 24	1 01	2 02
1 11	20 30		

(Edm Davy)

Sp gr of HCl+Ag

Sp gr	% HCl	B pt	Sp gr	% HCl	B p
1 199	34 01	49°	1 094	16 08	111°
1 181	31 09	65	1 075	13 16	109
1 166	28 29	76	1 064	11 16	107
1 154	26 57	87	1 047	8 62	105
1 144	24 94	100	1 035	6 92	104
1 136	23 25	103	1 018	5 53	102
1 127	21 06	105	1 009	1 86	101
1 121	20 74	109			

(Kirwan and Dalton)

Sp gr of HCl+Ag at 1

% HCl	Sp gr	% HCl	Sp gr
2 22	1 0103	29 72	1 1304
5 80	1 0189	31 50	1 1388
6 26	1 0310	31 24	1 1730
11 02	1 0557	30 63	1 1811
15 20	1 0751	38 67	1 1938
18 67	1 0912	40 1	1 2021
20 91	1 1048	41 72	1 2074
23 72	1 1196	43 09	1 2121
25 96	1 1308		

(Kirby C R 74 337)

Sp gr of HCl+Ag at 1

Sp gr	HCl	Sp gr	HCl	Sp gr	HCl
1 2000	40 777	1 1620	2 0 1	1 1 01	1 161
1 1982	40 369	1 1 11	3 21	1 118	1 0 8
1 1964	31 961	1 1 78	1 80	1 114	3 0 6
1 1946	39 1	1 1 37	31 398	1 111	2 21
1 1928	31 110	1 1 36	30 000	1 112	2 831
1 1910	38 738	1 1 11	30 82	1 110	1 2
1 1893	38 330	1 1194	30 171	1 108	2 019
1 1875	37 923	1 1173	29 767	1 1061	2 1 611
1 1857	37 516	1 1152	9 50	1 1041	1 03
1 1840	37 108	1 1131	28 9 1	1 1020	0 706
1 1822	36 700	1 1110	8 41	1 1000	20 88
1 1804	36 292	1 1384	28 13	1 0980	1 980
1 1786	35 884	1 1369	27 728	1 0960	1 72
1 1768	35 476	1 1349	27 21	1 0939	1 165
1 1741	35 068	1 1 28	26 013	1 0919	18 757
1 1721	34 660	1 1308	25 5	1 0899	18 349
1 1701	34 252	1 1287	25 098	1 0879	17 941
1 1681	33 845	1 1267	24 690	1 0859	17 534
1 1661	33 437	1 1247	24 282	1 0838	17 126
1 1641	33 029	1 1226	24 874	1 0818	16 718

Sp gr of HCl+Aq at 15° — *C nrmued*

Sp gr	% HCl	Sp gr	% HCl	Sp gr	% HCl
1 0798	16 310	1 0517	10 602	1 0209	5 301
1 0778	15 902	1 0497	10 194	1 0239	4 893
1 0758	15 494	1 0477	9 768	1 0220	4 486
1 0738	15 087	1 0457	9 379	1 0200	4 078
1 0718	14 679	1 0437	8 971	1 0180	3 670
1 0697	14 271	1 0417	8 563	1 0160	3 262
1 0677	13 863	1 0397	8 155	1 0140	2 854
1 0657	13 456	1 0377	7 747	1 0120	2 447
1 0637	13 049	1 0357	7 340	1 0100	2 039
1 0617	12 641	1 0337	6 932	1 0080	1 631
1 0597	12 233	1 0318	6 524	1 0060	1 224
1 0577	11 825	1 0298	6 116	1 0040	0 816
1 0557	11 418	1 0279	5 709	1 0020	0 408
1 0537	11 010				

(Ure Handwörterbuch)

Sp gr of HCl+Aq U=sp gr at 15 55°
according to Ure, K=sp gr at 15° according to Kremers

% HCl	U	K	% HCl	U	K
1	1 005	1 005	22	1 109	1 111
2	1 010	1 010	23	1 114	1 116
3	1 015	1 015	24	1 119	1 121
4	1 020	1 020	25	1 124	1 126
5	1 025	1 025	26	1 128	1 131
6	1 030	1 030	27	1 133	1 136
7	1 034	1 034	28	1 138	1 141
8	1 039	1 039	29	1 143	1 146
9	1 044	1 044	30	1 147	1 151
10	1 048	1 048	31	1 153	1 157
11	1 053	1 053	32	1 157	1 163
12	1 059	1 059	33	1 163	1 169
13	1 064	1 065	34	1 169	1 179
14	1 069	1 070	35	1 174	
15	1 074	1 075	36	1 179	
16	1 079	1 080	37	1 183	
17	1 084	1 085	38	1 188	
18	1 089	1 090	39	1 193	
19	1 094	1 095	40	1 197	
20	1 098	1 100	41	1 203	
21	1 104	1 105			

(Calculated by Gerlach, Z anal 8 292)

Sp gr of HCl+Aq at 15° (H O at 0°=1)

HCl	Sp gr	HCl	Sp gr	HCl	Sp gr
0	0 9992	15	1 07539	30	1 15079
1	1 00503	16	1 08042	31	1 15581
2	1 01005	17	1 08545	32	1 16084
3	1 01508	18	1 09047	33	1 16587
4	1 02010	19	1 09550	34	1 17089
5	1 02513	20	1 10052	35	1 17592
6	1 03016	21	1 10555	36	1 18095
7	1 03518	22	1 11058	37	1 18597
8	1 04021	23	1 11560	38	1 191
9	1 04524	24	1 12063	39	1 196
10	1 05026	25	1 12566	40	1 200
11	1 05529	26	1 13068	41	1 204
12	1 06031	27	1 13571	42	1 208
13	1 06534	28	1 14074	43	1 212
14	1 07037	29	1 14516		

(Kolb, recalculated by Gerlach, Z anal 27 316)

Sp gr of HCl+Aq at 15°

% HCl	Sp gr	% HCl	Sp gr	% HCl	Sp gr
5	1 0244	20	1 0982	35	1 1739
10	1 0488	25	1 1234	40	1 1969
15	1 0733	30	1 1488	41	1 2013

(Hager, Adjumenta varia, Leipzig, 1876)

Sp gr of HCl+Aq at 15° (H₂O at 15°=1)

% HCl	Sp gr	% HCl	Sp gr
44 345	1 21479	34 464	1 17138
43 136	1 21076	25 260	1 12479
41 901	1 20430	19 688	1 09675
41 212	1 20204	14 788	1 07255
39 831	1 19708	6 382	1 03150
37 596	1 18687		

(Pickering, B 26 277)

Most accurate table

Sp gr of HCl+Aq at 15° (H O at 4°=1)

Sp gr	% HCl	Kg HCl in l	Sp gr	% HCl	Kg HCl in l
1 000	0 16	0 016	1 105	20 97	0 232
1 005	1 15	0 012	1 110	21 92	0 243
1 010	2 14	0 022	1 115	22 86	0 255
1 015	3 12	0 032	1 120	23 82	0 267
1 020	4 13	0 042	1 125	24 78	0 278
1 025	5 15	0 053	1 130	25 75	0 291
1 030	6 15	0 064	1 135	26 70	0 303
1 035	7 15	0 074	1 140	27 66	0 315
1 040	8 16	0 085	1 145	28 61	0 322
1 045	9 16	0 096	1 150	29 57	0 340
1 050	10 17	0 107	1 155	30 55	0 353
1 055	11 18	0 118	1 160	31 52	0 366
1 060	12 19	0 129	1 165	32 49	0 379
1 065	13 19	0 141	1 170	33 46	0 392
1 070	14 17	0 152	1 175	34 42	0 404
1 075	15 16	0 163	1 180	35 39	0 418
1 080	16 15	0 174	1 185	36 31	0 430
1 085	17 13	0 186	1 190	37 23	0 443
1 090	18 11	0 197	1 195	38 16	0 456
1 095	19 06	0 209	1 200	39 11	0 469
1 100	20 01	0 220			

(Tunge and Marchlewski, Z angew Ch 1891 133)

Sp gr of HCl+Aq at room temp

% HCl	Sp gr
8 14	1 0370
16 12	1 0843
23 045	1 1138

(Wagner, W Ann 1883, 18 264)

Relation of sp gr of HCl+Aq at t° to sp gr at $19.5^\circ=1.0$

t	8.9 % HCl sp gr =1.0401	16.6 % HCl sp gr =1.0704	25.5 % HCl sp gr =1.101	35.8 % HCl sp gr =1.133	46.6 % HCl sp gr =1.1606
0	0.99557	0.99379	0.99221	0.99079	0.98982
19.5	1.00000	1.00000	1.00000	1.00000	1.00000
40	1.00707	1.00781	1.00877	1.00990	1.01063
60	1.01588	1.01665	1.01794	1.01969	1.02180
80	1.02639	1.02676	1.02791	1.02986	
100	1.03855	1.03801	1.03867	1.04059	

(Kremers, Pogg 108 115)

Sp gr of HCl+Aq

G equivalents HCl per liter	t°	Sp gr t°/t°
0.005036	17.111	1.0000943
0.01006	17.125	1.0001892
0.02008	17.148	1.0003775
0.04990	17.138	1.000935
0.09885	17.133	1.001843
0.19641	17.162	1.003633
0.29247	17.147	1.005382
0.48278	17.140	1.008811
0.4994	17.28	1.00908
4.994	17.35	1.08390

(Kohlrausch, W Ann 1894, 53 28)

Sp gr of a normal solution of HCl+Aq at $18^\circ/4^\circ=1.0165$ (Loomis, W Ann 1896, 60 550)

Sp gr of HCl+Aq at 19.5° , when p = per cent strength of solution, d = observed density, w = volume conc in grams per cc

$$\left(\frac{pd}{100} = w\right)$$

p	d	w
36.0	1.1818	0.4255
29.97	1.1511	0.3450
24.35	1.1207	0.2729
18.55	1.0910	0.2024
12.22	1.0587	0.1294
9.148	1.0433	0.0954
6.559	1.0305	0.0676
3.540	1.0159	0.0360
5.345	1.0246	0.0548
1.356	1.0051	0.0136

(Barnes, J Phys Chem 1898, 2 546)

Sp gr of HCl+Aq at $18^\circ/4^\circ$

% HCl in 100 lb of solution	Sp gr
0.12149	0.99928
0.60757	0.99900
0.040609	0.99887
0.030328	0.99881

(Jahn, Z phys Ch 1900, 33 567)

Sp gr of HCl+Aq at 20°

Normality of HCl+Aq	% HCl	Sp gr
8.42	27.10	1.1336
5.784	19.30	1.0936
3.77	12.94	1.0618
2.031	7.17	1.0334
1.588	5.65	1.0261
1.138	4.05	1.0187
0.523	1.90	1.0076

(Forchheimer, Z phys Ch 1900, 34 28)

Sp gr at 20° of HCl+Aq containing M g mols HCl per liter

M	0.025	0.05	0.075	0.10
Sp gr	1.00034	1.00101	1.00135	1.00181

M	0.25	0.50	0.75	1.0
Sp gr	1.00425	1.00849	1.01264	1.01741

M	1.5	2.0
Sp gr	1.02542	1.03414

(Jones and Pearce, Am Ch J 1907, 38 730)

HCl is not absorbed by conc. H_2SO_4 +Aq but in large amounts by anhydrous H_2SO_4 (Aimé)

Absorption of HCl by H_2SO_4 +Aq1 cm p = 17°

Sp gr	g per l		g per 100 g	
	HCl	H_2SO_4	HCl	H_2SO_4
1.211	517.8		42.7	
1.220	487.3	22.7	39.9	1.86
1.220	478.8	58.0	39.2	4.75
1.235	455.3	99.3	36.9	8.04
1.260	418.0	161.7	33.2	12.8
1.305	371.4	273.2	28.5	20.9
1.355	306.6	417.7	22.6	30.8
1.430	215.3	638.2	15.0	44.6
1.545	96.7	917.6	6.26	59.4
1.580	51.3	1033.5	3.25	65.4
1.660	10.3	1224.0	0.62	73.7
1.735	1.89	1344.9	0.11	77.5
1.815	1.24	1615.3	0.068	89.0

Absorption of HCl by $\text{H}_2\text{SO}_4 + \text{Aq}$ —Cont
Temp = 40°

Sp gr	g per l		g per 100 g	
	HCl	H_2SO_4	HCl	H_2SO_4
1 185	421 4	42 2	35 6	3 56
1 195	416 4	70 0	34 8	5 86
1 210	392 1	107 7	32 4	8 90
1 255	346 3	211 2	27 6	16 8
1 255	325 4	236 3	25 9	18 8
1 340	247 4	383 7	18 5	28 6
1 400	161 6	619 4	11 5	44 2
1 520	50 9	929 3	3 35	61 1
1 575	18 5	1046 0	1 17	66 4
1 650	2 9	1207 6	0 17	73 2
1 725	1 4	1370 5	0 081	79 4
1 755	0 57	1428 4	0 032	81 4
1 770	0 52	1478 4	0 029	83 5

Temp = 70°

Sp gr	g per l		g per 100 g	
	HCl	H_2SO_4	HCl	H_2SO_4
1 145	374 1	18 4	32 7	1 61
1 150	357 3	38 9	31 1	3 38
1 160	353 8	55 7	30 5	4 80
1 180	341 3	93 6	28 9	7 93
1 225	277 7	231 9	22 8	18 9
1 230	274 3	246 4	22 3	20 0
1 315	173 7	476 7	13 2	36 2
1 380	96 5	661 8	6 99	48 0
1 510	23 6	946 1	1 56	62 7
1 560	8 4	1055 0	0 54	67 6
1 700	0 86	1371 3	0 05	80 7
1 745	0 62	1448 2	0 035	83 0
1 745	0 57	1455 2	0 032	83 4

(Coppadoro, Gazz ch it 1910, **39** II, 626)

100 pts alcohol of 36° B absorb 68 pts HCl at 12 5° (Boullay)

Alcohol of 0 836 sp gr dissolves 327 vols HCl at 17 5° and 758 mm pressure, and the solution has sp gr = 1 005 (Pierre, A ch (3) **31** 135)

Solubility of HCl in methyl alcohol (absolute)
at t°

t	% HCl	t	% HCl
10 3	51 6	18	46 9
0	51 3	31 7	43

(de Bruyn, R t c **11** 112)

Solubility of HCl in ethyl alcohol (absolute)
at t°

t°	% HCl	t	% HCl
0	45 4	19 2	41
6 5	44 2	23 5	40 2
11 5	42 7	32 0	38 1

(de Bruyn, l c)

Solubility of HCl in ether at t° and 760 mm pressure

t°	% HCl	t°	% HCl
—9 2	37 51	15	27 62
— 5	37 0	20	24 9
0	35 6	25	22 18
+ 5	33 1	30	19 47
10	30 35		

(Schuncke, Z phys Ch 1894, **14** 336)

Sol in glacial $\text{HC}_2\text{H}_3\text{O}_2$, ether, hexane, benzene, xylene, etc

Oil of turpentine absorbs 50% HCl (Thénard)

Oil of turpentine absorbs 163 vols HCl at 22° and 724 mm, isobutene absorbs 34% at 24° and 724 mm, metaterebentene absorbs 17 7% at 24° and 724 mm (Berthelot)

Oil of lavender absorbs 68 7 vols at 24° (Thénard)

Oil of lavender absorbs 210 vols without being saturated, oil of rosemary absorbs 218 vols at 22°, sol in 0 4 vol petroleum (Saussure)

Absorbed by caprylic alcohol (Bous)
Fuming HCl + Aq is sol in glycerine and miscible with conc $\text{HC}_2\text{H}_3\text{O}_2$

Solubility of HCl in phenol + Aq at 12°

Comp of H_2O layer		Comp of phenol layer	
% HCl	% phenol	% HCl	% phenol
0	7 45	0	72
3 1	6 6	0 09	78
6 6	5 3	0 2	80 3
8 0	5 1	0 36	82 6
10 7	4 8	0 52	84 5

Composition of solution in contact with solid phenol

% H_2O	% HCl	% phenol
11 22	0	88 78
14 98	0 52	84 5
84 5	10 7	4 8
80 38	15 64	3 98
72 43	24 37	3 2
60 25	36 25	3 5

(Schreinemakers, Z phys Ch 1912, **79** 553)

+ H_2O F-pt — 15 35°
Very sol in H_2O but only slightly sol in HCl (Rupert, J Am Chem Soc 1909, **31** 866)

+ $2\text{H}_2\text{O}$ M-pt — 17 4°
+ $3\text{H}_2\text{O}$ M-pt — 24 8° (Pickering, B 1893 **26** 280)

The composition of the hydrates formed by HCl at different dilutions is calculated

from determinations of the lowering of the f-pt produced by HCl, and of the conductivity and sp gr of HCl+Aq (Jones, Am Ch J 1905, 34 323)

Chlorhydric cyanhydric acid, 3HCl, 2HCN

Decomp by H₂O or alcohol, sol in HC₂H₃O₂ Insol in ether, chloroform, or acetic ether (Clausen, B 16 309)

HCl, HCN Sol in H₂O, absolute alcohol, HC₂H₃O₂, and CHCl₃, with decomp, decomp is especially rapid in H₂O (Gautier, A ch (4) 17 130)

Chloric acid, HClO₃

Known only in aqueous solution, which can be concentrated in vacuo to a sp gr of 1.282 at 14.2°, and then contains 40.10% HClO₃, corresponding to HClO₃+7H₂O, if left longer in vacuo over H₂SO₄ an acid corresponding to HClO₃+4½H₂O is obtained. Aqueous solution of HClO₃ decomp at 40° (Kammereis, Pogg 138 390)

Chlorates

All chlorates except mercurous chlorate are sol in H₂O, most of them are deliquescent, many are sol in alcohol

Aluminum chlorate, Al(ClO₃)₃+6H₂O

Very hygroscopic (Dobroserdow, C C 1904, II 177)

+9H₂O Very sol in cold but much less than in hot H₂O (Dobroserdow)

Ammonium chlorate, NH₄ClO₃

Easily sol in H₂O less sol in alcohol
Much less sol in H₂O at 0° than NaClO₃ (Storer)

Very sl sol in absolute alcohol (Wichter, J pr 30 321)

Barium chlorate, Ba(ClO₃)₂+2H₂O

Sol in 4 pts cold, and less hot H₂O (Chevenix)

100 pts H₂O dissolve at
0 20° 40 60 80° 100
22.8 37.0 52.1 77.5 98.0 126.1 pts Ba(ClO₃)₂

100 grms sat Ba(ClO₃)₂+Aq at t contains grms anhydrous Ba(ClO₃)₂

t°	Gram Ba(ClO ₃) ₂	t	Gram Ba(ClO ₃) ₂
Freezing point -2.749 ± 0.004	15.28	50	36.69
0	16.90	60	40.05
+10	21.23	70	43.04
20	25.26	80	45.90
25	27.53	90	48.70
30	29.43	99.1	51.17
40	33.16	104.6	52.67

* 104.6° is hpt at 740 mm pressure = 105.0° at 760 mm pressure

(Anschutz, Z phys Ch 1906, 56 238)

Solubility of Ba(ClO₃)₂ in H₂O

t°	g Ba(ClO ₃) ₂ in 100 g H ₂ O	Sp gr
0	25.5	1.195
20	39.3	1.274
40	55.9	1.355
60	74.1	1.433
80	92.1	1.508
100	113.2	1.580
105.6*	120	1.600

* Bpt of sat solution

(Carlson, Dissert 1910)

Only slight traces dissolve in absolute alcohol (Wachter, J pr 30 334)

Sol in acetone (Eidmann, C C 1899, I 1014)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethylacetate (Naumann, B 1910, 43 314)

Bismuth chlorate

Known only in solution, which decomp on evaporation

Cadmium chlorate, Cd(ClO₃)₂+2H₂O

Very deliquescent, sol in H₂O and alcohol
Melts in crystal H₂O at 80° (Wichter, J pr 30 321)

Solubility in H₂O

Sat solution contains at

-20°	-15°	0°	+18°
72.18	72.53	74.95	76.36
49°	69°		
80.08	82.95	Cd(ClO ₃) ₂	

Sp gr of solution containing 76.36 Cd(ClO₃)₂ at 18° = 2.284 (Meusser, B 1912, 35 1422)

Sol in acetone (Naumann, B 1904, 37 4328)

Cadmium chlorate ammonia, Cd(ClO₃)₂+6NH₃

Ppt (Liphum, P 1913 48 49)

Cæsium chlorate, CsClO₃

100 g H₂O dissolve at

0°	5°	19.8	30	42.2
24.6	30	62.8	93.3	119
30	77	99		
19.40	11.65	76.36	CsClO ₃	

(Calzolari, Acc Sc med di Ferrara 1911 85 160)

Calcium chlorate, Ca(ClO₃)₂+2H₂O

Deliquescent, very sol in H₂O and alcohol (Wichter, J pr 30 323)

Melts in its water of crystallization at over 100°

Sp gr of solution sat at 18°=1 729, containing 64% $\text{Ca}(\text{ClO}_3)_2$ (Mylius B 1897, 30 1718)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Chromic chlorate

Easily sol in H_2O (Prudhomme, C C 1890, 1 668)

Cobaltous chlorate, $\text{Co}(\text{ClO}_3)_2 + 2\text{H}_2\text{O}$

(Meusser, B 1902, 35 1418)

+4 H_2O Solubility in H_2O

Sat solution contains at

18°	21°	35°	47°	61°
64 19	64 39	67 09	69 66	76 12%

$\text{Co}(\text{ClO}_3)_2$

Sp gr of solution containing 64 19% $\text{Co}(\text{ClO}_3)_2$ at 18°=1 861 (Meusser, B 1902, 35 1418)

+6 H_2O Very deliquescent Sol in H_2O and alcohol Melts in crystal H_2O at 50° (Wachter, J pr 30 321)

Solubility in H_2O

Sat solution contains at

-21°	-19°	0°	+10 5°
53 30	53 61	57 45	61 83%

$\text{Co}(\text{ClO}_3)_2$
(Meusser, B 1902, 35 1418)

Cupric chlorate, basic, $\text{Cu}(\text{ClO}_3)_2, 3\text{Cu}(\text{OH})_2$

Insol in H_2O Very sol in dil acids Sol in warm conc $\text{Cu}(\text{ClO}_3)_2 + \text{Aq}$, the solubility increases with the conc and temp (Bourne, B 1 Soc 1898, (3) 19 950)

Cupric chlorate, $\text{Cu}(\text{ClO}_3)_2 + 4\text{H}_2\text{O}$

Solubility in H_2O

Sat solution contains at

-31°	-21°	+0 8°	18°	45°
54 59	57 12	58 51	62 17	66 17

59 6°	71°
69 42	76 9%

$\text{Cu}(\text{ClO}_3)_2$

Sp gr of the solution containing 62 17% $\text{Cu}(\text{ClO}_3)_2$ at 18°=1 695 (Meusser, B 1902, 35 1420)

+6 H_2O Very deliquescent Easily sol in H_2O and alcohol Melts in its crystal H_2O at 65° (Wachter, J pr 30 321)

Sp gr of $\text{Cu}(\text{ClO}_3)_2 + \text{Aq}$ at 15°

% $\text{Cu}(\text{ClO}_3)_2$	2 106	4 778	6 945
Sp gr	1 01620	1 03857	1 05714

% $\text{Cu}(\text{ClO}_3)_2$	10 016	14 387
Sp gr	1 0844	1 12531

(Irube, Gm -K 5 1, 921)

Sol in acetone (Naumann, B 1904, 37 4328)

Cupric chlorate ammonia, $\text{Cu}(\text{ClO}_3)_2, 4\text{NH}_3$

Ppt Not hygroscopic Insol in alcohol
 $\text{Cu}(\text{ClO}_3)_2, 6\text{NH}_3$ Not hygroscopic (Ephraim, B 1915, 48 46)

Erbium chlorate, $\text{Er}(\text{ClO}_3)_3 + 8\text{H}_2\text{O}$

Deliquescent Sol in H_2O and alcohol

Glucinum chlorate

Known only in aqueous solution, which decomposes on evaporation

Ferrous chlorate

Known only in solution

Ferric chlorate, $\text{Fe}(\text{ClO}_3)_3$

Sol in H_2O

Basic salt Insol in H_2O

Lanthanum chlorate, $\text{La}(\text{ClO}_3)_3$

Deliquescent (Cleve)

Lead chlorate, $\text{Pb}(\text{ClO}_3)_2 + \text{H}_2\text{O}$

Deliquescent, easily sol in H_2O and alcohol (Wachter, J pr 30 321)

Sp gr of solution sat at 18°=1 947 and contains 60 2% $\text{Pb}(\text{ClO}_3)_2$ (Mylius, B 1897, 30 1718)

100 g H_2O dissolve 440 g $\text{Pb}(\text{ClO}_3)_2$ at 18°, sp gr of sat solution=1 63 (Carlson, Dissert 1910)

Lithium chlorate, $\text{LiClO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Very deliquescent and sol in H_2O Very easily sol in alcohol Melts at 50° in its crystal water (Wachter, J pr 30 321)

$\text{LiClO}_3 + \text{Aq}$ sat at 18° contains 75 8% LiClO_3 Sp gr=1 815 (Mylius, B 1897, 30 1718)

483 g LiClO_3 dissolve in 100 g H_2O at 15°, sp gr of solution=1 82 (Carlson, Dissert 1910)

Contains 3 H_2O , and is not deliquescent (Lagorio, Zeit f Kryst 15 80)

Salt is anhydrous (Retgers, Z phys Ch 5 449)

Magnesium chlorate, $\text{Mg}(\text{ClO}_3)_2$

128 1 g $\text{Mg}(\text{ClO}_3)_2$ dissolve in 100 g H_2O at 19°, sp gr of solution=1 59 (Carlson, Dissert 1910)

Sp gr of solution containing 56 5% $\text{Mg}(\text{ClO}_3)_2$ at 18°=1 564 (Meusser, l c)

Sp gr of solution sat at 18°=1 594, containing 56 3% $\text{Mg}(\text{ClO}_3)_2$ (Mylius, B 1897, 30 1718)

Sol in acetone (Naumann, B 1904, 37 4328)

Sol in acetone (Eidmann, C C 1899, II 1014)

+2 H_2O Solubility in H_2O

Sat solution contains at

39 5°	61°	68°	93°
65 37	69 46	70 69	73 71%

$\text{Mg}(\text{ClO}_3)_2$
(Meusser, B 1902, 35 1416)

+4H₂O Solubility in H₂O

Sat solution contains at

42° 65 5°
63 82 69 12% Mg(ClO₃)₂
(Meusser, *l c*)

+6H₂O Very deliquescent and sol in H₂O Very easily sol in alcohol Melts at 40° in its crystal water (Wachter, *J pr* 30 325)

Solubility in H₂O

Sat solution contains at

-18° 0° +18° 29° 35°
51 64 53 27 56 50 60 23 63 65% Mg(ClO₃)₂
(Meusser)

Manganous chlorate, Mn(ClO₃)₂

Known only in solution which decomposes on evaporation (Wachter)

Mercurous chlorate, Hg₂(ClO₃)₂

α Easily sol in alcohol and H₂O (Wachter, *J pr* 30 321)

β Insol in H₂O, easily sol in HC₂H₃O₂ + Aq (Wachter) Decomp by boiling H₂O

Mercuric chlorate, 2HgO, Cl₂O₅ + H₂O

Deliquescent Decomp by H₂O into oxide and an acid salt (Wachter)

Sol in 4 pts cold H₂O (Chevenix, 1802)

Nickel chlorate, Ni(ClO₃)₂ + 4H₂O

Solubility in H₂O

Sat solution contains at

48 5° 55° 65° 79 5°
67 60 68 78 69 05 75 50% Ni(ClO₃)₂
(Meusser, *B* 1902, 35 1419)

+6H₂O Deliquescent Easily sol in H₂O and alcohol Melts in crystal H₂O at 80° (Wachter, *J pr* 30 321)

Solubility in H₂O

Sat solution contains at

-18° -8° 0° +18° 40°
49 55 51 52 52 66 56 74 64 47% Ni(ClO₃)₂

Sp gr of solution containing 56 74% Ni(ClO₃)₂ at 18° = 1 661

Goes over into 4H₂O salt at 39° (Meusser)
156 g Ni(ClO₃)₂ dissolve in 100 g H₂O at 16°, sp gr of solution = 1 76 (Carlson, *Disser* 1910)

Nickel chlorate ammonia, Ni(ClO₃)₂, 6NH₃

Ppt (Ephraim, *B* 1915, 48 47)

Potassium chlorate, KClO₃

Sol in H₂O with absorption of heat

Sol in about 16 pts cold and in much less hot H₂O (Chevenix, 1802)

Sol in 30 03 pts H₂O at 0 17 85 pts at 13 3 and in 1 66 pts at 104 78 (M R and P)

Sol in 16 pts H₂O at 18 70° (Abl)
100 pts H₂O at 15 5° dissolve 6 2 pts at 100° 46 pts (Ure s Diet)

100 pts H₂O dissolve pts KClO₃ at t -

t°	28	35	40	47	60
Pts KClO ₃	9 5	12 3	14 1	18 3	29 1

(Gerardin)

100 pts H₂O dissolve pts KClO₃ at t°

t°	Pts KClO ₃	t°	Pts KClO ₃
0	3 33	30 0	12 05
13 32	5 60	49 08	18 96
15 37	6 03	74 89	30 40
24 43	8 44	104 78	60 24

(Gay Lussa *A ch* 11 314)

100 pts H₂O dissolve pts KClO₃ at t°

t°	Pts KClO ₃	t°	Pts KClO ₃
0	3 3	130	88 5
100	56 5	180	190

(Tilden and Shenstone, *Roy Soc Proc* 31 345)

100 pts H₂O dissolve pts KClO₃ at t°

t	Pts KClO ₃	t	Pts KClO ₃
120	73 7	160	148
136	98 9	190	183

(Tilden and Shenstone, *Phil Trans* 1884 23)

Coefficient of solubility is 3 2 + 0 109t
0 0043t² between 0° and 35° (Blanc, *C* 1 112 1213)

Sat KClO₃ + Aq contains % KClO₃ at t°

t	% KClO ₃	t	% KClO ₃
-0 5	2 6	92	31 2
-0 3	2 4	106	37 2
+4 5	3 5	130	47 0
4 5	2 9	171	59 8
11	4 7	180	62 1
19	6 1	190	63 1
29	8 9	200	64 2
36	9 9	207	66 0
42	11 4	300	87 0
56	15 1	336	96 7
58	16 6		

(Étard, *A ch* 1894, (7) 2 528)

Solubility in H_2O

Temp	% $KClO_3$ in a sat sol	Pts sol in 100 pts H_2O	Pts H_2O to 1 pt $KClO_3$
0°	3 06	3 14	31 8
5	3 67	3 82	26 2
10	4 27	4 45	22 5
15	5 11	5 35	18 5
20	6 76	7 22	13 6
25	7 56	8 17	12 2
30	8 46	9 26	10 8
35	10 29	11 47	8 7
40	11 75	13 31	7 5
45	13 16	14 97	6 6
50	15 18	17 95	5 6
55	16 85	20 27	4 9
60	18 97	23 42	4 2
65	20 32	25 50	3 9
70	22 55	29 16	3 4
75	24 82	32 99	3 0
80	26 97	36 93	2 6
85	29 25	41 35	2 4
90	31 36	46 11	2 1
95	33 76	51 39	1 9
100	35 83	55 54	1 8

(Pawlewski, B 1899, 32 1041)

1 l $KClO_3$ +Aq at 25° contains 675 millimols $KClO_3$ (Calvert, Z phys Ch 1901, 38 541)

100 g H_2O dissolve at

	0°	20°	40°	60°
Sp gr	3 3	7 4	13 8	24 0 g $KClO_3$
	1 021	1 045	1 073	1 115

	80°	100°	104°*
Sp gr	37 7	56 5	59 9 g $KClO_3$
	1 165	1 219	1 230

* Bpt of sat solution

(Carlson, Dissert 1910)

100 g H_2O dissolve at

	8°	19 5°	30°	99°
	4 48	7 15	10 27	57 3 g $KClO_3$

(Calzolari, Acc Sc mod di Ferrara, 1911, 85 150)

Sat $KClO_3$ +Aq contains at

	53°	68°	81°	56° (?)
	17 37	23 25	23 53	30 46% $KClO_3$

(Ischugaff, Z anorg 1914, 86 161)

Sp gr of $KClO_3$ +Aq, according to Kremers' experiments (Pogg 96 62), and Gerlach's calculations (Z anal 8 290)

$KClO_3$	Sp gr	% $KClO_3$	Sp gr
1	1 067	6	1 039
2	1 014	7	1 045
3	1 026	8	1 052
4	1 026	9	1 059
5	1 033	10	1 066

Sp gr of $KClO_3$ +Aq at 20° containing 1 mol $KClO_3$ to 100 mols H_2O =1 04122 (Nicol, Phil Mag (5) 16 122)

Sp gr of $KClO_3$ +Aq at 15° containing 5% $KClO_3$ =1 0316 (Kohlrausch, W Ann 1879 1)

B-pt of $KClO_3$ +Aq containing pts $KClO_3$ to 100 pts H_2O

Pts $KClO_3$	B pt	Pts $KClO_3$	B pt
6 5	100 5°	44 6	103 0°
13 2	101 0	53 4	103 5
20 2	101 5	62 2	104 0
27 8	102 0	69 2	104 4
35 8	102 5		

(Gerlach, Z anal 26 450)

Saturated solution boils at 105° (Kremers)

Saturated solution boils at 104 2°, and contains 61 5 pts $KClO_3$ to 100 pts H_2O (Legrand)

Saturated solution boils at 103 3°, and contains 66 6 pts $KClO_3$ to 100 pts H_2O (Griffiths)

Saturated solution boils at 104 4° (Gerlach, Z anal 26 427)

Sol in pure HNO_3 without decomp, but decomp at once by HNO_3 containing NO_2 (Millon, A ch (3) 6 92)

Sol in sat NH_4Cl +Aq without causing pptn

1 mol (=129 pts) $KClO_3$ dissolves in 2493 vols H_2O , in 2208 vols H_2O when 1 mol (=59 pts) $NaCl$ is added, in 2060 vols H_2O with 2 mols (=118 pts) $NaCl$, and in 1910 vols H_2O with 4 mols (=236 pts) $NaCl$ (Gladstone, Chem Soc 15 302)

$KClO_3$ is sol in about—

29 50 pts H_2O
35 50 pts NH_4OH +Aq conc
39 00 pts dil NH_4OH +Aq (1 vol conc 3 vols H_2O)

30 50 pts HNO_3 +Aq (1 vol conc HNO_3 5 vols H_2O)

33 0 pts HCl +Aq (1 vol conc HCl 4 vols H_2O)

48 00 pts $HC_2H_3O_2$ +Aq (1 vol commercial $HC_2H_3O_2$ 1 vol H_2O)

31 50 pts NH_4Cl +Aq (1 pt NH_4Cl 10 pts H_2O)

18 00 pts NH_4NO_3 +Aq (1 pt NH_4NO_3 10 pts H_2O)

34 00 pts $NH_4C_2H_3O_2$ +Aq (dil NH_4OH +Aq+dil $HC_2H_3O_2$ +Aq)

32 50 pts $N_2C_2H_3O_2$ +Aq (commercial $HC_2H_3O_2$ + N_2CO_3 , diluted with 4 vols H_2O)

31 50 pts $Cu(C_2H_3O_2)$ +Aq (See Stolba, Z anal 2 390)

33 50 pts cane-sugar (1 pt cane-sugar 10 pts H_2O)

36 50 pts grape-sugar (1 pt grape-sugar 10 pts H_2O) (Pearson, Zeit Chem 1869 662)

Addition of K salts to sat $KClO_3$ +Aq ppts $KClO_3$ in such a way, that the sum of the

KClO₃ remaining in solution and the K in the salt added, is a constant, which constant is equal to the solubility of KClO₃, so that the following formula represents the coefficient of solubility of KClO₃ after addition of a K salt, $3.2 + 0.109t + 0.0043t^2 - K$ of salt added (Blarez, C. R. 112 1213)

Solubility of KClO₃+TiClO₃

100 g H₂O dissolve g salts

t°	g TiClO ₃	g KClO ₃
0	2 8	3 3
15	10	1 5
50	12 67	16 2
100	57 3	48 2

(Rabe, Z. anorg. 1902, 31 156)

Solubility of KClO₃ in KNO₃+Aq

t°	g per l	
	KNO ₃	KClO ₃
19 85	0 00	69 88
	12 65	64 86
	25 29	60 33
	101 19	45 85
	202 38	40 20
23 87	0 00	79 09
	50 59	63 14

(Arrhenius, Z. phys. Ch. 1893, 11 397)

Solubility in KCl+Aq at 20° C

G KCl in 1 litre	G KClO ₃ in 1 litre	Sp. gr.
0	71 1	1 050
10	58	1 050
20	49	1 050
30	43	1 050
40	39 5	1 054
50	36 5	1 058
60	34	1 064
70	32	1 070
80	30	1 075
90	28	1 081
100	27	1 086
110	25 5	1 091
120	24 5	1 098
130	23 5	1 103
140	22 5	1 108
150	21 5	1 113
160	21 0	1 119
170	20 5	1 124
180	20 0	1 130
190	20 0	1 135
200	20	1 140
210	20	1 145
220	20	1 150
230	20	1 156
240	20	1 161
250	20	1 168

(Winteler, Z. Elektrochem. 1900, 7 361)

Solubility in KOH+Aq at 25°

KOH+Aq	Millimols KClO ₃ per lit. of the solution
$\frac{1}{8}$ -normal	624
$\frac{1}{4}$ -normal	573

(Calvert, Z. phys. Ch. 1901, 38 541)

Solubility in H₂O₂ at 25°

Concentration of H ₂ O ₂ millimols per litre	Millimols KClO ₃ per lit. of the solution
1260	730
1310	737

(Calvert, l. c.)

Solubility in $\frac{1}{4}$ normal KOH+Aq in presence of H₂O₂ at 25°

Concentration of H ₂ O ₂ millimols per litre	Millimols KClO ₃ per lit. of the solution
15	578
276	584
954	616
1073	673

(Calvert, l. c.)

Moderately sol. in liquid NH₃ (Franklin Am. Ch. J. 1898, 20 828)

Neither dissolved nor attacked by liquid NO₂ (Frankland, Chem. Soc. 1901, 79 1361)

Sol. in 120 pts. alcohol of 83% at 16° (Wittstein)

Sol. in 120 pts. alcohol of 77.1% (Poh W. A. B. 6 595)

Insol. in absolute alcohol (Gerardin)

Solubility of KClO₃ in dil. alcohol D=s₁ gr. of alcohol, S=solubility in 100 pt. alcohol at t°

D = 0.9904		D = 0.9845		D = 0.9793	
t	S	t°	S	t	S
13	4 9	14	4 7	14	3 2
21	6 3	26	7 1	26	5 4
25	7 5	39	9 3	38	7.9
30	9 1	47	12 8	46	10 8
35	10 2	55	16 1	51	12 2
44	13 6	65	22 3	63	17 5
50	16 2	66	22 5	65	19 0

D = 0.9726		D = 0.9573		D = 0.9390	
t	S	t	S	t	S
13	2 2	13	1 9	14 5	1 1
20	3 3	20	2 7	28	2 2
33	5 8	29	3 6	40	3 4
43	7 2	36	4 3	50	4 3
56	11 4	55	7 9	62	6 6
59	12 9	60	9 7	67	7 6
		63	10 5		

Solubility of KClO_3 in dil alcohol—*Continued*

D=0.9111		D=0.8967		D=0.8429	
t	S	t°	S	t°	S
13	0.74	12	6.46	25	0.09
25	1.08	31	1.28	34	0.12
32	1.78	43	1.95	56	0.24
52	3.35	58	3.10	64	0.32

(Gerardin, A. ch (4) 5 148)

Solubility of KClO_3 in alcohol+Aq

wt % alcohol	g KClO_3 per 100 g solution	
	t=30°	t=40°
0	9.23	12.23
5	7.72	10.48
10	6.44	8.84
20	4.51	6.40
30	3.21	4.67
40	2.35	3.41
50	1.64	2.41
60	1.01	1.41
70	0.54	0.78
80	0.24	0.34
90	0.06	0.12

(Taylor, J. phys. Ch. 1897, 1 301)

Insol. in benzonitrile (Naumann, B. 1914, 47 1370)

Very sl. sol. in acetone (Krug and M'Elroy, J. Anal. Ch. 6 184)

Insol. in acetone (Naumann, B. 1904, 37 4329; Eidmann, C. C. 1899, II 1014)

Solubility of KClO_3 in acetone+Aq

wt % acetone	g KClO_3 per 100 g solution	
	t=30	t=40°
0	9.23	12.23
5	8.32	11.10
9.09	7.63	10.28
20	6.09	8.27
30	4.93	6.69
40	3.90	5.36
50	2.90	4.03
60	2.03	2.86
70	1.24	1.68
80	0.57	0.79
90	0.18	0.24

(Taylor, J. phys. Ch. 1897, 1 301)

Insol. in methyl acetate (Naumann, B. 1909, 42 3790), ethyl acetate (Naumann, B. 1904, 37 3601)

Solubility in glycol=0.9% at ord. temp. (de Coninck, Belg. Acad. Bull. 1905 359)

100 g glycerol (sp. gr. 1.256) dissolve 3.54 g KClO_3 at 15–16° (Ossendowski, Pharm. J. 1907, 79 575)Potassium silver chlorate, KClO_3 , AgClO_3
(Pfaundler, W. A. B. 46, 2 266)Rubidium chlorate, RbClO_3 100 pts H_2O dissolve 2.8 pts at 47°, 3.9 pts at 13°, 4.9 pts at 182°, 5.1 pts at 19° (Reissig, A. 127 33)100 g H_2O dissolve 3.1 RbClO_3 at 15°, sp. gr. of solution=1.07 (Carlson, Dissert. 1910)100 g H_2O dissolve at

0°	8°	19.8°	30°
2.138	3.07	5.36	8.00 g RbClO_3

42.2°	50°	76°	99°
12.48	15.98	34.12	62.8 g RbClO_3

(Calzolari, Acc. Sc. med. di Ferrara, 1911, 85 150)

Scandium chlorate

(Crookes, Roy. Soc. Proc. 1908, 80 A, 518)

Silver chlorate, AgClO_3 Sol. in 10–12 pts. cold H_2O (Vauquelin), in 8–10 pts. cold, and 2 pts. hot H_2O (Chevenix), in 5 pts. cold H_2O (Wachter). Sl. sol. in alcohol (Chevenix), easily sol. in alcohol (Wachter)Silver chlorate ammonia, AgClO_3 , 2NH_3 Easily sol. in H_2O or alcohol (Wachter, 1843)Sodium chlorate, NaClO_3

Deliquescent

Sol. in 3 pts. cold and less hot H_2O (Wachter, Chevenix)Sol. in 3 pts. H_2O at 14.75° (Abl.)100 pts H_2O dissolve 35.5 pts NaClO_3 (Ure & Diet.)100 pts H_2O dissolve at

0°	20°	40°	60°
81.9	99	123.5	147.1 pts NaClO_3

80°	100°	120°
175.6	232.6	333.3 pts NaClO_3

 (Kremers, Pogg. 97 4)
100 pts H_2O dissolve 89.3 pts NaClO_3 at 12° (Schlosing)100 g H_2O dissolve at

-15°	0°	20°	40°
72	79	101	126 pts NaClO_3

 Sp. gr. 1.380 1.389 1.430 1.472

60°	80°	100°	122° +
155	189	230	286 pts NaClO_3

 Sp. gr. 1.514 1.559 1.604 1.654

* Bpt. of sat. solution

(Carlson, Dissert. 1910)

100 g NaClO_3 + Aq contain at
 4 78° 19 85° 30 05° 35 10° 44 72°
 45 47 48 91 51 22 52 36 54 50 g NaClO_3
 (Le Blanc and Schmandt, Z phys Ch 1911,
 77 614)

Sp gr of NaClO_3 + Aq, containing
 10 15 20 25 30 25% NaClO_3
 1 070 1 108 1 147 1 190 1 235 1 282
 (Gerlach, Z anal 8 290)

Sp gr of NaClO_3 + Aq at 20° containing 1
 mol NaClO_3 in 100 mols H_2O = 1 03844
 (Nicol, Phil Mag (5) 16 122)

NaClO_3 + Aq containing 7.23% NaClO
 has sp gr 20°/20° = 1 0496 (Le Blanc and
 Rohland, Z phys Ch 1896, 19 278)

Sat solution boils at 132°, and temp can
 be raised to 135° by supersaturation (Krem-
 ers, Pogg 97 4)

Easily sol in liquid HF (Franklin, Z
 anorg 1905, 46 2)

NaClO_3 + NaCl
 100 pts H_2O dissolve 50 75 pts NaClO_3 +
 24 4 pts NaCl at 12°, 100 pts H_2O dissolve
 249 6 pts NaClO_3 + 11 5 pts NaCl at 122°,
 and when cooled to 12° contain 68 6 pts
 NaClO_3 + 11 5 pts NaCl (Schlosing, C R
 73 1272)

Solubility in NaCl + Aq at 20° C

	G NaClO_3 in 1 litre	Sp gr
5	668	1 426
10	661	1 424
15	653	1 423
20	645	1 421
25	638	1 419
30	630	1 418
35	622	1 417
40	615	1 415
45	607	1 414
50	599	1 412
55	590	1 411
60	582	1 409
65	574	1 408
70	566	1 406
75	559	1 405
80	551	1 404
85	544	1 402
90	537	1 401
95	529	1 399
100	522	1 398
105	514	1 396
110	507	1 394
115	499	1 392
120	491	1 391
125	484	1 389
130	476	1 387
135	467	1 385
140	459	1 383
145	451	1 381

Solubility in NaCl + Aq at 20° C — *Continue*

G NaCl in 1 litre	G NaClO_3 in 1 litre	Sp gr
150	442	1 379
155	437	1 377
160	423	1 374
165	414	1 372
170	403	1 369
175	393	1 365
180	382	1 362
185	371	1 359
190	360	1 355
195	349	1 350
200	338	1 345
205	326	1 340
210	315	1 335
215	302	1 330
220	287	1 324
225	271	1 319
230	257	1 313
235	243	1 307
240	228	1 301
245	211	1 295
250	197	1 289
255	184	1 283
260	170	1 276
265	150	1 270
270	135	1 263
275	120	1 256
280	105	1 249
285	91	1 241
290	78	1 235
295	67	1 226
300	55	1 217

(Winteler, Z Elektrochem 1900, 7 361)

Very sol in liquid NH_3 (Franklin, Ann
 Ch J 1898, 20 829)

Sol in 34 pts alcohol of 83% at 16° and in
 less hot alcohol (Wittstein)

Somewhat more easily sol in alcohol than
 NaCl (Berzelius)

Solubility of NaClO_3 in alcohol (g NaClO_3 per 1 of solution)

t	Alcohol		
	90 %	70 %	50 %
20	16 1	110 8	311 5
40	22 9	133 5	321 8
60	29 0	155 8	326 8
70		161 3	

(Carlson, Dissert 1910)

Insol in methyl acetate (Naumann, B
 1909, 42 3790), ethyl acetate (Naumann
 B 1910, 43 314)

100 g glycerol dissolve 20 g NaClO_3 at
 15 5° (Ossendowski, Pharm J 1907, 79
 575)

Strontium chlorate, $\text{Sr}(\text{ClO}_3)_2 + 5\text{H}_2\text{O}$

Very deliquescent, and sol in H_2O (Topsoe, W A B 66, 2 29)

Sp gr of solution sat at 18° containing 63.3% $\text{Sr}(\text{ClO}_3)_2 = 1.839$ (Mylius, B 1897, 30 1718)

Easily sol in H_2O , less in alcohol, but more sol in alcohol than SrCl_2 (Souhay, A 102 381)

Insol in absolute alcohol (Wachter)

Thallous chlorate, TlClO_3

Sol in H_2O , but decomp by heating

100 pts H_2O dissolve at

0° 20° 50° 80° 100°

2.80 3.92 12.67 36.65 57.31 pts TlClO_3
(Murr, Chem Soc 29 857)

1.1 $\text{TlClO}_3 + \text{Aq}$ sat at 10° contains 25.637 g TlClO_3 (Roozeboom, Z phys Ch 8 532)

1.1 H_2O dissolves 0.134 equivalents TlClO_3 at 20° , or 38.51 g in 1.1 of the solution (mean of 10 experiments) (Noyes and Farrell, J Am Chem Soc 1911, 33 1657)

Solubility in $\text{Ti}_2\text{SO}_4 + \text{Aq}$ at 20°

G equiv per l		Solid phase
HClO_3	Ti_2SO_4	
0.1058	0.1366	$\text{TlClO}_3 + \text{Ti}_2\text{SO}_4$

(Noyes and Farrell, *l c*)

Thallic chlorate, $\text{H}(\text{ClO}_3)_3 + 4\text{H}_2\text{O}$

Very deliquescent, sol in H_2O Decomp slowly in the air (Gewecke, Z anorg 1912, 75 273)

Ytterbium chlorate

Sol in H_2O (Popp, A 131 179)

Yttrium chlorate, $\text{Y}(\text{ClO}_3)_3 + 8\text{H}_2\text{O}$

Deliquescent Easily sol in alcohol Sl sol in ether (Clcvc)

Zinc chlorate, $\text{Zn}(\text{ClO}_3)_2 + 4\text{H}_2\text{O}$

Solubility in H_2O

Sat solution contains at

$+15^\circ$ 30° 40° 55°
66.52 67.66 69.06 75.44% $\text{Zn}(\text{ClO}_3)_2$

Sp gr of solution containing 66.52% $\text{Zn}(\text{ClO}_3)_2$ at $15^\circ = 1.916$

(Meusser, B 1902, 35 1417)

More sol in H_2O than chlorates of Mg, Co, Ni or Cu, less sol than chlorate of Cd, more sol than $\text{Zn}(\text{NO}_3)_2$ (Meusser, *l c*)

$+6\text{H}_2\text{O}$ Very deliquescent Easily sol in H_2O and alcohol Melts in crystal H_2O at 60° (Vauquelin, A ch 95 113)

Solubility in H_2O

Sat solution contains at

-18° 0° 8° 15°
55.62 59.19 60.20 67.32% $\text{Zn}(\text{ClO}_3)_2$
(Meusser, *l c*)

Sp gr of solution sat at 18° containing 65% $\text{Zn}(\text{ClO}_3)_2 = 1.914$ (Mylius, B 1897, 30 1718)

Zinc chlorate ammonia, $\text{Zr}(\text{ClO}_3)_2 \cdot 4\text{NH}_3$

$\text{Zn}(\text{ClO}_3)_2 \cdot 6\text{NH}_3$ Ppt (Ephraim, B 1915, 48 48)

Perchloric acid

See Perchloric acid

Chlorides

Most chlorides are sol in H_2O , a few, however, are insol or nearly so therein, the chief of which are AgCl , Hg_2Cl_2 , Cu_2Cl_2 , PtCl_2 , and AuCl . Several chlorides are decomp into insol basic salts or hydroxides, either by the addition of H_2O , as in the case of BiCl_3 and SbCl_3 , or on evaporating the aqueous solution, as AlCl_3 , ZnCl_2 , MgCl_2 , etc

Some chlorides are sol in alcohol or ether
See under each element

Chlorine, Cl_2

The maximum solubility of Cl in H_2O is at 10° (Schonfeld), at $8-10^\circ$ (Gay-Lussac), at $9-10^\circ$ (Pelouze)

Solubility decreases from $9-0^\circ$, at 100° the solubility = 0 (Gay-Lussac)

$\text{Cl}_2 + \text{Aq}$ sat at 6° has sp gr = 1.003 (Berthelot)

1 vol H_2O at t° absorbs vols Cl reduced to 0° and 760 mm pressure

t	Vols Cl	t	Vols Cl
10	2.5852	26	1.9099
11	2.5413	27	1.8695
12	2.4977	28	1.8295
13	2.4543	29	1.7895
14	2.4111	30	1.7499
15	2.3681	31	1.7104
16	2.3253	32	1.6712
17	2.2828	33	1.6322
18	2.2405	34	1.5934
19	2.1984	35	1.5550
20	2.1565	36	1.5166
21	2.1148	37	1.4785
22	2.0734	38	1.4406
23	2.0322	39	1.4029
24	1.9912	40	1.3655
25	1.9504		

(Schonfeld, A 93 26)

1 vol H₂O absorbs vols Cl at t° (not corrected)

Vols Cl	t°	Vols Cl	t°	Vols Cl	t°
1 43	0	3 04	8	1 19	50
1 52	3	3 00	10	0 71	70
2 08	6 5	2 37	17	0 15	100
2 17	7	1 61	35		

(Gay-Lussac, A ch (3) 7 124)

1 vol H₂O at 8° absorbs 3 04 vols Cl which is the maximum of solubility. At 50° 1 09 vols are absorbed and at 0 15 vols (Pelouze and Fremy)

1 vol H₂O at t dissolves vols Cl (not corrected)

t°	Vols Cl	t°	Vols Cl	t°	Vols Cl
0	1 75-1 80	12	2 50-2 60	40	1 55-1 60
9	2 70-2 75	14	2 45-2 50	50	1 15-1 20
10	2 70-2 75	30	2 00-2 10	70	0 60-0 65

(Pelouze A ch (3) 7 188)

1 vol H₂O absorbs vols Cl at t°

t°	Vols Cl	t°	Vols Cl	t°	Vols Cl
0	1 5-1 6	9	2 65-2 70	14	2 6-2 65
5	2 05-2 1	10	2 9-3 0	16	2 35-2 4
8	2 5-2 6	12	2 65-2 75	30	1 8-1 85

(Land and Walz Berz J B 1846 72)

Solubility in H₂O α = coefficient of solubility

t°	α	t°	α	t°	α
6 9	2 2931	10 1	2 8741	21 7	2 0422
8 4	2 5469	11 2	2 7267	32 1	1 5766
9 3	2 7135	13 7	2 5079	36 7	1 3802

(Goodwin, B 15 3040)

Goodwin also gives tables for solubility of Cl in HCl and various chlorides, but they do not show evidence of accurate work (A M C)

Cl₂+Aq contains at 760 mm pressure

1 44% Cl at 0°
1 07% " " 6°
0 95% " " 9°
0 87% " " 12°

(Roozeboom, R t c 1884, 3 29)

See also Cl₂+8H₂O

Solubility of Cl₂ in H₂O

β¹=Vol of Cl (reduced to 0° and 760 mm) absorbed by 1 vol H₂O under a total pressure of 760 mm

q=g Cl₂ absorbed by 100 g H₂O under a total pressure of 760 mm

t°	β ¹	q	t°	β ¹	q
10	3 095	0 980	25	1 985	0 630
11	2 996	948	26	1 937	615
12	2 900	918	27	1 891	600
13	2 808	889	28	1 848	587
14	2 720	861	29	1 808	574
15	2 635	835	30	1 769	562
16	2 553	809	35	1 575	501
17	2 474	784	40	1 414	451
18	2 399	760	45	1 300	415
19	2 328	738	50	1 204	386
20	2 260	716	60	1 006	324
21	2 200	698	70	0 848	274
22	2 143	680	80	0 672	219
23	2 087	662	90	0 380	125
24	2 035	646	100	0 000	000

(Winkler, Landolt and Bornstein, Tab 4th Ed 1912, 597)

1 l HCl+Aq (38% HCl) dissolves 17 3 g Cl, 1 l HCl+Aq (33% HCl) dissolves 11 g Cl, 1 l HCl+Aq (3% HCl) dissolves 6 5 g Cl (Berthelot, C R 91 191)

Solubility of Cl₂ in HCl+Aq at 20-21° and 759-761 mm pressure

g HCl per l	g Cl ₂ per l	Coefficient of absorption	Solubility
0	7 23	2 1157	2 2799
3 134	5 30	1 5496	1 6698
6 248	4 94	1 4433	1 5607
9 402	4 76	1 3942	1 5013
12 540	4 85	1 4200	1 5292
15 670	5 10	1 4933	1 6092
31 340	5 81	1 6736	1 8033
62 680	6 38	1 8682	2 0131
94 020	7 19	2 1044	2 2677
125 360	7 76	2 2711	2 4473
156 700	8 58	2 5095	2 7043
188 040	9 23	2 7020	2 9117
219 380	9 93	2 9243	3 1312
250 720	10 68	3 1272	3 3677
282 060	11 87	3 3278	3 5859
313 401	12 03	3 5492	3 8224

(Mellor, Chem Soc 1901, 75 227)

Solubility of Cl in NaCl+Aq α = coefficient of solubility
NaCl=9 97%

t°	α	t	α
7 9	1 8115	18 8	1 2785
11 9	1 5879	22 6	1 0081
15 4	1 3684		

Solubility of Cl in NaCl + Aq — *Continued*

NaCl = 16.01%

t°	α	t°	α
6	1 5866	21 4	0 8732
11 6	1 2227	26 9	0 7017
16 4	1 0121		

NaCl = 19.66%

t°	α	t°	α
0	1 6978	15 4	0 9511
9 2	1 2145	20 4	0 7758
9 3	1 2068	21 9	0 7385
14 8	0 9740		

(Kumpf, W Ann Bebl 6 276)

Solubility of Cl in sat NaCl + Aq at t° and 760 mm pressure

t°	Coefficient of absorption at 0° and 760 mm	Solubility at 0° and 760 mm
14 5	0 3607	0 3898
29 0	0 3125	0 3458
60 0	0 1332	0 1625
82 0	0 0586	0 0763

(Kohn and O'Brien, J Soc Chem Ind 1898, 17 1100)

Sat KCl + Aq absorbs $\frac{1}{3}$ less Cl at 15° than pure H₂O (Dettmer, A 38 35)1 l of a solution of CaCl₂ (1 pt in 15 pts H₂O) dissolves 2.45 g Cl at 12°1 l of a solution of MgCl₂ (1 pt in 15 pts H₂O) dissolves 2.33 g Cl at 12°1 l of a solution of MnCl₂ (1 pt in 15 pts H₂O) dissolves 2.00 g Cl at 12°

Sl sol in KOH + Aq (Fremy)

Somewhat sol in liquid NO (Frankland, Chem Soc 1901, 79 1361)

CCl₄ absorbs 10% of Cl at 13° (Perkins, Chem Soc 1894 65 20)

1 mol CrOCl dissolves at 0° 0.70 atom Cl, at -14°, 1.24 atoms, at -21°, 2.31 atoms, and at -24°, 3.00 atoms Cl (Roozeboom, R t c 4 379)

Sulphuryl chloride absorbs 71 vols Cl or 0.136 pt Cl by weight at t° (Schulze, J pr (2) 27 168)

Insol in benzene (Moride)

Sl sol in chloral and iodol (Dumas)

Sol in perchlorethylene (Faraday)

Sol in a very large quantity of ether with decomp

Coefficient of solubility of Cl₂ in organic liquids at 15°

Substance	Coefficient of Solubility
Carbon tetrachloride	51 7
Acetic anhydride	39 6
Acetic acid (99.84%)	36 7
" (90 vol %)	25 3
" (75 vol %)	16 43
" (65 vol %)	13 43

(Jones, Chem Soc 1911, 99 392)

+8H₂O Critical temp of decomposition in open vessel = 9.6°, in closed vessel = 28.7°Solubility in H₂O% Cl₂ = % of Cl₂ in Cl₂ + Aq sat at t° and 760 mm in presence of Cl₂ + 8H₂O

t°	% Cl ₂	t°	% Cl
0	0 505	12 5	1 10
3	0 64	20	1 82
6	0 709	28 5	3 50
9	0 900		

(Roozeboom, R t c 1884, 3 57)

Chlorine monoxide, Cl₂OSol in H₂O At 0°, H₂O absorbs at least 200 times its volume of Cl₂O gasChlorine trioxide, Cl₂O₃

Decomp on air at 57° with explosion

H₂O absorbs 5-6 vols Cl₂O₃ (Millon, A ch (3) 7 298)H₂O absorbs at 8.5° and 753 mm press 8.591 vols Cl₂O₃ (Brandan)100 g H₂O dissolve at8.5° and 752.9 mm press 4.7655 g Cl₂O₃

14° " 756 3 " " 5.0117 "

21° " 754 " " 5.4447 "

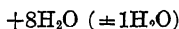
93° " 760 " " 5.6508 "

(Brandan, A 151 340)

Does not exist, and above data are for mixture of ClO₂ and Cl (Garzaroli-Thurnkuch, A 209 184)Chlorine tetroxide, ClO₄H₂O at 4° absorbs about 20 vols ClO₄ with formation of HClO and HClO₃H₂SO₄ at -18° absorbs about 20 vols ClO₄ (Millon, A ch (3) 7 285)Solubility of ClO₂ in H₂O

t	α ClO ₂ per l
1	> 108 6
10 7	116 7
14 0	> 107 9

(Bray, Z phys Ch 1906, 54 569)

Solubility in H_2O

t°	g ClO_2 per l	t°	g ClO_2 per l
0 79*	26 98	10	60 06
0	27 59	15 3	60 06
1	29 48	18 2	107 9
5 7	42 10		

* Entertic

(Bray)

Chlorine oxide, Cl_2O_{17}

Very easily decomp (Millon, A 46 281)
Probably a mixture of ClO_2 and O

Chlorine heptoxide, Cl_2O_7

Explosive, decomp by H_2O , sol in well cooled benzene with sl decomp (Michael, Am Ch J 1909, 23 447)

Chlorirididramine chloride,

Sl sol in cold, easily in hot H_2O (Skobkoff, A 84 275)

— nitrate, $\text{Cl}_2\text{Ir}(\text{N}_2\text{H}_5\text{NO}_3)_2$ Sol in H_2O **— sulphate, $\text{Cl}_2\text{Ir}(\text{N}_2\text{H}_5\text{SO}_4)$**

Sl sol in cold, much more easily in hot H O

Chloriridic acid**Chloriridates**

Most of the chloriridates are very difficultly sol in H O, but a little more sol than the corresponding chloroplatinates. Insol or nearly so in alcohol, but not so difficultly sol as the chloroplatinates (Rose)

Ammonium chloriridate, $(\text{NH}_4)_2\text{IrCl}_6$

Sol in 20 pts cold H_2O (Vauquelin), sl sol in cold, much more in hot H_2O (Claus), sol in $\text{HCl} + \text{Aq}$ (Soblewsky), insol in cold $\text{NH}_4\text{Cl} + \text{Aq}$ (Claus), insol in alcohol (Berzelius)

100 pts H O dissolve at

14 4° 26 8° 39 4°

0 699 0 905 1 226 pts $(\text{NH}_4)_2\text{IrCl}_6$,

52 2° 61 2° 69 3°

1 608 2 130 2 824 pts $(\text{NH}_4)_2\text{IrCl}_6$

(Rimbach and Korten, Z anorg 1907, 52 407)

Cæsium chloriridate, Cs_2IrCl_6

Only sl sol in H O (Delepine, C R 1908, 146 1268)

Lithium chloriridate, Li_2IrCl_6

Somewhat deliquescent, very sol in H_2O (Antony, Gazz ch it 23, 1 190)

Potassium chloriridate, K_2IrCl_6

Sl sol in cold H_2O , sol in 15 pts boiln H_2O , less sol in H_2O containing HCl , insol in alcohol or sat KCl and $\text{CaCl}_2 + \text{Aq}$. Insol in liqnd NH_3 (Gore, Am Ch 1898, 20 829)

Rubidium chloriridate, Rb_2IrCl_6

Very sl sol in H_2O (Rimbach, Z anorg 1907, 52 408)

Sodium chloriridate, $\text{Na}_2\text{IrCl}_6 + 6\text{H}_2\text{O}$

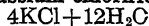
Easily sol in H_2O , sol in alcohol of 0.8 sp gr

Thallium chloriridate, Tl_2IrCl_6

Decomp by hot HCl forming Tl_3IrCl_6 (Delépine, C R 1909, 149 1073)

Chloriridium pentamine comps

See Iridopentamine chloro comps

Chloriridosulphurous acid**Potassium chloriridosulphite, $\text{K}_4\text{Ir}_2\text{Cl}_2(\text{SO}_3)_4$** Insol in cold, decomp by hot H_2O

$\text{K}_4\text{Ir}_2\text{Cl}_2(\text{SO}_3)_4, 2\text{K}_2\text{SO}_3$ Decomp by H_2O
 $\text{Cl}_2\text{Ir}_2(\text{SO}_3)_2, 8\text{KCl} + 4\text{H}_2\text{O}$ Sol in H_2O
insol in alcohol (Claus, J p 42 354)

Chloriridous acid**Ammonium chloriridite, $(\text{NH}_4)_3\text{IrCl}_6$**

Decomp by H_2O (Delepine, C R 190 146 1268)

+ $1\frac{1}{2}\text{H}_2\text{O}$ Sol in H O (Claus)

$\text{IrCl}_5(\text{H}_2\text{O})(\text{NH}_4)_2$ (Delepine)

Cæsium chloriridite, $\text{IrCl}_5(\text{H}_2\text{O})\text{Cs}$

(Delépine)

Lithium chloriridite, $\text{Li}_2\text{IrCl}_6 + 12\text{H}_2\text{O}$

Deliquescent, sol in H O and alcohol (Delepine, C R 1914, 158 1277)

Lithium sodium chloriridite, $\text{LiNaIrCl}_6 + 12\text{H}_2\text{O}$

Stable in aq solution in the presence of excess of lithium salt (Delepine, C R 1914, 158 1278)

$\text{LiNa}_2\text{IrCl}_6 + 12\text{H}_2\text{O}$ Stable in aq solution in the presence of excess of sodium salt (Delepine, C R 1914, 158 1278)

Potassium chloriridite, K_3IrCl_6 Decomp by H_2O (Delepine)

+ $3\text{H}_2\text{O}$ Easily sol in H_2O , insol in alcohol, insol in sat $\text{KCl} + \text{Aq}$ (Berzelius)
 $\text{IrCl}_5(\text{H}_2\text{O})\text{K}_2$ (Delepine)

Rubidium chloriridite, $\text{IrCl}_5(\text{H}_2\text{O})\text{Rb}_2$

(Delepine)

Silver chloriridite, Ag_2IrCl_6 Insol in H_2O or acids, sl sol in $\text{NH}_4\text{OH} + \text{Aq}$

Ppt (Delépine, Bull Soc 1910, (4), 7 55)

Sodium chloriridite, $\text{Na}_2\text{IrCl}_6 + 12\text{H}_2\text{O}$ Efflorescent, sol in $\frac{1}{2}$ pt H_2O Insol in alcohol Melts in crystal H_2O at 50° **Thallium chloriridite**, Tl_2IrCl_6 Sol in hot HCl , pptd on cooling (Delepine, C R 1909, 149 1073)**Chlorotetramine chromium comps**

See Chlorotetramine chromium comps

Chloro-azoumide, N_3Cl Sl sol in H_2O (Raschig, B 1908, 41 4194)**Chlorobromo comps**

See Bromochloro comps

Chlorocarbonic acid

See Carbonyl chloride

Chlorochromic acid $\text{CrO}_2\frac{\text{OH}}{\text{Cl}}$

Known only in its salts

 CrOCl_2 See Chromyl chloride**Ammonium chlorochromate**, $\text{NH}_4\text{CrO}_3\text{Cl} = \text{CrO}_2\frac{\text{Cl}}{\text{ONH}_4}$ More sol in H_2O than the K salt (Peligot, A ch 52 283)**Barium chlorochromate chloride**, $\text{Ba}(\text{CrO}_3\text{Cl})$, BaCl Deliquescent Very sol in H_2O (Pratorius A 201 1) $+ \text{H}_2\text{O}$ Not deliquescent**Calcium chlorochromate**, $\text{Ca}(\text{CrO}_3\text{Cl})$

Deliquescent (Peligot)

 $+ 5\text{H}_2\text{O}$ Very deliquescent (Pratorius)**Chromous chlorochromate**

See Trichromyl chloride

Cobalt chlorochromate, $\text{Co}(\text{CrO}_3\text{Cl}) + 9\text{H}_2\text{O}$ Deliquescent, melts at 10° in crystal H_2O (Pratorius)**Lithium chlorochromate**, LiCrO_3Cl Sol in H_2O acidified with HCl without decomp (Lowenthal, Z anorg 1894, 6 357)**Magnesium chlorochromate**, $\text{Mg}(\text{CrO}_3\text{Cl})_2$

Deliquescent (Peligot)

 $+ 9\text{H}_2\text{O}$ Less deliquescent than the other chlorochromates (Pratorius, A 201 1)Very hygroscopic, sol in H_2O acidified with HCl without decomp (Lowenthal, Z anorg 1894, 6 359)**Nickel chlorochromate**, $\text{Ni}(\text{CrO}_3\text{Cl}) + 9\text{H}_2\text{O}$ Deliquescent, melts in its crystal H_2O at $46-48^\circ$ (Pratorius)**Potassium chlorochromate**, $\text{KCrO}_3\text{Cl} = \text{CrO}_2(\text{Cl})\text{OK}$ Sol in H_2O with decomp Cryst from H_2O containing HCl without decomp (Peligot)

Sol in acetone (Naumann B 1904, 37 4328)

Sodium chlorochromate, NaCrO_3Cl

Deliquescent (Peligot)

 $+ 2\text{H}_2\text{O}$ Deliquescent (Pratorius)**Strontium chlorochromate**, $\text{Sr}(\text{CrO}_3\text{Cl})_2 + 4\text{H}_2\text{O}$ Deliquescent, melts in crystal H_2O at 72° (Pratorius)**Thalious chlorochromate**, TlCrO_3Cl Decomp by H_2O (Lachaud and Leprieux, C R 103 198)**Zinc chlorochromate**, $\text{Zn}(\text{CrO}_3\text{Cl}) + 9\text{H}_2\text{O}$ Deliquescent, melts at 37.5° in crystal H_2O (Pratorius)Very hygroscopic, very sol in H_2O and acids (Lowenthal, Z anorg 1894, 6 360)**Dichlorochromium bromide**, $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Br}$ V. y deliquescent Sol in fuming HBr in a mixture of equal volumes ether and fuming HBr , in alcohol and in acetone (Bjerrum, B 1907, 40 2919)**Chlorochromotetrammonium comps**

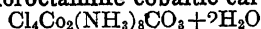
See Chlorotetramine chromium comps

Chlorocolumbium bromide, $(\text{C}^{90}\text{Cl}_{12})\text{Br} + 7\text{H}_2\text{O}$ Sol in a small quantity of cold H_2O (Harned, J Am Chem Soc 1913, 35 1083)**Chlorocolumbium chloride**, $(\text{C}^{90}\text{Cl}_{12})\text{Cl} + 7\text{H}_2\text{O}$ Insol in cold, sol in boiling H_2O Not easily decomp by boiling with NH_4OH Conc HNO_3 decomp a boiling solution of this comp Completely sol in conc alkalies (Harned, J Am Chem Soc 1913, 35 1080)

Chlorocolumbium hydroxide, $(\text{Cb}_2\text{Cl}_{12}) (\text{OH})_2 + 8\text{H}_2\text{O}$

Insol in H_2O Sol in acids and alkalis
(Harned, J Am Chem Soc 1913, **35** 1082)

Chloroctamine cobaltic carbonate,



Very sol in H_2O (Vortmann and Blasberg, B **22** 2651)

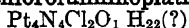
$\text{Cl}_2\text{Co}_2(\text{NH}_3)_8(\text{CO}_3)_2 + \text{H}_2\text{O}$ (Vortmann and Blasberg)

Chloroferrous acid

Calcium chloroferriate, CaO , CaCl_2 , Fe_2O_3

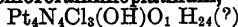
Insol in H_2O (le Chatelier, C R **99** 276)

Dichlorofulminoplatinum,



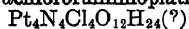
Insol in H_2O (v Meyer, J pr (2) **18** 305)

Trichlorofulminoplatinum,



Insol in H_2O , sol in $\text{HCl} + \text{Aq}$ (v Meyer)

Tetrachlorofulminoplatinum

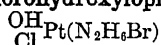


Insol in H_2O (v Meyer)

Chlorohydroxylonitroplatinsamidramine nitrate, $(\text{OH})\text{ClNO}_2\text{Pt}(\text{NH}_3)_2\text{NO}_2$

Easily sol in hot H_2O (Cleve)

Chlorohydroxyloplatinamidramine bromide,



Sl sol in H_2O

— **carbonate**, $\frac{\text{OH}}{\text{Cl}}\text{Pt}(\text{N}_2\text{H}_5)\text{CO}_3$

Insol in H_2O (Cleve)

— **chloride**, $\frac{\text{OH}}{\text{Cl}}\text{Pt}(\text{N}_2\text{H}_5\text{Cl})$

Sl sol in H_2O (Cleve)

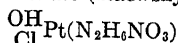
— **chromate**, $\frac{\text{OH}}{\text{Cl}}\text{Pt}(\text{N}_2\text{H}_5)\text{CrO}_4$

Nearly insol in H_2O

— **dichromate**, $\frac{\text{OH}}{\text{Cl}}\text{Pt}(\text{N}_2\text{H}_5)_2\text{Cr}_2\text{O}_7$

Ppt (Cleve)

— **nitrate** (Raewsky's nitrate),



Sl sol in cold, more easily in hot H_2O
(Gerhardt)

Chlorohyposulphuric acid, $\text{S}_2\text{O}_3\text{Cl}_4$

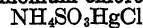
See Sulphur oxytetrachloride

Chloromanganic acid

See Manganic hydrogen chloride

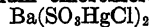
Chloromercurosulphurous acid

Ammonium chloromercurosulphite,



Sol in H_2O (Barth, Z phys Ch **9** 205)

Barium chloromercurosulphite,



Insol in H_2O (Barth)

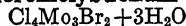
Potassium chloromercurosulphite, KSO_3HgCl

Sol in H_2O (Barth)

Sodium chloromercurosulphite, NaSO_3HgCl
 $+ \text{H}_2\text{O}$

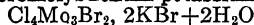
Very sol in H_2O (Barth)

Chloromolybdenum bromide,



Insol in H_2O and dil acids, sol in alcohol
 $+ 6\text{H}_2\text{O}$ At first easily sol in H_2O , but a
precipitate soon forms Can be crystallized
from dil $\text{HBr} + \text{Aq}$ Sol in alcohol and ether
(Blomstrand)

Chloromolybdenum potassium bromide,



Decomp by H_2O Can be cryst from HBr
 $+ \text{Aq}$ (Blomstrand)

Chloromolybdenum chloride, $\text{Cl}_4\text{Mo}_3\text{Cl}_2 =$
molybdenum dichloride, MoCl_2

Insol in H_2O , easily sol in $\text{HCl} + \text{Aq}$ or
 $\text{H}_2\text{SO}_4 + \text{Aq}$, sl sol in HNO_3 , sol in NH_4OH
 $+ \text{Aq}$, $\text{NaOH} + \text{Aq}$, or $\text{KOH} + \text{Aq}$, with sep
aration of precipitate on boiling, sol in
alcohol and ether (Blomstrand, J pr **77**
96)

Very sol in conc HCl (Rosenham and
Kohn, Z anorg 1910 **66** 2)

$+ 3\text{H}_2\text{O}$ Insol in H_2O

$+ 4\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Leicht and
Kempe, A **170** 351)

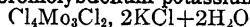
$+ 6\text{H}_2\text{O}$ Sol in H_2O , alcohol, or ether
(Blomstrand)

Chloromolybdenum hydrogen chloride,



Sol in H_2O , but ppt forms after a few
minutes (Rosenham and Kohn, Z anorg
1910, **66** 5)

Chloromolybdenum potassium chloride,



Decomp by pure H_2O , can be recrystal
lized from $\text{HCl} + \text{Aq}$ (Blomstrand, J pr **77**
108)

Chloromolybdenum hydroxide, $\text{Cl}_4\text{Mo}_3(\text{OH})_2 + 2\text{H}_2\text{O}$

Insol in H_2O or alcohol Easily sol in strong acids if fresh, and washed only with cold H_2O If washed with warm H_2O , it is less sol in acids If precipitated hot, is insol in acids, even H_2SO_4 or fuming HNO_3 (Blomstrand, J pr 77 100)
 $+8\text{H}_2\text{O}$

Chloromolybdenum iodide, $\text{Cl}_4\text{Mo}_3\text{I}_2 + 3\text{H}_2\text{O}$

Precipitate
 $+6\text{H}_2\text{O}$ Sol in H_2O and alcohol

Chloromolybdenum potassium iodide, $\text{Cl}_4\text{Mo}_3\text{I}_2, 2\text{KI} + 2\text{H}_2\text{O}$

Decomp by H_2O Recryst from $\text{HI} + \text{Aq}$ (Blomstrand)

Chloromolybdenum oxybromide, $\text{Cl}_4\text{Mo}_3 \begin{smallmatrix} \text{OH} \\ \text{Br} \end{smallmatrix} + 2\text{H}_2\text{O}$

Insol in alcohol (Blomstrand, J pr 77 116)

Chloromolybdic acid, $\text{MoOCl}_3(\text{OH}) + 7\text{H}_2\text{O}$

Very hygroscopic (Weinland, B 1904, 37 572)

Diammonium tetrachloromolybdate, $\text{MoCl}_4(\text{ONH}_4)_2 + 2\text{H}_2\text{O}$

Hygroscopic Decomp by H_2O Sol in dilute acids, alkalis and ammonia (Weinland, Z anorg 1905, 44 83)

Cæsium chlorotrimolybdate, acid, $\text{Mo}_3\text{O}_{11}\text{Cl}_{14}(\text{Cs O}) + 22\text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis, and ammonia (Weinland, l c)

Monocæsium trichloromolybdate, $\text{MoOCl}_3(\text{OCs}) + \text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis and ammonia (Weinland)

Dicæsium tetrachloromolybdate, $\text{MoCl}_4(\text{OCs})_2$

Hydroscopic Sol in H_2O with decomp Sol in dilute acids, alkalis, and ammonia (Weinland, Z anorg 1905, 44 83)

Monopotassium trichloromolybdate, $\text{MoOCl}_3(\text{OK}) + \text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis, and ammonia (Weinland)

Dipotassium tetrachloromolybdate, $\text{M Cl}_4(\text{OK}) + 2\text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis, and ammonia (Weinland)

Potassium hydrogen chlorotrimolybdate, $\text{Mo}_3\text{O}_{11}\text{Cl}_{14}, \text{K}_2\text{O} + 6\text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis, and ammonia (Weinland)

Monorubidium trichloromolybdate, $\text{MoOCl}_3(\text{ORb}) + \text{H}_2\text{O}$

Hydroscopic Decomp by H_2O Sol in dilute acids, alkalis, and ammonia (Weinland)

Dicubidium tetrachloromolybdate, $\text{MoCl}_4(\text{ORb})_2$

Hydroscopic Decomp by H_2O Sol in dilute acid, alkalis, and ammonia (Weinland)

Chloronitratoplatinamine nitrite, $\begin{smallmatrix} \text{Cl} \\ \text{NO}_3 \end{smallmatrix} \text{Pt}(\text{NH}_2\text{NO}_2)_2$

Easily sol in H_2O

Chloronitratoplatin diamine nitrate, $\begin{smallmatrix} \text{Cl} \\ \text{NO}_3 \end{smallmatrix} \text{Pt}(\text{N}_2\text{H}_5\text{NO}_3)_2$

Decomp by H_2O with formation of $\begin{smallmatrix} \text{Cl} \\ \text{OH} \end{smallmatrix} \text{Pt}[(\text{NH}_3)_2\text{NO}_3]_2$

— sulphate, $\begin{smallmatrix} \text{Cl} \\ \text{NO}_3 \end{smallmatrix} \text{Pt}(\text{N}_2\text{H}_5)_2\text{SO}_4 + \text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O

Chloronitritotetramine cobaltic chloride, $\text{Cl}(\text{NO})\text{Co}(\text{NH}_3)_4\text{Cl}$

Not very sol in cold H_2O (Jørgensen, Z anorg 5 195)

Chloronitritoplatin semidiamine chloride, $\text{Cl}_2(\text{NO}_2)\text{Pt}(\text{NH}_3)_3\text{Cl}$

100 pts solution in H_2O sat at 18° contain 1.8 pts salt, sat at 100° , 6 pts

Insol in abs alcohol or ether Not decomp by conc HNO_3 , HCl , or $\text{H}_2\text{CO}_4 + \text{Aq}$, and by H_2SO_4 only at a high heat

Formula given was $\text{PtN}_6\text{H}_7\text{Cl}_2\text{O}_5$ (Peyronc, J B 1855 421)

— nitrite, $\text{Cl}(\text{NO}_2)\text{Pt}(\text{NH}_3)_2\text{NO}_2$

Sol in H_2O (Blomstrand)

Chlorophosphatoplatin diamine phosphate, $\begin{smallmatrix} \text{ClPt}(\text{N H}_3)_2 \\ \text{PO}_4 \end{smallmatrix} + 2\text{H}_2\text{O}$

Nearly insol in cold, and only very sl sol in hot H_2O (Raewsky)

Chloronitrous acid**Iridium potassium chloronitrite**, $\text{Ir}_2\text{Cl}_2(\text{NO})_4, 6\text{KCl}$

Ppt, decomp by boiling H_2O Sol in cold H_2O (Leidic, C R 1902, 134 1583)

$\text{Ir}_3\text{K}_{12}\text{Cl}_{16}(\text{NO}_2)_8 + 4\text{H}_2\text{O}$ Ppt (Quen-
nessen, C R 1905, 141 258)

Chloropalladic acid

Chloropalladates

The chloropalladates are generally very sol
in H_2O , and sol in alcohol (v Bonsdorff,
Pogg 17 264)

Ammonium chloropalladate, $(\text{NH}_4)_2\text{PdCl}_6$
Sl sol in H_2O (Berzelius)

Barium chloropalladate
Sol in H_2O and alcohol (v Bonsdorff)

Cadmium chloropalladate
As above

Cæsium chloropalladate, Cs_2PdCl_6
Nearly insol in cold H_2O Decomp by
boiling with H_2O or by hot conc H_2SO_4
(Gutbier, B 1905, 38 2386)

Calcium chloropalladate
Deliquescent, sol in H_2O and alcohol (v
Bonsdorff, 1829)

Glucinum chloropalladate, $\text{GIPdCl}_6 + 8\text{H}_2\text{O}$
ic, and sol in H_2O
uropalladate, $\text{MgPdCl}_6 +$
cent, sol in H_2O

Nickel chloropalladate, $\text{NiPdCl}_6 + 6\text{H}_2\text{O}$
Extremely deliquescent

Potassium chloropalladate, K_2PdCl_6
Sl sol in cold H_2O Decomp by long boil-
ing with H_2O Sl sol in dil $\text{HCl} + \text{Aq}$ with-
out decomp Insol in NH_4Cl , KCl , or NaCl
 $+ \text{Aq}$ Insol in alcohol (Berzelius)

Rubidium chloropalladate, Rb_2PdCl_6
Insol in cold H_2O Decomp by boiling
with H_2O or by hot conc H_2SO_4 (Gutbier,
B 1905, 38 2387)

Zinc chloropalladate, $\text{ZnPdCl}_6 + 6\text{H}_2\text{O}$
Very deliquescent (v Bonsdorff)

Chloropalladous acid

Aluminum chloropalladite, $\text{Al}_2\text{Pd}_2\text{Cl}_{10} +$
 $20\text{H}_2\text{O}$
Deliquescent Sol in H_2O , alcohol, or
ether (Welkow, B 7 804)

Ammonium chloropalladite, $(\text{NH}_4)_2\text{PdCl}_4 +$
 H_2O
Easily sol in H_2O Insol in alcohol Sol
in $\text{NH}_4\text{Cl} + \text{Aq}$ (Claus)

Easily sol in H_2O (Gutbier, B 1905, 38
2386)

Barium chloropalladite
Easily sol in H_2O or alcohol

Cadmium chloropalladite
Not deliquescent

Cæsium chloropalladite, Cs_2PdCl_4
Can be cryst from hot H_2O (Gutbier, B
1905, 38 2386)

Calcium chloropalladite
Deliquescent Sol in H_2O or alcohol

Glucinum chloropalladite, $\text{GIPdCl}_4 + 6\text{H}_2\text{O}$
Very hygroscopic, very sol in H_2O , alcohol,
or ether (Welkow)

Magnesium chloropalladite
Deliquescent Easily sol in H_2O (v
Bonsdorff)

Manganese chloropalladite
Sol in H_2O and alcohol

Nickel chloropalladite
Sol in H_2O

Potassium chloropalladite, K_2PdCl_4
Much more sol in hot than cold H_2O
(Joannis, C R 95 295) Sol in $\text{NH}_4\text{OH} +$
 Aq (Berzelius) Sol in cold sat $\text{KCl} + \text{Aq}$
(Gibbs, Sill Am J (2) 31 70) Insol in al-
cohol (Wollaston) Somewhat sol in al-
cohol of 0.84 sp gr, but insol in absolute al-
cohol, decomp on boiling (Berzelius)

Rubidium chloropalladite, Rb_2PdCl_4
Can be cryst from hot H_2O (Gutbier, B
1905, 38 2387)

Sodium chloropalladite
Deliquescent Sol in H_2O and alcohol

Zinc chloropalladite
Very deliquescent Sol in H_2O and alcohol
(v Bonsdorff)

Chlorophosphoarsenouridic acid, $2\text{IrCl}_3,$
 $3\text{H}_3\text{PO}_3, 3\text{H}_3\text{PO}_4, 5\text{H}_3\text{AsO}_4(?)$
Very sol in H_2O (Geisenheimer)

Lead chlorophosphoarsenouridate, $4\text{IrCl}_3,$
 $3\text{Pb}_2\text{H}_2(\text{PO}_3)_2, 3\text{Pb}_3(\text{PO}_4)_2,$
 $5\text{Pb}_2\text{H}_2(\text{AsO}_4)_2$
Insol in H_2O

Chlorophosphouridic acid, $2\text{IrCl}_3, 3\text{H}_3\text{PO}_4,$
 $3\text{H}_3\text{PO}_3$
Very sol in H_2O Insol in alcohol
(Geisenheimer, A ch (6) 23 254)
 $2\text{IrCl}_3, 3\text{H}_3\text{PO}_4$ Sol in H_2O and alcohol

Ammonium chlorophosphoride, 2IrCl_3 ,
 $3(\text{NH}_4)_3\text{PO}_4$, $3(\text{NH}_4)_2\text{HPO}_3$

Very deliquescent Very sol in H_2O
(Geisenheimer)

Lead chlorophosphoride, 4IrCl_3 ,
 $3\text{Pb}_3(\text{PO}_4)_2$, $3\text{PbH}_3(\text{PO}_3)_2$

Insol in H_2O or acetic acid, very sol in dil
 $\text{HNO}_3 + \text{Aq}$ (Geisenheimer)

Silver chlorophosphoride, 2IrCl_3 ,
 $3\text{AgH}_2\text{PO}_4$, $3\text{AgH}_2\text{PO}_3$

Insol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$, and
 $\text{NH}_4\text{OH} + \text{Aq}$ (Geisenheimer)

Chlorophosphoplatinic acid

See Chloroplatinophosphoric acid

Chlorophosphoric acid

Thorium chlorophosphate, 3ThO_2 , ThCl_4 ,
 $2\text{P}_2\text{O}_5$

Insol in H_2O and acids, decomp by boiling
with H_2SO_4 and fusing with alkali carbonates
(Colani, C R 1909, 149 208)

Chloroplatinamine chloride, $\text{Cl}_2\text{Pt} \begin{smallmatrix} \text{NH}_3\text{Cl} \\ \text{NH}_3\text{Cl} \end{smallmatrix}$

Sol in about 700 pts H_2O at 0° , and 33–34
pts at 100° Not attacked by boiling conc
 HNO_3 or H_2SO_4 Sol in boiling $\text{KOH} + \text{Aq}$
with decomp Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Cleve,
Sv V A H 10, 9 30)

— **nitrite**, $\text{Cl}_2\text{Pt}(\text{NH}_3\text{NO}_2)$

Sl sol in cold, easily in hot H_2O

— **nitrite silver nitrite**, $\text{Cl}_2\text{Pt}(\text{NH}_3\text{NO}_2)_2$,
 AgNO_2

Easily sol in hot, sl sol in cold H_2O
(Cleve)

— **nitritochloride**, $\text{Cl}_2\text{Pt} \begin{smallmatrix} \text{NH}_3\text{NO}_2 \\ \text{NH}_3\text{Cl} \end{smallmatrix}$

Sol in H_2O (Cleve)

Chloroplatinamine bromide,
 $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5\text{Br})$

Sl sol in hot H_2O (Cleve)

— **chloride** (Gros' chloride),
 $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5\text{Cl})_2$

Nearly insol in cold, and only sl sol in hot
 H_2O Sol in hot conc $\text{KOH} + \text{Aq}$, with decomp
(Grimm)

Sol in cold $\text{KOH} + \text{Aq}$ without decomp
Nearly insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Buckton)
 $+ \text{H}_2\text{O}$ (Ruwsky)

— **chloroplatinate**, $\text{NCl}_2\text{Pt}(\text{N}_2\text{H}_5\text{Cl})_2$, PtCl_4
Easily sol in hot H_2O

— **chloroplatinite**, $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5\text{Cl})_2$, PtCl_2
Sl sol in H_2O (Cleve)

Chloroplatinamine chromate,
 $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{CrO}_4$

Nearly insol in H_2O (Cleve)

— **dichromate**, $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{Cr}_2\text{O}_7$

Sl sol in cold, more sol in hot H_2O
(Cleve)

— **nitrate** (Gros' nitrate), $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5\text{NO}_3)_2$

Much more easily sol in hot than in cold
 H_2O Sol in hot $\text{KOH} + \text{Aq}$ with decomp
Nearly insol in conc $\text{HNO}_3 + \text{Aq}$

— **nitritochloride**, $\text{Cl}_2\text{Pt} \begin{smallmatrix} \text{N}_2\text{H}_5\text{NO}_2 \\ \text{N}_2\text{H}_5\text{Cl} \end{smallmatrix}$

Ppt (Jorgensen)

— **phosphate**

See Chlorophosphatoplatinamine phosphate

— **sulphate**, $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5)_2\text{SO}_4$

Sl sol in both cold or hot H_2O (Cleve)
 $+ x\text{H}_2\text{O}$ Sl sol in cold, easily in hot
 H_2O (Grimm)

— **sulphocyanide**, $\text{Cl}_2\text{Pt}(\text{N}_2\text{H}_5)_2(\text{CNS})_2$
 $+ \text{H}_2\text{O}$

Ppt (Cleve)

Chloroplatinmonodiamine chloride,

$\text{Cl}_2\text{Pt} \begin{smallmatrix} (\text{NH}_3)_2\text{Cl} \\ \text{NH}_3\text{Cl} \end{smallmatrix}$

Quite easily sol in H_2O (Cleve)

Chloroplatinsemidiamine carbonate chloride,
 $2\text{Pt}(\text{NH}_3)_2\text{Cl}_2$, $\text{Pt}_2(\text{NH}_3)_4\text{Cl}_2(\text{CO}_3)$

Sl sol in H_2O , insol in alcohol and ether
Decomp by cold $\text{HCl} + \text{Aq}$ (Schon, Z anorg
1897, 13 37)

Chloroplatinsemidiamine chloride,
 $\text{Cl}_2\text{Pt}(\text{NH}_3)_2\text{Cl}$

Sol in 300 pts H_2O at 0° , and 65 pts at
 100° Not decomp by conc H_2SO_4 Sol in
 $\text{KOH} + \text{Aq}$ without decomp (Cleve)

Chloroplatinic acid, $\text{H}_2\text{PtCl}_6 + 6\text{H}_2\text{O}$

Deliquescent Sol in H_2O , alcohol, or ether
 $+ 4\text{H}_2\text{O}$ Deliquescent (Pigeon, C R
112 1218)

PtCl_4 , $\text{HCl} + 2\text{H}_2\text{O}$ (Pigeon)

Aluminium chloroplatinate, AlCl_3 , $\text{PtCl}_4 +$
 $15\text{H}_2\text{O}$

Very sol in H_2O and alcohol (Welkow, B
7 304)
Insol in ether

Ammonium chloroplatinate, $(\text{NH}_4)_2\text{PtCl}_6$

Sl sol in cold, more easily in hot H_2O
(Fresenius)

100 pts H_2O dissolve 0.666 pt at ord
temp and 12.5 pts at 100° (Crookes, C N
9 37)

Insol in cold HCl + Aq. Separates out on cooling from solution in hot HCl, HNO₃, or H₂SO₄. (Fischer)

Very sl sol in cold, easily in hot NH₄OH + Aq. (Fresenius)

Conc NH₄Cl + Aq ppts it almost completely from aqueous solution. (Böttger)

Sol in NH₄ succinate + Aq. (Döpping)

Less sol in H₂PtCl₆ + Aq than in H₂O. (Rogojski, A. ch (3) 41 452)

Sol in SnCl₂ + Aq. (Fischer)

Very sol with decomp in KCNS + Aq. (Claus)

At 15–20°, sol in 26,535 pts 97.5% alcohol, in 1476 pts 76% alcohol, and in 665 pts 55% alcohol. If free HCl is present, it is sol in 672 pts 76% alcohol. (Fresenius, A. 59 118)

Insol in absolute alcohol or ether

Barium chloroplatinate, BaPtCl₆ + 6H₂O

Permanent, sol in H₂O, decomp by alcohol. (v. Bonsdorff, Pogg 17 250)

Barium monochloroplatinate, PtCl(OH)₂Ba + H₂O

Insol in H₂O and in org solvents. (Bellucci, C. C. 1903, I 131)

Barium pentachloroplatinate, OH PtCl₅Ba + H₂O

(Miolati, Chem Soc 1900, 78 (2) 732)

Cadmium chloroplatinate, CdPtCl₆ + 6H₂O

Deliquescent, and easily sol in H₂O. (v. Bonsdorff)

Cæsium chloroplatinate, Cs₂PtCl₆

100 pts H₂O dissolve it

0° 10° 20° 30°
0.024 0.050 0.079 0.110 pts Cs₂PtCl₆,

40° 50° 60° 70°
0.142 0.177 0.213 0.251 pts Cs₂PtCl₆,

80° 90° 100°
0.291 0.332 0.377 pts Cs₂PtCl₆,

(Bunsen, Pogg 113 337)

Sol in 1308 pts H₂O at 15°, and 261 pts at 100°. (Crookes, C. N. 9 205)

Calcium chloroplatinate, CaPtCl₆ + 8H₂O

Deliquescent, easily sol in H₂O. (v. Bonsdorff)

Calcium monochloroplatinate, PtCl(OH)Ca + H₂O

Insol in H₂O and in org solvents. (Bellucci, C. C. 1903, I 131)

Cerium chloroplatinate, CeCl₃, PtCl₄ + 13H₂O

Deliquescent, very sol in H₂O or alcohol, insol in ether.

4CeCl₃, 3PtCl₄ + 5H₂O. Deliquescent, easily sol in H₂O or alcohol, insol in ether. (Holzmann, J. pr 84 80)

Chromium chloroplatinate, CrCl₃, PtCl₄ + 10½H₂O

Deliquescent. (Nilson, B. 9 1056)

+ 10H₂O. Very sol in H₂O and alcohol. Nearly insol in acetone. (Higley, J. Am Chem Soc 1904, 26 617)

Cobalt chloroplatinate, CoPtCl₆ + 6H₂O

Very deliquescent. (Jørgensen)

Copper chloroplatinate, CuPtCl₆ + 6H₂O

Deliquescent in moist air. (v. Bonsdorff)

Didymium chloroplatinate, D₂Cl₃, PtCl₄ + 13H₂O

Less deliquescent than the cerium salt. (Marignac)

+ 10½H₂O. Deliquescent. (Cleve, Bull Soc (2) 43 361)

Erbium chloroplatinate, ErCl₃, PtCl₄ + 11H₂O

Very deliquescent. (Cleve)

Gadolinium chloroplatinate, GdCl₃, PtCl₄ + 10H₂O

Ppt. (Benedicko, Z. anorg 1900, 22 204)

Glucinum chloroplatinate, GlPtCl₆ + 6H₂O

Deliquescent in moist air. Very sol in H₂O, moderately in alcohol. Insol in ether. (Welkow, B. 6 1288)

Indium chloroplatinate, 2InCl₃, 3PtCl₄ + 36H₂O

Deliquescent. (Nilson)

Iron (ferrous) chloroplatinate, FePtCl₆ + 6H₂O

Deliquescent. (Lopsoc)

Iron (ferric) chloroplatinate, FeCl₃, PtCl₄ + 10½H₂O

Deliquescent. (Nilson)

Lanthanum chloroplatinate, LaCl₃, PtCl₄ + 13H₂O

Deliquescent, extremely sol in H₂O. (Cleve)

Lead chloroplatinate, PbPtCl₆ + 3H₂O

Easily sol in H₂O and alcohol. (Lopsoc) with decomp. (Bunsen, Z. anorg 1867 520)

Lead monochloroplatinate, [PtCl(OH)]Pb₂Pb(OH)

Ppt. (Bellucci, Chem Soc 1902, 82, II 155)

Lead pentachloroplatinate, basic, PtCl(OH)Pb₂Pb(OH)

(Miolati, Chem Soc 1900, 78 (2) 732)

Lithium chloroplatinate, Li₂PtCl₆ + 6H₂O

Extremely deliquescent. (Jørgensen), efflorescent. Easily sol in H₂O, alcohol, or ether-alcohol, insol in ether. (Scheibler)

Lithium pentachloroplatinate, OH PtCl₅Li

Very hygroscopic. (Miolati, Chem Soc 1900, 78 (2) 732)

Magnesium chloroplatinate, $\text{MgPtCl}_6 \cdot 6\text{H}_2\text{O}$

Sol in H_2O and abs alcohol
+12 H_2O Sol in H_2O

Manganese chloroplatinate, $\text{MnPtCl}_6 \cdot 6\text{H}_2\text{O}$

Not deliquescent, sol in H_2O
+12 H_2O Sl efflorescent

Nickel chloroplatinate, $\text{NiPtCl}_6 \cdot 6\text{H}_2\text{O}$

Sol in H_2O

Potassium chloroplatinate, K_2PtCl_6

100 pts H_2O dissolve at

0° 10° 20° 30° 40° 50°
0.74 0.90 1.12 1.41 1.76 2.17 pts K_2PtCl_6 ,
60° 70° 80° 90° 100°
2.64 3.19 3.79 4.45 5.18 pts K_2PtCl_6
(Bunsen, Pogg 113 337)

100 pts H_2O dissolve 0.926 pt at 15°, and
5.26 pts at 100° (Crookes, C N 9 205)

100 g H_2O dissolve at

2° 16° 25° 35° 48°
0.4812 0.6718 0.8641 1.132 1.745 g K_2PtCl_6 ,
59° 68° 78° 92°
2.396 2.913 3.589 4.484 g K_2PtCl_6
(Archibald, J Am Chem Soc 1908, 30 752)

Not attacked by cold conc H_2SO_4 (Las-
saigne)

Sl sol in cold, more easily in hot dil acids
Less sol in $\text{KCl} + \text{Aq}$ than in H_2O , and nearly
insol in sat $\text{KCl} + \text{Aq}$ (Schrotter, W A B
50, 2 268)

Solubility in $\text{KCl} + \text{Aq}$ at 20°

G mol KCl per l of $\text{KCl} + \text{Aq}$	G K_2PtCl_6 in 100 g of solution
0 00	0 7742
0 20	0 0236
0 25	0 0207
0 50	0 0109
1 00	0 0046
2 00	0 0045
3 00	0 0043
4 00	0 0042
sat	0 0034

(Archibald, J Am Chem Soc 1908, 30 757)

Solubility in $\text{NaCl} + \text{Aq}$ at 16°

(mol NaCl per litre of $\text{NaCl} + \text{Aq}$	G K_2PtCl_6 in 100 g of solution
0 00	0 672
0 05	0 700
0 10	0 729
0 25	0 758
0 50	0 775
0 75	0 791
1 00	0 805
2 00	0 834

(Archibald, J Am Chem Soc 1908, 30 757)

Sol in $\text{KOH} + \text{Aq}$ Insol in cold or hot
alkali carbonates or bicarbonates + Aq (Rosa)

Easily sol in warm $\text{Na}_2\text{S}_2\text{O}_4 + \text{Aq}$ (Humly)

Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Brett)

Sol in NH_4 succinate + Aq (Dopping)

At 15–20°, sol in 12,083 pts absolute al-
cohol, in 3775 pts 76% absolute alcohol, and
in 1053 pts 55% absolute alcohol (Fresen-
ius)

Sol in 1835 pts 76% alcohol containing
 HCl at 15–20° (Fresenius)

Nearly absolutely insol in alcohol con-
taining ether

Sol in 42,600 pts absolute alcohol Precht
Z anal 18 509)

1.1 methyl alcohol dissolves 0.072 g at 20
(Pelgrot, Monat Sci 1892, (4) 6 I 573)

Solubility in methyl alcohol + Aq at 20

% alcohol by wt	G K_2PtCl_6 in 100 g of solution
0	0 7742
5	0 5350
10	0 4120
20	0 2642
30	0 1831
40	0 1165
50	0 0625
60	0 0325
70	0 0152
80	0 0124
90	0 0035
100	0 0027

(Archibald, J Am Chem Soc 1908 30 755)

Solubility in ethyl alcohol— Aq at 20

% alcohol by wt	G K_2PtCl_6 in 100 g of solution
0	0 7742
5	0 4910
10	0 3720
20	0 2180
30	0 1540
40	0 0760
50	0 0401
60	0 0265
70	0 0128
80	0 0085
90	0 0025
100	0 0009

(Archibald, J Am Chem Soc 1908 30 755)

Solubility in isobutyl alcohol— Aq at 20

alcohol	G K_2PtCl_6
0	0 7742
8 20	0 6250
sat	0 1800

(Archibald, J Am Chem Soc 1908 30 755)

Potassium pentachlorohydroplatinate, $K_2(PtCl_5OH)$ Easily sol in H_2O (Ruff, B 1913 46 925)**Praseodymium chloroplatinate**, $PrCl_3, PtCl_4 + 12H_2O$ Very sol in H_2O Sol in conc HCl (von Scheele, Z anorg 1898, 18 353)**Rubidium chloroplatinate**, Rb_2PtCl_6

100 pts H_2O dissolve at

0°	10°	20°
0 184	0 154	0 141 pts Rb_2PtCl_6 ,
30°	40°	50°
0 145	0 166	0 203 pts Rb_2PtCl_6 ,
60°	70°	80°
0 253	0 329	0 417 pts Rb_2PtCl_6 ,
90°	100°	
0 521	0 634	pts Rb_2PtCl_6

(Bunsen, Pogg 113 337)

Sol in 740 pts H_2O at 15°, and 157 pts at 100° (Crookes, C N 9 205)
Insol in alcohol**Samarium chloroplatinate**, $SmCl_3, PtCl_4 + 10\frac{1}{2}H_2O$ Deliquescent Very sol in H_2O (Cleve, Bull Soc (2) 43 165)**Silver chloroplatinate**, Ag_2PtCl_6 Ppt Gradually decomp by H_2O into $AgCl$ and $PtCl_4$ (Jorgensen, J pr (2) 16 345)
 $Ag PtCl_4(OH)_2$ Ppt**Silver monochloroplatinate**, $[PtCl(OH)_5]Ag_2$

Ppt (Bellucci, Chem Soc 1902, 82 (2) 155)

Silver pentachloroplatinate, $(OH)PtCl_5Ag_2$ Ppt, stable in boiling H_2O (Miolati, Chem Soc 1900, 78 (2) 732)**Silver chloroplatinate ammonia**, $Ag_2PtCl_6, 2NH_3$ Insol in H_2O^* (Birnbbaum)**Sodium chloroplatinate**, $Na_2PtCl_6 + 6H_2O$ Easily sol in H_2O Sat solution at 15° contains 39.77 g Na_2PtCl_6 and has sp gr of 1.368 Sol in $NaCl + Aq$ More sol in absolute alcohol than in 95% alcohol Sat solution in abs alcohol contains 11.90%, 95% alcohol, 6.34% Mixture of equal parts of alcohol and ether dissolve 2.43% Insol in ether (Precht, Z anal 18 502)**Sodium pentachloroplatinate**, $(OH)PtCl_5Na_2$

Exists only in solution (Miolati, l c)

Strontium chloroplatinate, $SrPtCl_6 + 8H_2O$ Very sol in H_2O **Strontium monochloroplatinate**, $PtCl(OH)_5Sr + H_2O$ Insol in H_2O and org solvents (Bellucci, C C 1903, I 131)**Thallium chloroplatinate**, Tl_2PtCl_6 Very sl sol in H_2O Sol in 15,585 pts H_2O at 15°, and 1948 pts at 100° (Crookes)**Thallium monochloroplatinate**, $[PtCl(OH)_5]Tl$

Ppt (Bellucci, Chem Soc 1902, 82 (2) 155)

Thallium pentachloroplatinate, $(OH)PtCl_5Tl_2$

(Miolati, Chem Soc 1900, 78 (2) 732)

Thorium chloroplatinate, $ThCl_4, PtCl_4 + 12H_2O$

Very deliquescent (Cleve, Bull Soc (2) 21 118)

Tin (stannic) chloroplatinate, $SnCl_4, PtCl_4 + 12H_2O$

(Nilson B 9 1142)

Ytterbium chloroplatinate, $2YbCl_3, PtCl_4 + 22H_2O$, and $+35H_2O$

Ppt (Cleve, Z anorg 1902, 32 137)

Vanadyl chloroplatinate, $(VO)PtCl_4 + 10\frac{1}{2}H_2O$ Sol in H_2O , cryst from $PtCl_4 + Aq$ (Brauner, M 3 58)**Yttrium chloroplatinate**, $4YCl_3, 5PtCl_4 + 52H_2O$ Very deliquescent (Cleve)
 $2YCl_3, 3PtCl_4 + 30H_2O$ (Nilson, B 9 1059)
 $2YCl_3, PtCl_4 + 21H_2O$ (Nilson)**Zinc chloroplatinate**, $ZnPtCl_6 + 6H_2O$ Deliquescent, sol in H_2O and alcohol**Zinc tetrachloroplatinate**, $ZnPt(OH)Cl_4 + 5H_2O$ Extremely sol in H_2O and alcohol (Miolati, Z anorg 1900, 22 458)**Zirconyl chloroplatinate**, $(ZrO)PtCl_6 + 12H_2O$ (Nilson)**Chloroplatinocyanhydripyrophosphoric**

acid, $ClPtP O_5H_4 = ClPt \begin{cases} \nearrow P(OH)_2 \\ \searrow O \\ \nearrow PO(OH)_2 \end{cases}$

Not deliquescent Sol in H_2O (Schutzenberger, Bull Soc (2) 18 154)**Chloroplatinocyanhydric acid**, $H_2Pt(CN)_4Cl_2$

See Perchloroplatinocyanhydric acid

Potassium chloroplatinocyanide, $5K_2Pt(CN)_4$,
 $K_2Pt(CN)_4Cl_2 + 21H_2O$
 Sol in H_2O , insol in alcohol

Silver chloroplatinocyanide,
 $Ag_2(PtCl_2(CN)_4)_2$
 Ppt (Miolati, C C 1901, I 500)

Chloroplatinophosphoric acid,
 $Cl_2PtP(OH)_3$
 Very deliquescent, and sol in H_2O
 (Schutzenberger, Bull Soc (2) 17 493)

Lead chloroplatinophosphate, $Pb_3(Cl_2PtPO_3)_2$
 $+ 8H_2O$

Ppt
 $Pb_3(Cl_2PtPO_3)_2$, $2PbO + 4H_2O$ Ppt
 (Schutzenberger, Bull Soc (2) 17 494)

Silver chloroplatinophosphate, Ag_2HPO_3 ,
 $PtCl_2$
 Ppt (Schutzenberger, Bull Soc (2) 17 494)

Chloroplatinodiphosphoric acid, $PtCl_2$,
 $P_2(OH)_6$
 Very deliquescent, and easily sol in H_2O
 (Schutzenberger, Bull Soc (2) 18 153)

Chloroplatinopyrophosphoric acid,
 $ClPt \begin{array}{c} \nearrow P(OH)_2 \\ \searrow O \\ \searrow P(OH)_2 \end{array}$
 Less deliquescent than chloroplatinodiphosphoric acid

Chloroplatinous acid, H_2PtCl_4
 Known only in solution

Aluminum chloroplatinite, $AlPtCl_5 + 10\frac{1}{2}H_2O$
 Very deliquescent, sol in H_2O (Nilson, J pr (2) 15 260)

Ammonium chloroplatinite, $(NH_4)_2PtCl_4$
 Sl sol in cold, easily in hot H_2O Insol in alcohol (Peyrone, A 55 206)

Barium chloroplatinite, $BaPtCl_4 + 3H_2O$
 Not deliquescent, sol in H_2O Very sl sol in 93% alcohol

Cadmium chloroplatinite ammonia, $CdPtCl_4$,
 $4NH_3$
 Insol in H_2O or $NH_4OH + Aq$ Sol in $HCl + Aq$ (Thomson, B 2 668)

Cesium chloroplatinite, Cs_2PtCl_4
 Sl sol in cold, easily in hot H_2O
 100 pts H_2O dissolve 3 4 pts salt at 20°
 " " 6 73 " " 40°
 " " 8 68 " " 60°
 " " 10 92 " " 80°
 " " 12 10 " " 100°
 (Godeffroy, A 181 176)

Cs_2PtCl_4 Ppt Very sensitive to sunlight Decomp by H_2O into the higher and lower chlorides (Wohler, B 1909, 42 4104)

Calcium chloroplatinite, $CaPtCl_4 + 8H_2O$
 Deliquescent, sol in H_2O

Cerium chloroplatinite, $CeCl_3$, $2PtCl_2 + 10\frac{1}{2}H_2O$
 Deliquescent, easily sol in H_2O (Nilson, B 9 1847)

Chromium chloroplatinite, $Cr_2Pt_3Cl_{12} + 18H_2O$
 Deliquescent

Cobalt chloroplatinite, $CoPtCl_4 + 6H_2O$
 Sl deliquescent in moist, efflorescent in dry air

Copper chloroplatinite, $CuPtCl_4 + 6H_2O$
 Extremely deliquescent (Topsøe)

Copper chloroplatinite ammonia (cuprammonium chloroplatinite),
 $Cu(NH_3)_4PtCl_4$
 Insol in H_2O or $NH_4OH + Aq$, easily sol in $H_2SO_4 + Aq$ (Millon and Commaulle, C R 57 822)

Didymium chloroplatinite, D_1Cl_3 , $2PtCl_2 + 10H_2O$
 Deliquescent, very sol in H_2O (Nilson)
 $2D_1Cl_3$, $3PtCl_2 + 18H_2O$ As above (Nilson)

Erbium chloroplatinite, $ErPtCl_5 + 13\frac{1}{2}H_2O$
 Deliquescent
 $Er_2Pt_3Cl_{12} + 24H_2O$ Deliquescent in moist air

Glucinum chloroplatinite, $GlPtCl_4 + 5H_2O$
 Deliquescent in moist air Sol in H_2O in all proportions

Iron (ferrous) chloroplatinite, $FePtCl_4 + 7H_2O$
 Deliquescent Rather sl sol in cold, very sol in hot H_2O (Nilson)

Lanthanum chloroplatinite, $L_1Pt_3Cl_{12} + 18$,
 and $27H_2O$
 Deliquescent

Lead chloroplatinite, $PbPtCl_4$
 Insol in cold H_2O

Lithium chloroplatinite, $Li_2PtCl_4 + 6H_2O$
 Sol in H_2O

Magnesium chloroplatinite, $MgPtCl_4 + 6H_2O$
 Not very deliquescent, very sol in H_2O

Manganese chloroplatinite, $\text{MnPtCl}_4 + 6\text{H}_2\text{O}$

As the Mg salt

Mercurous chloroplatinite

Ppt

Nickel chloroplatinite, $\text{NiPtCl}_4 + 6\text{H}_2\text{O}$

As the Co salt

Potassium chloroplatinite, K_2PtCl_4 Moderately sol in H_2O , insol in alcohol**Rubidium chloroplatinite**, Rb_2PtCl_4 Sl sol in cold, easily in hot H_2O **Silver chloroplatinite**, Ag_2PtCl_4 Insol in H_2O $\text{NH}_4\text{OH} + \text{Aq}$ dissolves out AgCl (Lang) AgCl , PtCl_2 (?) As above (Commaille, Bull Soc (2) 6 262)**Silver chloroplatinite ammonia**, $\text{Ag}_2\text{PtCl}_4 \cdot 4\text{NH}_3$

(Thomsen)

Sodium chloroplatinite, $\text{Na}_2\text{PtCl}_4 + 4\text{H}_2\text{O}$ Deliquescent, very sol in H_2O **Strontium chloroplatinite**, $\text{SrPtCl}_4 + 6\text{H}_2\text{O}$ y sol in H_2O **Tantalum chloroplatinite**, TaPtCl_4 sol even in boiling H_2O **Thallium chloroplatinite**, $\text{Th}_2\text{Pt}_2\text{Cl}_{14} + 24\text{H}_2\text{O}$

very deliquescent

Yttrium chloroplatinite, $\text{Y}_2\text{Pt}_2\text{Cl}_{12} + 24\text{H}_2\text{O}$

Deliquescent

Zinc chloroplatinite, $\text{ZnPtCl}_4 + 6\text{H}_2\text{O}$ Sl sol in cold, more easily in hot H_2O , insol in alcohol**Zinc chloroplatinite ammonia**, $\text{ZnPtCl}_4 \cdot 4\text{NH}_3$ Sl sol in H_2O , easily sol in $\text{HCl} + \text{Aq}$
Insol in alcohol (Thomsen, J B 1868 278)**Zirconyl chloroplatinite**, $(\text{ZrO})\text{PtCl}_4 + 8\text{H}_2\text{O}$

(Nilson)

Trichloroplatinous acid, $\text{H}_2\text{Pt}(\text{OH})\text{Cl}_3$ Sol in H_2O (Miolati, Z anorg 1902, 33 265) $+ \text{H}_2\text{O}$ (Nilson, J pr (2) 15 260)**Lead trichloroplatinite**, $\text{PbPt}(\text{OH})\text{Cl}_3$

Ppt (Miolati)

Silver trichloroplatinite, $\text{Ag}_2\text{Pt}(\text{OH})\text{Cl}_3$

Ppt (Miolati)

Chloroplatosulphurous acid**Ammonium chloroplatosulphite, acid**,
 $\text{NH}_4\text{PtClSO}_3, \text{H}_2\text{SO}_3 + 4\text{H}_2\text{O}$ Sol in H_2O (Birnbbaum, A 152 149)**Ammonium chloroplatosulphite chloride sulphite**, $\text{NH}_4\text{PtClSO}_3, (\text{NH}_4)_2\text{SO}_3, \text{NH}_4\text{Cl}$

Very deliquescent (Birnbbaum)

Ammonium chloroplatosulphite sulphite,
 $\text{NH}_4\text{ClPtSO}_3, (\text{NH}_4)_2\text{SO}_3 + 3\text{H}_2\text{O}$ Sol in H_2O (Birnbbaum)**Barium chloroplatosulphite chloride ammonium chloride**, $\text{Ba}(\text{ClPtSO}_3)_2$,
 $\text{Ba}(\text{PtClSO}_3)\text{Cl}, 6\text{NH}_4\text{Cl} + 3\text{H}_2\text{O}$ Sol in H_2O (Birnbbaum)**Potassium chloroplatosulphite ammonium chloride**, $\text{KPtClSO}_3, 2\text{NH}_4\text{Cl}$

Very deliquescent (Birnbbaum, A 152 142)

Potassium chloroplatosulphite chloride,
 $\text{KPtClSO}_3, 2\text{KCl}$ Deliquescent, sol in H_2O (Birnbbaum, A 152 145)**Potassium chloroplatosulphite ammonium potassium sulphite**, KPtClSO_3 ,
 $(\text{NH}_4)\text{KSO}_3 + 3\text{H}_2\text{O}$

Very deliquescent (Birnbbaum, A 159 120)

Sodium chloroplatosulphite ammonium chloride, $\text{NaPtClSO}_3, 2\text{NH}_4\text{Cl}$

Very deliquescent (Birnbbaum, A 159 117)

Chloroplumbic acid, H_2PbCl_6

Decomp in solution on standing (Gutbier, J pr 1914, (2) 90 497)

Ammonium chloroplumbate, $(\text{NH}_4)_2\text{PbCl}_6$ Ppt Difficultly sol in v small amount of H_2O Solution decomp slowly when cold more rapidly when warmedDecomp by a large amount of H_2O Sol without decomp in 20% HCl Decomp by dil acids and alkalis (Elbs, Z Elektrochem 1903, 9 778)Difficultly sol in small amount of H_2O and solution decomp slowly in the cold, more rapidly when warmed Decomp by a large amount of H_2O (Gutbier, J pr 1914, (2) 90 498)Sol in cold HNO_3 without decomp (Friedrich, M 1893, 14 511)Insol in conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Nikoljukin B 18 370 R) $5\text{NH}_4\text{Cl}, 2\text{PbCl}_4$ Not hygroscopic Decomp by H_2O with pptn of PbO_2 Sol in $\text{HCl} + \text{Aq}$ and in cold $\text{HNO}_3 + \text{Aq}$ without

decomp (Classen and Zahorski, Z anorg 4 100)

Composition is $2\text{NH}_4\text{Cl}$, PbCl_4 (Friedrich, W A B 102, 2b 527)

Cæsium chloroplumbate, Cs_2PbCl_6

Nearly absolutely insol in conc $\text{CsCl} + \text{Aq}$ in presence of Cl (Wells, Z anorg 4 335)

1 ccm conc $\text{HCl} + \text{Aq}$ containing PbCl_4 dissolves 0.000049 g Cs_2PbCl_6 (Wells, Z anorg 4 341)

Reacts with H_2O as the corresponding ammonium salt (Gutbier, J pr 1914, (2) 90 500)

Potassium chloroplumbate, K_2PbCl_6

Decomp by H_2O , sol in $\text{KCl} + \text{Aq}$ (Wells, Z anorg 4 335)

Readily decomp in the air (Gutbier, J pr 1914, (2) 90 499)

Rubidium chloroplumbate, Rb_2PbCl_6

Decomp by H_2O , sl sol in conc $\text{RbCl} + \text{Aq}$ (Wells, Z anorg 4 335)

1 ccm conc $\text{HCl} + \text{Aq}$ containing PbCl_4 dissolves 0.003 g Rb_2PbCl_6 (Wells, Z anorg 4 341)

Reacts with H_2O as the corresponding ammonium salt (Gutbier, J pr 1914, (2) 90 499)

Decomp by conc H_2SO_4 , Insol in 96% alcohol (Erdmann, A 1896, 294 76)

Chloropurpureochromium bromide,



Somewhat more easily sol in H_2O than the chloride (Jorgensen, J pr (2) 20 105)

— **chloride**, $\text{CrCl}(\text{NH}_3)_5\text{Cl}_2$

Difficultly sol in cold, and decomp by hot H_2O

1 pt dissolves in 154 pts H_2O at 16° Insol in conc $\text{HCl} + \text{Aq}$ More sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ than in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ without decomp (Jorgensen, J pr (2) 20 105)

— **mercuric chloride**, $\text{CrCl}(\text{NH}_3)_5\text{Cl}$, 3HgCl_2

Very difficultly sol in H_2O (Jorgensen)

— **chloroplatinate**, $\text{CrCl}(\text{NH}_3)_5(\text{PtCl}_6)$

Extremely difficultly sol in H_2O (Jorgensen)

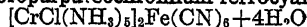
— **chromate**, $\text{CrCl}(\text{NH}_3)_5(\text{CrO}_4)$

Sl sol in H_2O , sl more sol than chloropurpureocobalt chromate (Jorgensen)

— **dithionate**, $\text{CrCl}(\text{NH}_3)_5(\text{S}_2\text{O}_6)$

Very sl sol in cold, but much more easily in hot H_2O (Jorgensen)

Chloropurpureochromium ferrocyanide,



Very difficultly sol in cold H_2O (Jorgensen)

— **fluosilicate**, $\text{CrCl}(\text{NH}_3)_5(\text{SiF}_6)$

Very difficultly sol in H_2O Insol in $\text{H}_2\text{SiF}_6 + \text{Aq}$ (Jorgensen, J pr (2) 20 105)

— **mercuric iodide**, $\text{CrCl}(\text{NH}_3)_5\text{I}_2$, 2HgI_2

Decomp by H_2O , sol in alcohol and warm $\text{KCN} + \text{Aq}$

$\text{CrCl}(\text{NH}_3)_5\text{I}_2$, HgI_2 Very difficultly sol in cold H_2O , easily sol in $\text{KCN} + \text{Aq}$ (Jorgensen, l c)

— **nitrate**, $\text{CrCl}(\text{NH}_3)_5(\text{NO}_3)_2$

Sol in 71 pts H_2O at 17.5° Insol in $\text{HNO}_3 + \text{Aq}$ (Jorgensen)

— **oxalate**, $\text{CrCl}(\text{NH}_3)_5\text{C}_2\text{O}_4$

Very sl sol in cold H_2O (Jorgensen, l c)

— **sulphate**, $\text{CrCl}(\text{NH}_3)_5\text{SO}_4 + 2\text{H}_2\text{O}$

Sol in H_2O , precipitated by alcohol (Jorgensen)

— **sulphate, acid**, $[\text{CrCl}(\text{NH}_3)_5]_2\text{SO}_4(\text{HSO}_4)_6$

Quite sol in H_2O (Jorgensen, J pr (2) 20 185)

— **pentasulphide**, $\text{CrCl}(\text{NH}_3)_5\text{S}_5$

Very sl sol in cold, easily sol in warm H_2O Decomp by dil $\text{HCl} + \text{Aq}$ Insol in alcohol (Jorgensen)

Chloropurpureocobaltic bromide,



Properties resemble the chloride very closely Sol in 214 pts H_2O at 14.3° (Jorgensen, J pr (2) 18 205)

— **mercuric bromide**, $4\text{CoCl}(\text{NH}_3)_5\text{Br}_2$, 9HgBr_2

Ppt (J)

— **bromoplatinate**, $\text{CoCl}(\text{NH}_3)_5\text{Br}_2$, PtBr_4

Very sl sol in H_2O (J)

— **carbonate**, $\text{CoCl}(\text{NH}_3)_5\text{CO}_3 + 4\frac{1}{2}\text{H}_2\text{O}$

Efflorescent, very easily sol in H_2O (J)

— **chloride**, $\text{CoCl}(\text{NH}_3)_5\text{Cl}_2$

Very sl sol in cold, more easily in hot H_2O Sol in 244 pts H_2O at 15.5° (Claudet, Phil Mag J (4) 2 253) In 287 pts H_2O at 10.2° and 255 pts at 11.5° (Rose, Pogg 20 152) 100 pts H_2O dissolve 0.232 pt CoCl_2 , 5NH_3 , at 0° , and 1.031 pts at 46.6° (Kurnakoff, J Russ Soc 24 629)

Sl decomp by cold, completely by boiling H_2O , decomp prevented by a little HCl Pptd from aqueous solution by alcohol, HCl ,

or sat KCl or NaCl + Aq, not deromp by boiling HCl + Aq (Claudet, *lc*) Nearly insol in cold, but sol in hot H₂O, to which a few drops of HCl have been added Less sol in dil HCl + Aq than luteocobaltic chloride (Rogojski, A ch (3) 41 447)

Insol in alcohol (Gibbs and Genth)

Chloropurpureocobaltic antimony chloride,
 $2\text{CoCl}(\text{NH}_3)_5\text{Cl}_2, \text{SbCl}_3$

Ppt Decomp by H₂O (Gibbs)

— **bismuth chloride**

Insol in conc HCl Easily decomp by H₂O (Gibbs)

— **mercuric chloride, CoCl(NH₃)₅Cl₂, 3HgCl₂**

Insol in cold, less sol in hot H₂O than chloropurpureocobaltic chloride Insol in cold fuming HCl + Aq, sl sol in hot HCl + Aq, separating on cooling, sl sol in hot aqua regia, moderately sol in hot HNO₃ + Aq, partly sol in cold conc H₂SO₄, wholly on warming Easily sol in warm H₂C₂O₄ + Aq Insol in HgCl₂ + Aq

Moderately sol in NH₄OH + Aq or (NH₄)₂CO₃ + Aq (Carstanjen)

CoCl(NH₃)₅Cl₂, 2HgCl₂ Sl sol in cold, but much more easily in hot H₂O (Gibbs, Proc Am Acad 10 33)

— **chloropalladite, CoCl(NH₃)₅Cl, PdCl₂**

Sl sol in cold, moderately sol in hot H₂O (Carstanjen)

— **chloroplatinate, CoCl(NH₃)₅Cl₂, PtCl₄**

Nearly insol in cold Very sl sol in hot H₂O (Gibbs and Genth, Sill Am J (2) 23 319)

— **chromate, CoCl(NH₃)₅CrO₄**

Very sl sol in H₂O (J)

— **dichromate, CoCl(NH₃)₅Cr₂O₇**

Much more easily sol in H₂O than the neutral salt (J)

— **dithionate, CoCl(NH₃)₅S₂O₈**

Very sl sol in cold, more easily in hot H₂O (J)

— **manganic fluoride**

Ppt Sl sol in dil HCl + Aq (Christensen, J pr (2) 35 161)

— **fluosilicate, CoCl(NH₃)₅SiF₆**

Very sl sol in HCl + Aq

— **iodide, CoCl(NH₃)₅I**

Much more sol in H₂O than bromide or chloride Sol in 54.5 pts H₂O at 15.6°, and 50 pts at 19.3° (J)

Chloropurpureocobaltic mercuric iodide,
 $\text{CoCl}(\text{NH}_3)_5\text{I}_2, 2\text{HgI}_2$

Sl sol in H₂O (J)
 $\text{CoCl}(\text{NH}_3)_5\text{I}_2, \text{HgI}_2$ Very sl sol in cold H₂O (J)

— **nitrate, CoCl(NH₃)₅(NO₃)₂**

Sol in 80 pts H₂O at 15° Rather easily sol in hot H₂O (Jorgensen J pr (2) 18 209)

— **oxalate, CoCl(NH₃)₅C₂O₄**

Sl sol in H₂O (J)

— **pyrophosphate, CoCl(NH₃)₅(H₂P₂O₇)**

Sl and very slowly sol in cold, much more easily in warm H₂O (J)

[CoCl(NH₃)₅]₂P₂O₇ + xH₂O Quite easily sol in H₂O

— **diphosphopentamolybdate,**

[CoCl(NH₃)₅]₂(5MoO₃, 2HPO₄)

Ppt Nearly insol in pure H₂O, more sol in dil H₂SO₄ + Aq without decomp (J)

[CoCl(NH₃)₅]₂(5MoO₃, 2NH₄PO₄) Ppt As above

— **sulphate, CoCl(NH₃)₅SO₄**

Anhydrous Slowly sol in 125-131.9 pts H₂O at 16°

+2H₂O Sol in 133.4 pts H₂O at 17.3° Rather easily sol in hot H₂O, and much more rapidly in conc H₂SO₄ (J)

[CoCl(NH₃)₅]₂SO₄ Decomp by H₂O into neutral sulphate Sol in H₂SO₄

— **tartrate, CoCl(NH₃)₅(C₄H₄O₆)₂ + 2½H₂O**

Moderately sol in H₂O, insol in alcohol

— **thiosulphate, CoCl(NH₃)₅S₂O₃**

Nearly insol in cold H₂O, very sl sol in boiling H₂O with partial decomp (J)

Chloropurpureoiridium comps

See Iridopentamine comps

Chloropurpureorhodium carbonate,

$\text{ClRh}(\text{NH}_3)_5(\text{CO}_3) + \text{H}_2\text{O}$

Easily sol in H₂O (Jorgensen)

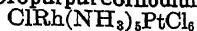
— **chloride, ClRh(NH₃)₅Cl**

Sol in 179 pts H₂O at 17° and more easily in hot H₂O Sol in conc H₂SO₄ or boiling NaOH + Aq without decomp Very sl sol in cold dil HCl + Aq (1:1) Sl sol in hot HCl + Aq Insol in alcohol (Jorgensen, J pr (2) 27 433, 34 394)

— **rhodium chloride,**
 $3\text{ClRh}(\text{NH}_3)_5\text{Cl}_2, 2\text{RhCl}_3$

Ppt (Jorgensen, Z anorg 5 75)

Chloropurpleorhodium chloroplatinate,



Insol in cold H_2O (J)

— **fluosilicate,** $\text{ClRh}(\text{NH}_3)_5\text{SiF}_6$

Very sl sol in cold H_2O Sol in $\text{NaOH} + \text{Aq}$ as roseo salt (J)

— **hydroxide,** $\text{ClRh}(\text{NH}_3)_5(\text{OH})_2$

Known only in solution (J)

— **nitrate,** $\text{ClRh}(\text{NH}_3)_5(\text{NO}_3)_2$

Sl sol in cold H_2O , but more easily than the chloride Sol in boiling $\text{NaOH} + \text{Aq}$ as roseo salt (J)

— **sulphate,** $\text{ClRh}(\text{NH}_3)_5\text{SO}_4 + 2\text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O (J)
 $4\text{ClRh}(\text{NH}_3)_5\text{SO}_4 \cdot 3\text{H}_2\text{SO}_4$ Sl sol in cold, more easily in hot H_2O (J)

Chlororhodous acid

Ammonium chlororhodite, $(\text{NH}_4)_2\text{RhCl}_5 + \text{H}_2\text{O}$

(Gutbier, B 1908, 41 213)
 Sol in H_2O , insol in alcohol (Wollaston)
 Not obtainable (Leidie, A ch (6) 17 275)
 $(\text{NH}_4)_3\text{RhCl}_5 + 1\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O , but less easily than Na salt, insol in alcohol Sol in dil $\text{NH}_4\text{Cl} + \text{Aq}$ (Claus, J B 1855 423) (Gutbier, l c)

Ammonium chlororhodite nitrate,



Very sol in H_2O Decomp by boiling with H_2O Sl sol in $\text{HNO}_3 + \text{Aq}$ (Leidie, C R 107 234)

Barium chlororhodite, $\text{Ba}_2(\text{RhCl}_5)$

Resembles the Na salt (Bunsen, A 146 276)

Cæsium chlororhodite, $\text{Cs}_2\text{RhCl}_5 + \text{H}_2\text{O}$

Difficulty sol in H_2O (Gutbier, B 1908, 41 214)

Lead chlororhodite, $\text{Pb}_3(\text{RhCl}_5)_2$

Ppt Insol in H_2O (Claus) Not obtainable (Leidie)

Mercurous chlororhodite, Hg_3RhCl_5

Ppt Insol in H_2O (Claus) Not obtainable (Leidie)

Potassium chlororhodite, $\text{K}_2\text{RhCl}_5 + \text{H}_2\text{O}$

Not efflorescent Sl sol in H_2O Sl sol in $\text{KCl} + \text{Aq}$ (Gibbs) Insol or sl sol in alcohol (Berzelius)
 Salt is anhydrous (Leidie)
 Contains $1\text{H}_2\text{O}$ (Seubert and Kobbé, B 23 2556)

Can be cryst from H_2O containing a little HCl (Gutbier, B 1908 41 212)

$\text{K}_2\text{RhCl}_5 + 3\text{H}_2\text{O}$ Efflorescent sl sol in H_2O Aqueous solution decomp to above on standing (Claus)

Not obtainable (Leidie)

Also obtained by Seubert and Kobbé B 23 2556)

$+1\frac{1}{2}\text{H}_2\text{O}$ (Leidie, C R 111 106)

Rubidium chlororhodite, $\text{Rb}_2\text{RhCl}_5 + \text{H}_2\text{O}$

Difficulty sol in H_2O (Gutbier B 1908, 41, 214)

Silver chlororhodite, Ag_2RhCl_5

Ppt Insol in H_2O (Claus)

Not obtainable (Leidie)

Sodium chlororhodite, $\text{Na}_4\text{RhCl}_{12} + 15\text{H}_2\text{O}$
 $\text{Na}_3\text{RhCl}_5 + 9\text{H}_2\text{O}$

Efflorescent Sol in 15 pts H_2O Melts in crystal H_2O at 50° Insol in alcohol (Claus)

$+12\text{H}_2\text{O}$ (Gutbier, B 1908 41 213)

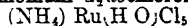
Chlororuthenic acid

Ammonium chlororuthenate, NH_4RuCl_4

Easily sol in H_2O (Claus)
 Formula is $(\text{NH}_4)\text{Ru}(\text{NO})\text{Cl}$ (Joh C R 107 994)

Sol in H_2O with decomp sol in HCl (Howe, J Am Chem Soc 1904 26 549)

Ammonium aquochlororuthenate,



Ppt (Howe J Am Chem Soc 1904 26 548)

Cæsium chlororuthenate, Cs_2RuCl_4

Sl sol in H_2O Sol in hot dil $\text{HCl} + \text{A}$ (Howe, J Am Chem Soc 1901 23 754)

Potassium chlororuthenate, $\text{K}_2\text{P}_2\text{Cl}_4$

Very sol in H_2O Very sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Insol in 70°C (Claus)

Formula is $\text{K}_2\text{Ru}_2\text{NO}_7\text{Cl}_5$ (Joh C R 107 994)

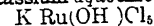
Very sl sol in cold H_2O Insol in H_2O (Claus)

Partially decomp in hot Aq (Anton, Gazz ch it 1899 29 52)

Easily sol in H_2O with decomp

Sol in HCl (Howe J Am Chem Soc 1904, 26 549)

Potassium aquochlororuthenate,



Sol in H_2O (Howe J Am Chem Soc 1904, 26 547)

Rubidium chlororuthenate, Pb_2RuCl_4

Sl sol in H_2O , sol in hot dil $\text{HCl} + \text{A}$ (Howe, J Am Chem Soc 1901 23 754)

Chlororuthenious acid

Ammonium chlororuthenite, $(\text{NH}_4)_4\text{Ru}_2\text{Cl}_{10}$
Sl sol in H_2O Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ or alcohol (Claus, J pr 80 282)

Cæsium chlororuthenite, $\text{Cs}_2\text{RuCl}_5 + \text{H}_2\text{O}$
Sl sol in H_2O , sol in $\text{HCl} + \text{Aq}$ (Howe, J Am Chem Soc 1901, 23 785)

Potassium chlororuthenite, $\text{K}_4\text{Ru}_2\text{Cl}_{10}$
Moderately sol in cold, more easily in hot H_2O Decomp easily by heating Insol in conc $\text{NH}_4\text{Cl} + \text{Aq}$ Insol in 80% alcohol

Rubidium chlororuthenite, $\text{Rb}_2\text{RuCl}_5 + \text{H}_2\text{O}$
Sl sol in H_2O , sol in $\text{HCl} + \text{Aq}$ (Howe, J Am Chem Soc 1901, 23 786)

Sodium chlororuthenite, $\text{Na}_4\text{Ru}_2\text{Cl}_{10}$
Deliquescent Sol in H_2O or alcohol

Trichlorosilcomercaptane

See Silicon chlorohydrosulphide

Chlorosmic acid

Chlorosmate, $(\text{NH}_4)_2\text{OsCl}_6$
 H_2O Insol in alcohol and H_2O
Jl.

Ammonium chlorosmate, K_2OsCl_6
Properties as the NH_4 salt

Potassium amino chlorosmate,
 $(\text{NH}_2)\text{OsCl}_5 \cdot 2\text{KCl}$
Ppt (Brizard, A ch 1900, (7) 21 375)

Potassium amino chlorosmate hydrogen chloride, $(\text{NH}_2)\text{CsCl}_3 \cdot 2\text{KCl} \cdot \text{HCl}$
Ppt (Brizard, A ch 1900, (7) 21 378)

Silver chlorosmate, Ag_2OsCl_6
Insol in H_2O or $\text{HNO}_3 + \text{Aq}$ (Claus and Jacoby)

Silver chlorosmate ammonia, $\text{Ag}_2\text{OsCl}_6 \cdot 2\text{NH}_3$
Sol in much H_2O Sl sol in $\text{KOH} + \text{Aq}$
Easily sol in $\text{KCN} + \text{Aq}$ (C and J)

Sodium chlorosmate, $\text{Na}_2\text{OsCl}_6 + 2\text{H}_2\text{O}$
Easily sol in H_2O or alcohol

Chlorosmious acid

Ammonium chlorosmite,
 $(\text{NH}_4)_4\text{Os}_2\text{Cl}_{10} + 3\text{H}_2\text{O}$
Easily sol in H_2O and alcohol, insol in ether (Claus and Jacoby, J pr 90 65)

Potassium chlorosmite, $\text{K}_4\text{Os}_2\text{Cl}_{12} + 6\text{H}_2\text{O}$
Very easily sol in H_2O or alcohol Insol in ether (C and J)

Chlorosmisulphurous acid

Potassium hydrogen chlorosmisulphite,
 $\text{OsCl}_4(\text{SO}_3)_4 \cdot \text{K}_6\text{H}_2$
Ppt (Rosenheim, Z anorg 1900, 24 422)

Sodium chlorosmisulphite,
 $\text{OsCl}_2(\text{SO}_3)_4 \cdot \text{Na}_6 + 10\text{H}_2\text{O}$
Ppt (Rosenheim, Z anorg 1900, 24 420)

Chloropyroselenious acid

Ammonium chloropyroselenite, NH_4Cl ,
 $2\text{SeO}_2 + 2\text{H}_2\text{O}$
Sol in H_2O (Muthmann and Schafer, B 26 1008)

Potassium chloropyroselenite, KCl , $2\text{SeO}_2 + \text{H}_2\text{O}$
As NH_4 salt (M and S)

Rubidium chloropyroselenite, RbCl ,
 $2\text{SeO}_2 + 2\text{H}_2\text{O}$
As NH_4 salt (M and S)

Chlorostannic acid, $\text{SnO}(\text{OH})\text{Cl}$
(Mallet, Chem Soc 35 524)
 $\text{H}_2\text{SnCl}_6 + 6\text{H}_2\text{O}$ Extremely deliquescent,
sol in H_2O (Seubert, B 20 793)

Ammonium chlorostannate, $(\text{NH}_4)\text{SnCl}_6$
(pink salt)
Sol in 3 pts H_2O at 14.5° Solution decomp on boiling when dilute, but not when conc (Bollev)

Barium chlorostannate, $\text{BaSnCl}_6 + 5\text{H}_2\text{O}$
Sol in H_2O (Lewy, A ch (3) 16 308)

Cæsium chlorostannate, Cs_2SnCl_6
Nearly insol in conc $\text{HCl} + \text{Aq}$ (Sharples, Sil Am J (2) 47 178)

Calcium chlorostannate, $\text{CaSnCl}_6 + 5\text{H}_2\text{O}$
Very deliquescent (Lewy, A ch (3) 16 308)

Cerium chlorostannate, $\text{CeSnCl}_7 + 9\text{H}_2\text{O}$
Deliquescent Sol in H_2O (Cleve, Bull Soc (2) 31 197)

Cobalt chlorostannate, $\text{CoSnCl}_6 + 6\text{H}_2\text{O}$
Sol in H_2O (Jorgensen)

Didymium chlorostannate, DlCl_3 , $\text{SnCl}_4 + 10\frac{1}{2}\text{H}_2\text{O}$
Sol in H_2O (Cleve)

Glucinum chlorostannate, $\text{GlSnCl}_6 + 8\text{H}_2\text{O}$
Deliquescent Sol in H_2O (Atterberg Sv V A Handl 12 No 4 14)

Lanthanum chlorostannate, $4\text{LaCl}_3, 5\text{SnCl}_4 + 45\text{H}_2\text{O}$

Deliquescent Sol in H_2O (Cleve)

Lithium chlorostannate, $\text{Li}_2\text{SnCl}_6 + 8\text{H}_2\text{O}$

Sol in little H_2O without decomp, but decomp by dilution (Chassevant, A ch (6) 30 42)

Magnesium chlorostannate, $\text{MgSnCl}_6 + 6\text{H}_2\text{O}$

Very deliquescent (Lewy)

Manganous chlorostannate, $\text{MnSnCl}_6 + 6\text{H}_2\text{O}$

Deliquescent in moist, efflorescent in dry air (Jorgensen)

Nickel chlorostannate, $\text{NiSnCl}_6 + 6\text{H}_2\text{O}$

Sol in H_2O (Jorgensen)

Potassium chlorostannate, K_2SnCl_6

Sol in H_2O

Sodium chlorostannate, $\text{Na}_2\text{SnCl}_6 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Topsoe, Gm K Handb 6te auf III 149)

Strontium chlorostannate, $\text{SrSnCl}_6 + 8\text{H}_2\text{O}$

Sl deliquescent, and easily sol in H_2O (Topsoe)

Yttrium chlorostannate, $\text{YCl}_3, \text{SnCl}_4 + 8\text{H}_2\text{O}$

Sol in H_2O (Cleve, Bull Soc (2) 31 197)

Zinc chlorostannate, $\text{ZnSnCl}_6 + 6\text{H}_2\text{O}$

(Bron, C C 1904, II 410)

Chlorosulphobismuthous acid

Cuprous chlorosulphobismuthite,
 $2\text{Cu}_2\text{S}, \text{Bi}_2\text{S}_3, 2\text{BiSCl}$

Stable in air and insol in H_2O at ord temp

Decomp by boiling H_2O

Decomp by mineral acids with evolution of H_2S (Ducatte, C R 1902, 134 1212)

Lead chlorosulphobismuthite, $\text{PbS}, \text{Bi}_2\text{S}_3, 2\text{BiSCl}$

Stable in the air Insol in H_2O , decomp by boiling H_2O , sol in dil acids with decomp and evolution of H_2S (Ducatte)

Chlorosulphonic acid, HClSO_3

See Sulphuryl hydroxyl chloride

Chloropyrosulphonic acid

Ammonium chloropyrosulphonate,
 $\text{ClS}_2\text{O}_6\text{NH}_4$

Fumes in the air

Decomp by H_2O and alcohol (Traube, B 1913, 46 2519)

Sodium chloropyrosulphonate, $\text{ClS}_2\text{O}_6\text{Na}$

Fumes in the air

Decomp by H_2O and alcohol (Traube)

Chlorosulphuric acid, HSO_3Cl

See Sulphuryl hydroxyl chloride

SO_2Cl_2 See Sulphuryl chloride

Aluminum chlorosulphate, $\text{Al}(\text{SO}_4)\text{Cl} + 6\text{H}_2\text{O}$

Very sol in H_2O Nearly insol in abs alcohol (Recoura, Bull Soc 1902, (3) 27 1155)

Chromium chlorosulphate, $\text{CrClSO}_4 + 5\text{H}_2\text{O}$

Green (Weinland, Z anorg 1905, 48 253) (Recoura, C R 1902, 135 164)

Violet (Weinland, Z anorg 1905, 48 254)

Very sol in H_2O Insol in a mixture of alcohol and acetone (Recoura, C R 1902, 135 164)

+ $8\text{H}_2\text{O}$ Two isomeric modifications

(a) *Green needles* Easily sol in H_2O (Weinland, Z anorg 1906, 48 251)

(b) *Violet plates* Easily sol in H_2O (Weinland)

Chlorosulphurous acid

Ammonium palladious trichlorosulphite,
 $(\text{NH}_4)_2\text{PdCl}_3\text{SO}_3 + \text{H}_2\text{O}$

Easily sol in H_2O (Rosenheim, Z anorg 1900, 23 30)

Chlorotelluric acid

Ammonium chlorotellurate, $(\text{NH}_4)_2\text{TeCl}_6$

Sol without decomp in a small amt of H_2O , but decomp by much H_2O or alcohol

Cæsium chlorotellurate, Cs_2TeCl_6

Decomp by H_2O Sol in dil $\text{HCl} + \text{Aq}$
100 pts $\text{HCl} + \text{Aq}$ (sp gr 1.2) dissolve 0.05 pt at 22°

100 pts $\text{HCl} + \text{Aq}$ (sp gr 1.05) dissolve 0.78 pt at 22°

Insol in alcohol (Wheeler, Sill Am J 145 267)

Potassium chlorotellurate, K_2TeCl_6

Deliquescent, decomp by H_2O and absolute alcohol (Berzelius)

The most sol in H_2O of the chloro- or bromo-tellurates Easily sol in dil $\text{HCl} + \text{Aq}$, conc $\text{HCl} + \text{Aq}$ ppts KCl (Wheeler, Sill Am J 145 267)

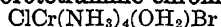
Rubidium chlorotellurate, Rb_2TeCl_6

Decomp by H_2O Much more sol in dil $\text{HCl} + \text{Aq}$ than Cs_2TeCl_6

100 pts $\text{HCl} + \text{Aq}$ (sp gr 1.2) dissolve 0.34 pt at 22°

100 pts $\text{HCl} + \text{Aq}$ (sp gr 1.05) dissolve, 13.99 pts at 22°

Sl sol in alcohol (Wheeler)

Chlorotetramine chromium bromide,

Very easily sol in H_2O (Cleve, 1861, (Jorgensen, J pr (2) 42 210)

— **chloride**, $\text{ClCr}(\text{NH}_3)_4(\text{OH}_2)\text{Cl}_2$

Sol in H_2O , but decomp by boiling. Sol in $\text{HCl} + \text{Aq}$, and this solution may be boiled without decomp (Cleve)

Sol in 15.7 pts H_2O at 15° (Jorgensen, J pr 42 208)

— **chromate**, $\text{ClCr}(\text{NH}_3)_4(\text{OH}_2)\text{CrO}_4$

Precipitate (Cleve)

— **fluosilicate**, $\text{ClCr}(\text{NH}_3)_4(\text{OH}_2)\text{SiF}_6$

Sl sol in H_2O (Jorgensen, J pr (2) 42 218)

— **hydroxide**, $\text{ClCr}(\text{NH}_3)_4(\text{OH})_2$

Known only in solution (Cleve)

— **iodide**, $\text{ClCr}(\text{NH}_3)_4(\text{OH})\text{I}$

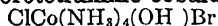
Easily sol in H_2O (Cleve)

— **nitrate**, $\text{ClCr}(\text{NH}_3)_4(\text{OH})(\text{NO}_3)$

Very easily sol in H_2O (Cleve), (Jorgensen, J pr (2) 42 209)

— **sulphate**, $\text{ClCr}(\text{NH}_3)_4(\text{OH})\text{SO}_4$

Very difficultly sol in cold, more easily in hot H_2O (Cleve)

Chlorotetramine cobaltic bromide,

More sol in H_2O than chloride. Nearly insol in $\text{HBr} + \text{Aq}$ (1:1) (Jorgensen, J pr (2) 42 215)

— **chloride**, $\text{ClCo}(\text{NH}_3)_4(\text{OH})\text{Cl}$

Sol in about 40 pts H_2O , and is identical with octamine cobaltic purpurichloride of Vortmann (Jorgensen, J pr (2) 42 211)

— **chloroplatinate**, $\text{ClCo}(\text{NH}_3)_4(\text{OH})\text{PtCl}_6 + 2\text{H}_2\text{O}$

Sl sol in H_2O (Jorgensen)

— **chromate**, $\text{ClCo}(\text{NH}_3)_4(\text{OH})\text{CrO}_4$

Easily sol in cold H_2O (Jorgensen, J pr (2) 42 216)

— **fluosilicate**, $\text{ClCo}(\text{NH}_3)_4(\text{OH}_2)\text{SiF}_6$

Sl sol in H_2O . Nearly insol in $\text{H}_2\text{SiF}_6 + \text{Aq}$ (Jorgensen, J pr (2) 42 219)

— **sulphate**, $\text{ClCo}(\text{NH}_3)_4(\text{OH})\text{SO}_4$

Sol in H_2O (Jorgensen, J pr (2) 42 211)

Chlorotitanic acid, $\text{TiCl}_4 \cdot 2\text{HCl} = \text{H}_2\text{TiCl}_6$

Known only in solution (Kowalewsky, Z anorg 1900, 25 192)

Chlorous acid, HClO_2

Known only in aqueous solution. 100 H_2O at 8.5° and 753 mm pressure dissolves 4.7 g Cl_2O_3 . Hydrate with 50.07–67.43 H_2O , perhaps $\text{HClO}_2 \cdot \text{H}_2\text{O}$, separates out at 0° (Brandan, A 151 340)

Pure HClO_2 is not known even in solution (Garzaroli-Thurnlakh, A 209 184)

Chlorites

All chlorites are easily sol in H_2O and in alcohol, with gradual decomp

Ammonium chlorite

Known only in aqueous solution, which decomposes on evaporation or long standing

Barium chlorite, $\text{Ba}(\text{ClO}_2)_2$

Deliquescent, easily sol in H_2O . Solution decomp on evaporation. Easily sol in alcohol (Millon, A ch (3) 7 298)

Lead chlorite, $\text{Pb}(\text{ClO}_2)_2$

Nearly insol in cold H_2O , and only sl sol in hot H_2O . Sol in $\text{KOH} + \text{Aq}$ (Garzaroli and Hayn, A 209 203)

Lead chlorite chloride, $6\text{Pb}(\text{ClO})_2 \cdot 4\text{PbCl}_2$

PbO
Rather difficultly sol in H_2O (Schmel, 109 317)

Potassium chlorite, KClO_2

Very deliquescent and sol in H_2O . Sol in alcohol of 35° (Millon, A ch (3) 7 323). Sol in $\text{HClO} + \text{Aq}$

Silver chlorite, AgClO_2

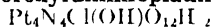
Sol in hot, less in cold H_2O . Easily decomp by heating above 100° . Decomp by weakest acids (Millon, A ch (3) 7 329)

Sodium chlorite, NaClO_2

Very deliquescent, and sol in H_2O

Strontium chlorite, $\text{Sr}(\text{ClO}_2)_2$

Deliquescent and sol in H_2O . Decomp by slow evaporation (Millon, A ch (3) 7 327)

Chloroxyfulminoplatinum,

Insol in H_2O , sol in $\text{HCl} + \text{Aq}$ (A Meyer, J pr (2) 18 305)

Chloruronic acid, $\text{HClO}_2 \cdot (\text{Cl} + 2\text{H}_2\text{O})$

Sol in H_2O , sl sol in alcohol (Mylus, J 1901, 34 2776)

Chromacichloride, $\text{Cr}(\text{OCl})_3$

See Chromyl chloride

Chromatiodic acid

See Chromiodic acid

Chromic acid, H_2CrO_4

Very sol in H_2O (Moissan, C R 98 1851)

Does not exist except in solution (Field, Chem Soc 61 405)

The composition of the hydrates formed by H_2CrO_4 at different dilutions is calculated from determinations of the lowering of the fr-pt produced by H_2CrO_4 and of the conductivity and sp gr of $H_2CrO_4 + Aq$ (Jones, Am Ch J 1905, 34 333)

See also **Chromium trioxide**

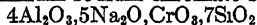
Chromates

Chromates of the alkali metals and of Ca, Mg, and Sr are sol in H_2O , the others are generally insol or sl sol in H_2O , but sol in $HNO_3 + Aq$

Aluminum chromate, basic, $Al_2O_3, CrO_3 + 7H_2O$

Easily sol in $NH_4OH + Aq$, alum, or acetic acid + Aq Insol in $NH_4Cl + Aq$ (Farne, Chem Soc 4 300)

Insol as such as H_2O , but easily decomp into H_2CrO_4 and a basic insol comp Sol in alkaline solutions and acids Decomp by many salts (Eliot and Storer, Proc Am Acad 5 214)

Aluminum sodium chromate silicate,

(Weyberg, C B Miner, 1904 727)

Ammonium chromate, basic, $5(NH_4)_2O, 4CrO_3(?)$

Easily sol in cold H_2O (Pohl, W A B 6 592)

Ammonium chromate, $(NH_4)_2CrO_4$

Very sol in H_2O , pptd from aqueous solution by alcohol (Malaguti and Sarzeau)

100 g H_2O dissolve 40.46 g at 30° (Schrenemakers, Chem Weekbl 1905, 1 395)

Sol in H_2O without decomp (Schrenemakers, C C 1905, II 1067)

Sp gr of $(NH_4)_2CrO_4 + Aq$ at $t^\circ/4^\circ$

t°	13°	13.7°	19.6°
% $(NH_4)_2CrO_4$	10.52	19.75	28.04
Sp gr	1.0633	1.1197	1.1727

(Slotte, W Ann 1881, 14 18)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

Difficulty sol in acetone (Naumann, B 1904, 37 4328)

Ammonium dichromate, $(NH_4)_2Cr_2O_7$

Less sol in H_2O than $(NH_4)_2CrO_4$ (Moser)

100 g H_2O dissolve 47.17 g at 30°

(Schrenemakers, Chem Weekbl 1905, 1 395)

Sp gr of $(NH_4)_2Cr_2O_7 + Aq$ at $t^\circ/4^\circ$

t°	12°	10.5°	12°
% $(NH_4)_2Cr_2O_7$	6.85	13.00	19.93
Sp gr	1.0393	1.0782	1.1258

(Slotte, W Ann 1881, 14 18)

Sol in alcohol (Rautzer, Zeit angew ch 1913, 26 456)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in acetone (Naumann, B 1904, 37 4328)

Ammonium trichromate, $(NH_4)_2Cr_3O_{10}$

Not deliquescent, but very sol in H_2O (Siewert)

Decomp by H_2O into chromic acid and dichromate (Jager and Kruss, B 22 2036)

Sol in acetone (Naumann, B 1904, 37 4328)

Ammonium tetrachromate, $(NH_4)_4Cr_4O_{13}$

Deliquescent Decomp by H_2O (Jager and Kruss, B 22 2037)

Ammonium heptachromate $(NH_4)_7Cr_7O_{19} +$ **Ammonium barium chromate,**

Ppt Decomp by H_2O (Groger, Z anorg 1908, 58 414)

Ammonium cadmium chromate, $(NH_4)_2O, 4CdO, 4CrO_3 + 3H_2O$

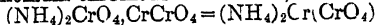
Ppt Decomp by boiling H_2O (Groger, M 1904, 25 533)

Ammonium cadmium chromate ammonia, $(NH_4)_2CrO_4, CdCrO_4, \frac{1}{2}NH_3 + 1\frac{1}{2}H_2O$

Decomp by H_2O (Groger, Z anorg 1908, 58 418)

$(NH_4)_2Cd(CrO_4)_2 \cdot 2NH_3$ Insol in cold decomp by hot H_2O

Sol in dil acids or in $NH_4OH + Aq$ (Briggs, Chem Soc 1903, 83 395)

Ammonium chromous chromate(?)

Difficultly sol in H_2O Insol in alcohol, ether, chloroform, or glacial acetic acid Easily sol in conc acids, from which it is separated on dilution Decomp by $NaOH + Aq$ (Heintze, J pi (2) 4 220)

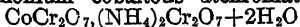
Ammonium chromyl chromate, $3(NH_4)_2O, 2CrO, 3CrO_3$

Nearly insol in H_2O (Pascal C R 1909, 148 1465)

Ammonium cobaltous chromate

Ppt Easily decomp (Briggs, Z anorg 1907, **56** 247)

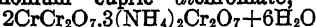
$(NH_4)_2O$, $4CoO$, $4CrO_3 + 3H_2O$ Insol in H_2O Sol in cold dil H_2SO_4 (Groger, Z anorg 1906, **49** 202)

Ammonium cobaltous dichromate,

Sl hygroscopic, sol in H_2O , insol in alcohol (Kruss, Z anorg 1895, **8** 454)

Ammonium cobaltous chromate ammonia,

Ppt, decomp by H_2O (Groger, Z anorg 1908, **58** 422)

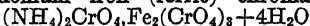
Ammonium cupric dichromate,

Sol in H_2O (Kruss, Z anorg 1895, **8** 455)

Ammonium cupric chromate ammonia,

Decomp by H_2O (Groger, Z anorg 1908, **58** 420)

Insol in cold, decomp by hot H_2O Sol in dil acids or in $NH_4OH + Aq$ (Briggs, Chem Soc 1903, **83** 394)

Ammonium iron (ferric) chromate,

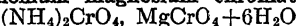
More easily decomp by H_2O than K_2CrO_4 , $Fe_2(CrO_4)_3 + 4H_2O$ (Hensgen, B **12** 1300)
 $6CrO_3$, $5Fe_2O_3$, $6(NH_4)_2O$, and $4CrO_3$, $Fe_2O_3, (NH_4)_2O + 4H_2O$ Ppts (Lepierre, C R 1894, **119** 1217)

Ammonium lithium chromate, $NH_4LiCrO_4 + 2H_2O$

Not deliquescent (Rammelsberg)

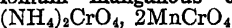
Ammonium lead chromate, $(NH_4)_2CrO_4, PbCrO_4$

Ppt Decomp by H_2O (Groger, Z anorg 1908, **58** 424)

Ammonium magnesium chromate,

Much more sol in H_2O than the corresponding sulphate (v Hauer)

Sol in H_2O (Groger, Z anorg 1908, **58** 416)

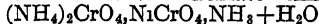
Ammonium manganous chromate,

Sol in H_2O (Hensgen, R t c **3** 433)

Ammonium nickel chromate, $(NH_4)_2CrO_4, NiCrO_4 + 6H_2O$

Sol in H_2O (Groger, Z anorg 1906, **51** 353)

Can be cryst from H_2O under 40° (Briggs, Chem Soc 1903, **83** 392)

Ammonium nickel chromate ammonia,

Decomp by H_2O (Groger, Z anorg 1906, **51** 354)

$(NH_4)_2Ni(CrO_4)_2$, $2NH_3$ Insol in cold H_2O Decomp by hot H_2O Sol in dil acids or in $NH_4OH + Aq$ (Briggs, Chem Soc 1903, **83** 393)

+ $6H_2O$ (Briggs, Proc Chem Soc 1902, **18** 254)

Ammonium potassium chromate, NH_4KCrO_4

Sol in H_2O (E Kopp, C N **11** 16)

+ H_2O (Étard, C R **85** 443)
 $2(NH_4)_2CrO_4$, $3K_2CrO_4$ Very sol in H_2O (Zehenter, M 1897, **18** 51)

Ammonium silver chromate, $(NH_4)_2CrO_4, 3Ag_2CrO_4$

Decomp by H_2O (Groger, Z anorg 1908, **58** 423)

Ammonium sodium chromate, $NH_4NaCrO_4 + 2H_2O$

Very sol in H_2O (Zehenter, M 1897, **18** 54)

Ammonium strontium chromate, $(NH_4)_2CrO_4, SrCrO_4$

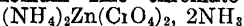
Ppt Decomp by H_2O (Groger, Z anorg 1908, **58** 415)

Ammonium uranyl chromate, $(NH_4)_2CrO_4, 2(UO_2)CrO_4 + 6H_2O$

Decomp by boiling with H_2O Sol in acidulated H_2O (Formanek, A **257**, 106)
 + $3H_2O$ (Formanek)

Ammonium zinc chromate, $(NH_4)_2O, 2ZnO, 2CrO_3 + H_2O$

Decomp by hot H_2O (Groger, M 1904, **25** 520)

Ammonium zinc chromate ammonia,

Insol in cold, decomp by hot H_2O Sol in dil acids or in $NH_4OH + Aq$ (Briggs, Chem Soc 1903, **83** 394)

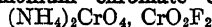
$4ZnCrO_4$, $2(NH_4)_2CrO_4$, $3NH_3 + 3H_2O$
 Ppt Decomp by H_2O (Groger, Z anorg 1908, **58** 416)

Ammonium dichromate chloride mercuric chloride, $(NH_4)_2Cr_2O_7, 2NH_4Cl, 4HgCl_2 + 2H_2O$

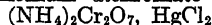
Ppt Sol in cold, more sol in warm H_2O (Stromholm, Z anorg 1912, **75** 280)

Ammonium dichromate chloride mercuric cyanide, $(NH_4)_2Cr_2O_7, 4NH_4Cl, 6Hg(CN) + 4H_2O$

(Stromholm, Z anorg 1913, **80** 157)

Ammonium chromate chromyl fluoride,Sol in H_2O (Varenne, C R 91 989)**Ammonium chromate iodate**

See Chromiodate, ammonium

Ammonium dichromate mercuric chloride,Cannot be recryst. from H_2O or $\text{HgCl}_2 + \text{Aq}$, but from $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 + \text{Aq}$ (Jäger and Kruss, B 22 2044)+ H_2O (Richmond and Abel, Chem Soc Q J 3 199)Cannot be made to crystallize with H_2O (Jäger and Kruss)3 $(\text{NH}_4)_2\text{Cr}_2\text{O}_7, \text{HgCl}_2$ Decomp by H_2O (J and K)4 $(\text{NH}_4)_2\text{Cr}_2\text{O}_7, \text{HgCl}_2$ Decomp by H_2O (J and K)**Ammonium chromate phosphate**

See Phosphochromate, ammonium

Ammonium chromate tellurate

See Chromotellurate, ammonium

Barium chromate, BaCrO_4 Extremely sl sol in H_2O Calculated from electrical conductivity of $\text{BaCrO}_4 + \text{Aq}$, 1 l H_2O dissolves 3.8 mg BaCrO_4 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)When not ignited, BaCrO_4 is sol in 86,957 pts H_2O , 22,988 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (0.5% NH_4Cl), 3670 pts $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (5% $\text{HC}_2\text{H}_3\text{O}_2$), 1986 pts $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (10% $\text{HC}_2\text{H}_3\text{O}_2$), 1813 pts $\text{H}_2\text{CrO}_4 + \text{Aq}$ (10% CrO_3). When ignited, 160,000 pts H_2O are necessary for solution (Schweitzer, by Fresenius, Z anal 29 414)Sol in 23,000 pts boiling H_2O (Mescherzelski, Z anal 21 399)3.5 mg BaCrO_4 are dissolved in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)Easily sol in HNO_3, HCl , or chromic acid + Aq , from which it is precipitated by NH_4OH , or by dilution with H_2O (Bahr)Insol in $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$ (Schweitzer)Sol in 49,381 pts $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (0.75% salt) at 15° , in 23,355 pts $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (1.5% salt) at 15° , in 45,162 pts $\text{NH}_4\text{NO}_3 + \text{Aq}$ (0.5% salt) at 15° (Fresenius, Z anal 29 418)Easily sol in alkali tartrates, or citrates + Aq (Fleischer, J pr (2) 5 326)0.22 $\times 10^{-4}$ g equiv BaCrO_4 are dissolved in 1 l of 45% alcohol at ord temp (Guerin, Dissert, 1912)Insol in acetic acid and in $\text{M}_2\text{Cr}_2\text{O}_7 + \text{Aq}$

Partly sol in a mixture of the two, except

in presence of $\text{MC}_2\text{H}_3\text{O}_2$ (Caron and Raquet, Bull Soc 1906, (3) 35 1064)

Not completely insol in acetic acid (Baubigny, Bull Soc 1907, (4) 1 58)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1900, 42 3790)

Barium dichromate, $\text{BaCr}_2\text{O}_7 + 2\text{H}_2\text{O}$ Decomp by H_2O with separation of BaCrO_4 . Sol in $\text{H}_2\text{CrO}_4 + \text{Aq}$ (Bahr, J B 1863 358)Sol in cold H_2O with formation of BaCrO_4 and CrO_3

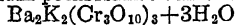
Insol in glacial acetic acid (Mayer, B 1903, 36 1742)

Barium calcium chromate, $\text{BaCa}(\text{CrO}_4)_2$

(Bourgeois Bull Soc Min 1879, 2 124)

Barium potassium chromate, $\text{BaK}_2(\text{CrO}_4)_2$ Decomp by H_2O (Gieger, Z anorg 1907, 54 186)Decomp by H_2O . Stable in $\text{K}_2\text{CrO}_4 + \text{Aq}$, containing2 181 pts K CrO_4 per 100 pts H_2O at 11.5° 3 395 " " " " " " " " 27.5° 5 120 " " " " " " " " 50.0° 7 119 " " " " " " " " 76.0° 9 036 " " " " " " " " 100.0°

(Barre, C R 1914, 158 497)

Barium potassium trichromate,

Extremely deliquescent (Bahr)

Bismuth chromates, basicThese comps are insol in H_2O even in presence of H_2CrO_4 , sol in HCl or $\text{HNO}_3 + \text{Aq}$ (Lowe, J pr 67 288)100 pts H_2O dissolve 0.00008 pt "bismuth chromate", 100 pts acetic acid dissolve 0.00021 pt "bismuth chromate", 100 pts $\text{HNO}_3 + \text{Aq}$ (sp gr = 1.038) dissolve 0.00024 pt "bismuth chromate", 100 pts $\text{KOH} + \text{Aq}$ (sp gr = 1.33) dissolve 0.00016 pt "bismuth chromate" (Praison, Phil Mag (4) 11 206)Not insol in dil $\text{HNO}_3 + \text{Aq}$ unless K_2CrO_4 is present. Less sol in hot $\text{NaOH} + \text{Aq}$ than PbCrO_4 (Storer)

"Bismuth chromate" is insol in acetone (Naumann, B 1904, 37 4329)

3 $\text{Bi}_2\text{O}_3, 2\text{CrO}_3 = 2(\text{BiO})_2\text{CrO}_4, \text{Bi}_2\text{O}_3$. Insol in H_2O , sol in $\text{HNO}_3 + \text{Aq}$ $\text{Bi}_2\text{O}_3, \text{CrO}_3 = (\text{BiO})_2\text{CrO}_4$. Insol in H_2O , easily sol in dil $\text{HCl} + \text{Aq}$, less in dil HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Murr) $\text{Bi}_2\text{O}_3, 2\text{CrO}_3 = (\text{BiO})_2\text{CrO}_4$. Insol in H_2O 5 $\text{Bi}_2\text{O}_3, 11\text{CrO}_3 + 6\text{H}_2\text{O}$ (Murr, Chem Soc 31 24)

$3\text{Bi}_2\text{O}_3, 7\text{CrO}_3$ Insol in H_2O , easily sol in mineral acids, especially $\text{HCl} + \text{Aq}$ Partly sol in $\text{KOH} + \text{Aq}$

Bismuth chromate, acid, $\text{Bi}_2\text{O}_3, 4\text{CrO}_3 + \text{H}_2\text{O}$

Insol in hot or cold H_2O Sol in dil HCl or $\text{HNO}_3 + \text{Aq}$ (Murr, Chem Soc 30 17)

Bismuth potassium chromate, $\text{Bi}_2(\text{CrO}_4)_3, \text{K}_2\text{CrO}_4$

Insol in H_2O . Decomp with hot H_2O
 $\text{Bi}_2\text{O}_3, \text{K}_2\text{O}, 6\text{CrO}_3 + \text{H}_2\text{O}$ (Preis and Raymann, J B 1880 336)

Bromomolybdenum chromate
 (Atterberg)

Cadmium chromate, basic, $2\text{CdO}, \text{CrO}_3 + \text{H}_2\text{O}$

Very sl sol in H_2O , very slowly sol in $\text{NH}_4\text{OH} + \text{Aq}$ with combination (Malaguti and Sarzeau, A ch (3) 9 431)

Composition as above (Freese, B 2 478)

Cadmium chromate, CdCrO_4

Insol in H_2O , sol in acids, decomp by heating with H_2O (Schulz, Z anorg 1895,

$\text{O}_4 + \text{Aq}$ (Briggs,

sup by boiling H_2O (Schulz, 10 153)

Chromate, $\text{CdO}, 2\text{CrO}_3 + \text{H}_2\text{O}$

sl sol in H_2O without decomp, hygroscopic (Schulz, Z anorg 1895, 10 152)

Easily sol in H_2O but decomp on evaporation (Groger, Z anorg 1910, 66 11)

Cadmium trichromate, $\text{CdCr}_3\text{O}_{19} + \text{H}_2\text{O}$

Deliquescent (Groger, Z anorg 1910, 66 12)

Cadmium chromate ammonia, $\text{CdCrO}_4, 4\text{NH}_3 + 3\text{H}_2\text{O}$

Efflorescent. Decomp, by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in alcohol and ether (Malaguti and Sarzeau)

Cadmium potassium chromate, $\text{CdK}(\text{CrO}_4)_2 + 2\text{H}_2\text{O}$

Ppt. Decomp by H_2O (Groger, Z anorg 1907, 54 189)

$3\text{CdO}, \text{K}_2\text{O}, 3\text{CrO}_3 + 3\text{H}_2\text{O}$ Ppt (Preis and Raymann, Sitzungsb bohms Gesell 1880)

$4\text{CdO}, \text{K}_2\text{O}, 4\text{CrO}_3 + 3\text{H}_2\text{O}$ Ppt Slowly decomp by H_2O (Groger, M 1904, 25 533)

Cadmium potassium dichromate, $\text{CdCr}_2\text{O}_7, \text{K}_2\text{Cr}_2\text{O}_7 + 2\text{H}_2\text{O}$

Sol in H_2O , sl hygroscopic (Krüss, Z anorg 1895, 8 454)

Cadmium dichromate mercuric cyanide, $\text{CdCr}_2\text{O}_7, 2\text{Hg}(\text{CN})_2 + 7\text{H}_2\text{O}$

Sol in H_2O without decomp (Krüss, Z anorg 1895, 8 460)

Cæsium chromate, Cs_2CrO_4

(Chabrié, C R 1901, 132 680)

Aq solution sat at 30° contains 47% (Schrenemakers, C C 1909, I 11)

Cæsium dichromate, $\text{Cs}_2\text{Cr}_2\text{O}_7$

(Chabrié, C R 1901, 132 680)

Much more sol in hot H_2O , than in cold (Fraprie, Am J Sci 1906, (4) 21 309)

Aq solution sat at 30° contains 5.2% (Schrenemakers, C C 1909, I 11)

Cæsium trichromate, $\text{Cs}_2\text{Cr}_3\text{O}_{10}$

Decomp by H_2O (Schrenemakers, Chem Weekbl 1908, 5 811)

Sol. in H_2O (Fraprie, Am J Sci 1906, (4) 21 315)

Cæsium tetrachromate, $\text{Cs}_2\text{Cr}_4\text{O}_{13}$

Sol in H_2O with decomp (Schrenemakers, Chem Weekbl 1908, 5 811)

Cæsium cobaltous chromate,

$\text{Cs}_2\text{Co}(\text{CrO}_4)_2 + 6\text{H}_2\text{O}$

(Briggs, Z anorg 1907, 56 248)

Cæsium magnesium chromate,

$\text{Cs}_2\text{Mg}(\text{CrO}_4)_2 + 6\text{H}_2\text{O}$

(Briggs, Chem Soc 1904, 85, 680)

Cæsium nickel chromate, $\text{Cs}_2\text{Ni}(\text{CrO}_4)_2 + 6\text{H}_2\text{O}$

Sol in cold H_2O without much change, but decomp by warm H_2O (Briggs, Chem Soc 1904, 85 679)

Calcium chromate basic, $\text{Ca}_2\text{CrO}_4 + 3\text{H}_2\text{O}$

Sol in 230 pts H_2O without decomp (Mylus and Wrochem, Gm K 3 I, 1385)

Calcium chromate, CaCrO_4

Anhydrous Very sl sol in H_2O (Siewert, J B 1862 148)

Aq solution sat at 18° contains 2.3% CaCrO_4 , sp gr = 1.023 (Mylus and Wrochem, B 1900, 33 3688)

Insol in acetone (Numann, B 1904, 37 4329)

$+ \frac{1}{2}\text{H}_2\text{O}$ Aq solution sat at 18° contains 4.4% CaCrO_4 , sp gr = 1.044 (Mylus and Wrochem, B 1900, 33 3688)

$+ \text{H}_2\text{O}$ Solubility in H_2O at t°

t°	0°	8°	13°	18°	25°
% CaCrO_4	11.5	10.8	10.3	9.6	9.1

t°	40°	60°	75°	90°	100°
% CaCrO_4	7.8	5.7	4.6	3.6	3.1

(Mylus and Wrochem, Gm -K 3 I, 1386)

Sp gr of solution containing 9.6% by wt CaCrO_4 at $18^\circ = 1.096$ (Mylius and Wrochem, B 1900, **33**, 3688)
 $+2\text{H}_2\text{O}$ Sol in 241.3 pts H_2O at 14° (Siewert)
 Sol in 34 pts H_2O (Schwarz, Dingl 198 159)

Solubility of two modifications in H_2O at t°

α modification

t°	0°	20°	30°	45°
% CaCrO_4	14.75	14.22	13.89	12.53

β modification

t°	0°	14°	18°	19.5°	30°	40°
% CaCrO_4	9.8	10	10.3	10.4	10.4	10.4

(Mylius and Wrochem Gm-K 3 I, 1387)

α modification Sp gr of the solution containing 14.3% by wt CaCrO_4 at $18^\circ = 1.149$ (Mylius and Wrochem, B 1900, **33**, 3688)

β modification Sp gr of the solution containing 10.3% by wt CaCrO_4 at $18^\circ = 1.105$ (Mylius and Wrochem, B 1900, **33**, 3688)

Easily sol in H_2O containing CrO_3

Insol in absolute alcohol

50 cc of alcohol (29%) dissolve 0.608 g CaCrO_4 , 50 cc of alcohol (53%) dissolve 0.44 g CaCrO_4 (Fresenius, Z anal **30**, 672)

Sol in acids and in dilute alcohol (Caron and Raquet, Bull Soc 1906, (3) **35**, 1064)

Calcium dichromate, $\text{CaCr}_2\text{O}_7 + 3\text{H}_2\text{O}$

Very deliquescent (Bahr, J pr **60**, 60)

In sat solution at 18° , 61% CaCr_2O_7 is present (Mylius and Wrochem, Gm-K 3 I, 1387)

Sol in acetone (Naumann, B 1904, **37**, 4328)

Calcium potassium chromate, CaCrO_4 ,

K_2CrO_4

(Barre, C R 1914, **158**, 495)

$+ \text{H}_2\text{O}$ Easily sol in H_2O (Duncan)

Insol in H_2O when ignited

$+ 2\text{H}_2\text{O}$ Easily sol in H_2O , even after ignition Insol in alcohol (Duncan, J B **1850**, 313)

Formed below 45° (Barré, C R 1914, **158**, 495)

Sol in cold H_2O Sl sol in sat $\text{K}_2\text{CrO}_4 + \text{Aq}$ (Groger, Z anorg 1907, **54**, 187)

Two modifications Solubility of α modification is somewhat less than that of the β modification (Wyrouboff, Bull Soc Min 1891, **14**, 255)

Solubility of two modifications in H_2O at t°

	t°	0°	15°
Solubility of α		23.06	25.06
" β		23.01	24.45

(Rakowski, C C **1909**, I 133)

4CaCrO_4 , K_2CrO_4

5CaCrO_4 , K_2CrO_4 Sol in much H_2O (Bahr)

Calcium chromate potassium sulphate,

CaCrO_4 , $\text{K}_2\text{SO}_4 + \text{H}_2\text{O}$

Decomp by H_2O (Hannay, Chem Soc **32**, 399)

CaCrO_4 , K_2SO_4 , K_2CrO_4 As above (H)

Cerous chromate

Insol in H_2O

Calcium strontium chromate, $\text{CaSr}(\text{CrO}_4)_2$

(Bourgeois, Bull Soc Min 1879, **2**, 123)

Ceric dichromate, CeO_2 , $2\text{CrO}_3 + 2\text{H}_2\text{O}$

Insol in H_2O , sol in acids, decomp completely by boiling H_2O (Bricout, C R 1894, **118**, 145)

Chromic chromate, $\text{CrO}_2 = \text{Cr}_2\text{O}_3$, CrO_3

Insol as such in H_2O , but decomp thereby into CrO_3 and Cr_2O_3 , decomp by alkaline and many saline solutions Easily sol in dil acids if recently pptd, but with difficulty if dried at a high temp (Eliot and Storer, Proc Am Acad **5**, 207)

$\text{Cr}_2\text{O}_{12} = \text{Cr}_2\text{O}_3$, 3CrO_3 Sol in $\text{HCl} + \text{Aq}$ Very slowly sol in $\text{HNO}_3 + \text{Aq}$ Slowly decomp by H_2SO_4 or $\text{NH}_4\text{OH} + \text{Aq}$ Easily decomp by $\text{KOH} + \text{Aq}$

Does not exist (Eliot and Storer, *loc*)

$\text{Cr}_2\text{O}_{15} = 3\text{CrO}_3$, 2CrO_3 Easily sol in HCl or $\text{HNO}_3 + \text{Aq}$ difficulty sol in acetic acid Easily sol in $\text{KOH} + \text{Aq}$ (Traube, A **66**, 108)

Existence doubtful

$\text{Cr}_2\text{O}_5 = 2\text{Cr}_2\text{O}_3$, Cr_2O_3 Insol in all acids, even aqua regia, slowly attacked by a boiling conc solution of alkali hydroxides (Geuther and Merz, A **118**, 62) Cr_2O_5 according to Wohler

Chromic cupric chromate, $\text{CuCr}_4\text{O}_{13}$, $\text{Cr}_2\text{O}_3 + 12\text{H}_2\text{O}$

Insol in H_2O and H_2SO_4 Sol in HCl and HNO_3 (Rosenfeld, B 1879, **12**, 957)

6CuO , Cr_2O_3 , $\text{CrO}_3 + 9\text{H}_2\text{O}$ Insol in H_2O Sol in acids (Rosenfeld, B 1879, **12**, 958)

Chromic potassium chromate, $\text{Cr}_2\text{H}(\text{CrO}_4)_2$, K_2CrO_4 (?)

Insol in H_2O , alcohol, or acetic acid Not attacked by cold $\text{HNO}_3 + \text{Aq}$, sl oxidized when hot Insol in cold, easily sol in hot H_2SO_4 Sl sol in $\text{SO}_2 + \text{Aq}$ Sol in conc $\text{HCl} + \text{Aq}$ (Tommasi, Bull Soc (2) **17**, 396)

Chromous potassium chromate,

$\text{K}_2\text{CrO}_4(\text{CrO}_2)_2 = \text{K}_2\text{Cr}(\text{CrO}_4)$ (?)

Sat cold solution in H_2O contains 9% of the salt Insol in alcohol and ether (Hentze, J pr (2) **4**, 212)

Cobaltous chromate, basic, 3CoO , $\text{CrO}_3 + 4\text{H}_2\text{O}$

Ppt Decomp by H_2O (Malaguti and Sarzeau, A ch (3) 9 431)

True formula is 2CoO , $\text{CrO}_3 + 2\text{H}_2\text{O}$ (Freese, Pogg 140 252)

4CoO , $3\text{CrO}_3 + 2\text{H}_2\text{O}$
Decomp by H_2O (Gröger, Z anorg 1906, 49 203)

Cobaltous chromate, CoCrO_4

Much more sol in H_2O than NiCrO_4 . Easily sol in hot dil $\text{HNO}_3 + \text{Aq}$ (Briggs, Z anorg 1909, 63 327)
 $+ 2\text{H}_2\text{O}$ Ppt (Briggs, Z anorg 1909, 63 328)

Cobaltous dichromate, $\text{CoCr}_2\text{O}_7 + \text{H}_2\text{O}$

Deliquescent Very sol in H_2O (Briggs, Z anorg 1907, 56 247)

Cobaltous potassium chromate, basic

K_2O , 4CoO , $4\text{CrO}_3 + 3\text{H}_2\text{O}$

Sol in cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Groger, Z anorg 1906, 49 199)

Cobaltous potassium chromate, $\text{K}_2\text{Co}(\text{CrO}_4)_2 + 2\text{H}_2\text{O}$

Decomp by H_2O (Groger, Z anorg 1906, 49 200)

chromate, basic, 3CuO , $\text{CrO}_3 + \text{H}_2\text{O}$

Insol in H_2O Easily sol in dil $\text{HNO}_3 + \text{Aq}$ and in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$ (Malaguti and Sarzeau, A ch (3) 9 434)

7CuO , $2\text{CrO}_3 + 5\text{H}_2\text{O}$ Ppt (Rosenfeld, B 13 1469)

7CuO , $\text{CrO}_3 + 5\text{H}_2\text{O}$ Ppt (R)

Cobaltous dichromate mercuric cyanide, CoCr_2O_7 , $2\text{Hg}(\text{CN})_2 + 7\text{H}_2\text{O}$

Very stable Sol in H_2O (Kruss, Z anorg 1895, 8 458)

Cupric chromate, CuCrO_4

Insol in H_2O , very sol in chromic acid and in other acids, decomp by boiling with H_2O (Schulz, Z anorg 1895, 10 152)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Cupric dichromate, basic, CuCr_2O_7 , 2CuO (Stanley, C N 54 194)

Cupric dichromate, $\text{CuCr}_2\text{O}_7 + 2\text{H}_2\text{O}$

Deliquescent Very easily sol in H_2O , $\text{NH}_4\text{OH} + \text{Aq}$, and alcohol (Droge, A 101 39)

Aqueous solution is decomp by boiling (Malaguti and Sarzeau, A ch (3) 9 456)

Very hygroscopic Very sol in H_2O without decomp (Schulz, Z anorg 1895, 10 150)

Cupric tetrachromate, $\text{CuCr}_4\text{O}_{13} + 2\text{H}_2\text{O}$

Deliquescent Decomp when its solution in H_2O is concentrated (Gröger, Z anorg 1910, 66 15)

Cupric lead chromate, $2(\text{PbCrO}_4, \text{PbO})$
 $(2\text{CuCrO}_4, \text{CuO})$

Min *Vauquelinite* Sol in acids

Cupric potassium chromate, basic, $\text{KC}_2\text{O}(\text{OH})(\text{CrO}_4)_2 + \text{H}_2\text{O}$

Ppt (Gröger, M 1903, 24 485)

3CuO , K_2O , $3\text{CrO}_3 + 2\text{H}_2\text{O}$ Nearly insol in H_2O Sol in NH_4OH or $(\text{NH}_4)_2\text{CO}_3 + \text{A}$ (Knop, A 70 52)

Does not exist (Rosenfeld, B 13 1472)
 4CuO , K_2O , $4\text{CrO}_3 + \text{H}_2\text{O}$ Decomp by boiling H_2O (Gerhardt)
 $+ 3\text{H}_2\text{O}$ Decomp by boiling H_2O (Gröger, Dissert 1880)

Cupric potassium chromate ammonia, $\text{K}_2\text{Cu}(\text{CrO}_4)_2, 2\text{NH}_3$

Very sol in dil $\text{NH}_3 + \text{Aq}$ decomp by H_4 (Briggs, Chem Soc 1904, 85 672)

Cupric chromate ammonia, $\text{CuCrO}_4, 4\text{NH}_3$

Decomp by H_2O Sol in dil NH_4OH Aq (Parravano and Pastre, Gazz ch 1 1907, 37 (2), 255)

$4\text{CuCrO}_4, 3\text{NH}_3 + 5\text{H}_2\text{O}$ Sol in HCl or $\text{NH}_4\text{OH} + \text{Aq}$, insol in organic solvents, easily sol in $\text{AgNO}_3 + \text{Aq}$ (Schuyten, C C 190 I 399)

$2\text{CuCrO}_4, 7\text{NH}_3 + \text{H}_2\text{O}$ Decomp by H_4 Very sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Briggs, Chem Soc 1904, 85 673)

3CuO , 2CuO , $10\text{NH}_3 + 2\text{H}_2\text{O}$ Decomp by H_2O , sl sol or insol in alcohol, ether, $\text{NH}_4\text{OH} + \text{Aq}$ (Malaguti and Sarzeau)
Decomp by hot H_2O , insol in alcohol (Böttger)

Cupric dichromate ammonia, $\text{CuCr}_2\text{O}_7, 4\text{NH}_3 + 2\text{H}_2\text{O}$

Decomp by H_2O Sol in dil NH_4OH Aq (Parravano and Pastre, Gazz ch 1 1907, 37 (2) 255)

Cupric dichromate mercuric cyanide, $\text{CuCr}_2\text{O}_7, \text{Hg}(\text{CN})_2 + 5\text{H}_2\text{O}$

Not hygroscopic Sol in H_2O (Kruss, anorg 1895, 8 461)

Didymium chromate, $\text{Dy}(\text{CrO}_4)_3$

Sl sol in H_2O , easily in dil acids (Friedrichs and Smith, A 191 353)
 $+ 7\text{H}_2\text{O}$ (Cleve)

Didymium potassium chromate, $\text{Dy}_2(\text{CrO}_4)_3, \text{K}_2\text{CrO}_4$

Precipitate Decomp by H_2O (Cleve)

Dysprosium chromate, $\text{Dy}_2(\text{CrO}_4)_3 \cdot 10\text{H}_2\text{O}$

Very sl sol in H_2O 1 0002 pt is sol in 100 pts H_2O at 25° (Jantsch, B 1911, 44 1276)

Glucinum chromate, basic, $\text{GlCrO}_4 \cdot 13\text{H}_2\text{O} + 23\text{H}_2\text{O}$

Ppt Insol in H_2O (Creuzberg, Dingl 163 449)

$\text{GlCrO}_4 \cdot 6\text{H}(\text{OH}_2)$ Ppt Insol in H_2O (Glassmann, B 1907, 40 2603)

Glucinum chromate, $\text{GlCrO}_4 + \text{H}_2\text{O}$

Decomp by H_2O with separation of the basic chromate (Glassmann, B 1907, 40 2603)

Gold (auric) chromate, $\text{Au}(\text{CrO}_4)_3 \cdot \text{CrO}_3$

Ppt (Orloff, Ch Z 1907, 31 1182)

Indium chromate

Ppt (Meyer)

Indium dichromate

Very sol in H_2O Known only in solution

Iron (ferric) chromate, basic

Decomp by H_2O (Maus)

$\text{Fe}_2\text{O}_3 \cdot \text{CrO}_3$ Insol in H_2O , but decomp thereby, or by saline solutions, easily sol in acids Sol in $\text{H}_2\text{CrO}_4 + \text{Aq}$ (Eliot and Stoici, Proc Am Acad 5 216)

Iron (ferric) dichromate

Sol in H_2O and alcohol (Maus, Pogg 9 132)

Iron (ferric) potassium chromate, basic,

$2\text{CrO}_3 \cdot 6\text{Fe}_2\text{O}_3 \cdot 3\text{K}_2\text{O}$

$4\text{CrO}_3 \cdot 3\text{Fe}_2\text{O}_3 \cdot 4\text{K}_2\text{O}$

$10\text{CrO}_3 \cdot 6\text{Fe}_2\text{O}_3 \cdot 7\text{K}_2\text{O}$

$11\text{CrO}_3 \cdot 3\text{Fe}_2\text{O}_3 \cdot 4\text{K}_2\text{O} + 9\text{H}_2\text{O}$

$9\text{CrO}_3 \cdot 2\text{Fe}_2\text{O}_3 \cdot 6\text{K}_2\text{O} + 6\text{H}_2\text{O}$

$9\text{CrO}_3 \cdot 2\text{Fe}_2\text{O}_3 \cdot 6\text{K}_2\text{O} + 10\text{H}_2\text{O}$

$10\text{CrO}_3 \cdot 3\text{Fe}_2\text{O}_3 \cdot 6\text{K}_2\text{O} + 5\text{H}_2\text{O}$

$7\text{CrO}_3 \cdot 2\text{Fe}_2\text{O}_3 \cdot 2\text{K}_2\text{O} + 7\text{H}_2\text{O}$

$4\text{CrO}_3 \cdot \text{Fe}_2\text{O}_3 \cdot \text{K}_2\text{O} + 4\text{H}_2\text{O}$

$6\text{CrO}_3 \cdot 2\text{Fe}_2\text{O}_3 \cdot 3\text{K}_2\text{O}$

$16\text{CrO}_3 \cdot 4\text{Fe}_2\text{O}_3 \cdot 5\text{K}_2\text{O} + 8\text{H}_2\text{O}$

Above compounds as ppts, insol in H_2O , alcohol and ether (Picque, C R 1894, 119, 1215-18)

Iron (ferric) potassium chromate,

$\text{K}_2(\text{CrO}_4)_3 \cdot \text{K}_2\text{CrO}_4 + 4\text{H}_2\text{O}$

Decomp by much H_2O , conc HCl , or $\text{NH}_4\text{OH} + \text{Aq}$ Not decomp by alcohol (Hensgen, B 12 1300)

Iron (ferric) sodium chromate, basic,

$5\text{CrO}_3 \cdot 7\text{Fe}_2\text{O}_3 \cdot 4\text{Na}_2\text{O}$

Ppt (Lepierre, C R 1894, 119, 1217)

Lanthanum chromate, $\text{La}_2(\text{CrO}_4)_3$

Sl sol in cold, more easily in hot H_2O , easily sol in acids (Frierichs and Smith, A 191 355)

$+8\text{H}_2\text{O}$ Ppt (Cleve)

Lanthanum potassium chromate

(Cleve)

Lead chromate, basic, $2\text{PbO} \cdot \text{CrO}_3$ (*chrome red*)

Insol in H_2O , acetic acid dissolves out $\frac{1}{2}$ the PbO Sol in $\text{KOH} + \text{Aq}$ (Badams, Pogg 3 221)

Insol in acetone (Naumann, B 1904, 37 4329)

$3\text{PbO} \cdot \text{CrO}_3$ (Hermann, Pogg 28 162) $+ \text{H}_2\text{O}$ Ppt (Stromholm, Z anorg 1904, 38 443)

Mim *Melanochrome*, *Phaenochrome* Sol in acids

PbO , PbCrO_4 Ppt (S)

Lead chromate, PbCrO_4

Insol in H_2O Pptd from $\text{Pb}(\text{NO}_3)_2$ in presence of 70,000 pts H_2O (Harting)

Calculated from electrical conductivity of $\text{PbCrO}_4 + \text{Aq}$, 1 l H_2O dissolves 0.2 mg PbCrO_4 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

1 l H_2O dissolves 1.2×10^{-6} g PbCrO_4 at 25° (Hevesy, Z anorg 1913, 82 328)

Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Storer), sl sol in dil $\text{HNO}_3 + \text{Aq}$

Sol in 560 pts $\text{HNO}_3 + \text{Aq}$ of 1.12 sp gr, in 150 pts $\text{HNO}_3 + \text{Aq}$ of 1.225 sp gr, in 130 pts $\text{HNO}_3 + \text{Aq}$ of 1.265 sp gr, in 80 pts $\text{HNO}_3 + \text{Aq}$ of 1.395 sp gr (Storey's Diet)

Solubility of PbCrO_4 in $\text{HNO}_3 + \text{Aq}$ at 18°
(Millimols per l)

0.1N	0.2N	0.3N	0.4N
0.506	0.844	1.13	1.44

(Beck and Stegmüller, lc)

Easily decomp by hot $\text{HCl} + \text{Aq}$ (Fresenius)

Solubility of PbCrO_4 in $\text{HCl} + \text{Aq}$
(Millimols per l)

t°	0.1N	0.2N	0.3N	0.4N	0.5N	0.6N
18	0.186	0.393	0.654	1.07	1.56	2.20
25	0.239	0.485	0.839	1.32	2.06	2.90
37	0.357	0.744	1.31	2.10	3.28	4.60

(Beck and Stegmüller, Arb k Gesund Amt 1910, 34 446)

Insol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$

Easily sol in KOH , or $\text{NaOH} + \text{Aq}$ 1 l $\text{KOH} + \text{Aq}$ ($\frac{1}{2}$ normal) dissolves 11.9 g PbCrO_4 at 15° , 16.2 g at 60° , 26.1 g at 80°

38.5 g at 102° (Lachaud and Lepierre, Bull Soc (3) 6 230)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Brett, 1837)

Sol in $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$, almost completely insol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$, or $\text{NH}_4\text{NO}_3 + \text{Aq}$

Not pptd in presence of Na citrate (Spiller)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in acetone (Naumann, B 1904, 37 4329)

Min *Crocoite* Sol in hot $\text{HCl} + \text{Aq}$, difficultly sol in $\text{HNO}_3 + \text{Aq}$, sol in $\text{KOH} + \text{Aq}$

Lead dichromate, PbCr_2O_7

Decomp by H_2O

+ $2\text{H}_2\text{O}$ As above (Preis and Raymann, B 13 340)

Lead lithium chromate, PbCrO_4 , Li_2CrO_4

(Lachaud and Lepierre, C R 110 1035)

Lead potassium chromate, PbCrO_4 , K_2CrO_4

Insol in hot or cold H_2O or in alcohol Dil acids dissolve out K_2CrO_4 (Lachaud and Lepierre, C R 110 1035)

Decomp by H_2O Stable in contact with solutions containing

8 950 pts	K_2CrO_4	per 100 pts	H_2O	at	10°
8 077 "	"	"	"	"	27 5°
7 629 "	"	"	"	"	37 5°
7 150 "	"	"	"	"	50 0°
6 145 "	"	"	"	"	76 0°
4 940 "	"	"	"	"	100 0°

(Barre, C R 1914, 158 497)

Lead sodium chromate, PbCrO_4 , Na_2CrO_4

Sol in H_2O (?) (Lachaud and Lepierre)

PbCrO_4 , 2PbO , Na_2CrO_4 (L and L)

Lithium chromate, Li_2CrO_4

100 cc of solution sat at 18° contain 85 g anhydrous salt (Kohlrausch, B A B 1897 90)

99.94 pts are sol in 100 pts H_2O at 30° (Schreinemakers, C C 1905 II, 1486)

+ $2\text{H}_2\text{O}$ Very easily sol in H_2O (Rammelsberg, Pogg 128 323)

100 g H_2O dissolve 111 g salt at 20° (Von Weimarn, C C 1911 II, 1300)

Sp gr of solution sat at 18° = 1.574, and contains 52.6% LiCrO_4 (Mylius and Wrochem, B 1897, 30 1718)

Lithium dichromate, $\text{Li}_2\text{Cr}_2\text{O}_7$

130.4 pts are sol in 100 pts H_2O at 30° (Schreinemakers, C C 1905 II, 1486)

+ $2\text{H}_2\text{O}$ Deliquescent Sol in H_2O (Rammelsberg)

Lithium potassium chromate, K_2CrO_4 , $\text{Li}_2\text{CrO}_4 + \frac{1}{2}\text{H}_2\text{O}$

Hydroscopic (Zehenter, M 1897, 18 54)

Magnesium chromate, MgCrO_4

Sol in H_2SO_4 , and HCl , insol in H_2O (Dufau, C R 1896, 123 888)

Sp gr of $\text{MgCrO}_4 + \text{Aq}$ sat at t°/4°

t°	13 6°	14 5°	13	'
% MgCrO_4	12 31	21 86	27	1
Sp gr	1 0886	1 1641	1	170

(Slotte, W Ann 1881, 14 19)

Sol in acetone (Naumann, B 1904 37 4328)

+ $7\text{H}_2\text{O}$ Easily sol in H_2O (Vauquelin) 100 cm of solution sat at 18° contain 0 g

MgCrO_4 (Kohlrausch, B A B 1897 9)

Sp gr of solution sat at 18° = 1.422, and contains 42% MgCrO_4 (Mylius and Wrochem, B 1897, 30 1718)

+ $5\text{H}_2\text{O}$ Very sol in H_2O (Wyrouff, Bull Soc Min 12 60)

Magnesium dichromate, $\text{Mg}_2\text{Cr}_2\text{O}_7$

Sol in H_2O

Sl sol in alcohol (Reinitzer, Zeit anorg 1913, 26 456)

Magnesium potassium chromate, MgCrO_4 , $\text{K}_2\text{CrO}_4 + 2\text{H}_2\text{O}$

100 pts H_2O dissolve 28.2 pts at 20°, 4.3 pts at 60° (Schweitzer)

Sol in H_2O Sl sol in sat $\text{K}_2\text{CrO}_4 + \text{Aq}$ (Gieger, Z anorg 1907, 54 188)

Insol in alcohol

+ $6\text{H}_2\text{O}$ Efflorescent (Briggs, C R Soc 1904, 85 679)

Magnesium rubidium chromate,

$\text{MgRb}_2(\text{CrO}_4)_2 + 6\text{H}_2\text{O}$

(Briggs Chem Soc 1904, 85 679) (Bailey, Chem Soc 1911, 99 1327)

Magnesium sodium chromate

(Stanley, C N 54 194)

Manganous chromate, 2MnO , $\text{CrO}_3 + \text{H}_2\text{O}$

Ppt Sol in dil H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ (Warrington and Reimschuesch, J 3 78)

Manganous potassium chromate, MnCrO_4 , $\text{K}_2\text{CrO}_4 + 2\text{H}_2\text{O}$

Decomp by H_2O Sol in dil H_2O (Gieger, Z anorg 1905, 44 459)

2MnCrO_4 , $\text{K}_2\text{CrO}_4 + 4\text{H}_2\text{O}$ Sol in H_2O (Hensgen, R t c 3 433)

Mercurous chromate, basic, 4HgO , 3CrO_3

Very sl sol in cold, more in boiling H_2O Sl sol in $\text{HNO}_3 + \text{Aq}$ Decomp by H_2O

+ Aq Sl sol in $\text{NH}_4\text{Cl} + \text{Aq}$ or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Does not exist (Richter, B 15 148)

$3\text{Hg}_2\text{O}$, CrO_3 Sol in $\text{HNO}_3 + \text{Aq}$ (Fischer)

$3\text{Hg}_2\text{O}$, 2CrO_3 Ppt (Fichter, Z anorg 1912, **76** 350)

Mercurous chromate, Hg_2CrO_4

Very sl sol in cold, more readily in hot H_2O Sl sol in dil $\text{HNO}_3 + \text{Aq}$, sol in conc HNO_3 , sol in $\text{KCN} + \text{Aq}$, insol in $\text{Hg}_2(\text{NO}_3)_2 + \text{Aq}$ (Rose, Pogg **53** 124)

Less sol in $\text{K}_2\text{CrO}_4 + \text{Aq}$ than in H_2O (Fichter, Z anorg 1912, **76** 349)

Insol in acetone (Naumann, B 1904, **37** 4329)

Mercuric chromate, basic, 2HgO , CrO_3

Sol in HCl , and in $\text{HNO}_3 + \text{Aq}$ (Geuther) 3HgO , CrO_3 Sl sol in H_2O (Millon)

The only true compound All others are mixtures of HgO or HgCrO_4 with this compound (Cox, Z anorg 1904, **40** 155)

4HgO , CrO_3 Sl sol in H_2O (Millon, A ch (3) **13** 365)

7HgO , 2CrO_3 Easily sol in warm HNO_3 , when freshly precipitated Easily sol in $\text{HCl} + \text{Aq}$ (Geuther, A **106** 247)

Does not exist (Freese, B **2** 477)
 5HgO , CrO_3 Easily sol in $\text{HCl} + \text{Aq}$
Very sl sol in $\text{HNO}_3 + \text{Aq}$ Decomp by H_2O into—

6HgO , CrO_3 Insol in H_2O (Jager and Kruss, B **22** 2049)

Mercuric chromate, HgCrO_4

Decomp by H_2O and acids into basic salt (Geuther)

Sol in acids Sol in warm NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ Sol in $\text{Hg}(\text{NO}_3)_2$, or $\text{HgCl}_2 + \text{Aq}$

Insol in ethyl acetate (Naumann, B 1910, **43** 314)

Insol in acetone (Naumann, B 1904, **37** 4329)

Mercuric dichromate, HgCr_2O_7

Ppt (Gawłowski, C C **1906** II, 1307)

Mercurous potassium chromate,

$\text{Hg}_2\text{K}_2(\text{CrO}_4)_2$

Ppt, decomp by H_2O (Groger, Z anorg 1907, **54** 191)

Mercuric chromate, basic, ammonia, 12HgO , 3CrO_3 , $2\text{NH}_3 + 3\text{H}_2\text{O}$

(Groger, Z anorg 1908, **58** 420)

Mercuric chromate ammonia, HgCrO_4 , $2\text{NH}_3 + \text{H}_2\text{O}$

(Groger, Z anorg 1908, **58** 419)

Mercuric chromate sulphide, 2HgCrO_4 , HgS

Not attacked by weak acids (Palm, C C **1863** 121)

Nickel chromate, basic, 4NiO , $\text{CrO}_3 + 6\text{H}_2\text{O}$

Insol in H_2O , easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Malaguti and Sarzeau, A ch (3) **9** 451)

3NiO , $\text{CrO}_3 + 6\text{H}_2\text{O}$ Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Freese, J B **1869** 271)

2NiO , $\text{CrO}_3 + 6\text{H}_2\text{O}$ As above (Schmidt, A **156** 19)

5NiO , $2\text{CrO}_3 + 12\text{H}_2\text{O}$ As above (Schmidt)

Nickel chromate, NiCrO_4

Not attacked by boiling H_2O

Nearly insol in hot dil HNO_3 Slowly sol in conc HNO_3 and aqua regia

Somewhat sol in $\text{NH}_3 + \text{Aq}$ (Briggs, Z anorg 1909, **63** 326)

Nickel dichromate, $2\text{NiCr}_2\text{O}_7 + 3\text{H}_2\text{O}$

Slowly sol in cold, rapidly sol in hot H_2O

Deliquescent (Briggs, Z anorg 1907, **56** 246)

Nickel potassium chromate, NiCrO_4 , $\text{K}_2\text{CrO}_4 + 2\text{H}_2\text{O}$

Decomp by H_2O (Groger, Z anorg 1906, **51** 353)

$+ 6\text{H}_2\text{O}$ Efflorescent (Briggs, Chem Soc 1904, **85** 678)

Nickel rubidium chromate, $\text{NiRb}(\text{CrO}_4)_2 + 6\text{H}_2\text{O}$

Sl efflorescent at ord temp (Briggs, Chem Soc 1904, **85** 678)

Nickel chromate ammonia, NiCrO_4 , $6\text{NH}_3 + 4\text{H}_2\text{O}$

Decomp by H_2O Quite easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ of 0.96 sp gr (Schmidt) Insol in alcohol or ether

Potassium chromate, K_2CrO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, etc

System K_2O , CrO_3 , H_2O at 0°

100 g of the at solution contain		Solid phase
g K_2O	g CrO_3	
31 18		K_2CrO_4
26 06	0 54	
19 31	4 27	
17 73	5 50	
17 06	11 77	"
17 18	11 91	
17 62	18 71	
17 63	18 72	
17 61	18 91	$\text{K}_2\text{CrO}_4 + \text{K}_2\text{Cr}_2\text{O}_7$
17 79	19 10	
17 80	19 10	
10 90	11 93	
8 07	8 93	$\text{K}_2\text{Cr}_2\text{O}_7$
1 87	3 13	
1 41	3 00	
1 42	3 01	
0 97	3 94	"
0 78	22 38	
1 02	38 83	
1 26	40 10	
1 36	40 41	"
1 22	41 70	

System K_2O, CrO_3, H_2O at 0° —Continued

100 g of the sat solution contain		Solid phase
g K_2O	g CrO_3	
1 28	41 75	$K_2Cr_2O_7$
1 40	42 10	"
1 23	42 11	"
1 33	42 16	"
1 31	42 28	"
1 38	42 48	"
1 40	42 68	"
1 47	42 93	$K_2C_2O_7 + K_2Cr_2O_7$
1 47	42 95	"
1 47	43 09	"
1 25	44 52	$K_2Cr_2O_7$
1 27	44 95	"
1 18	45 84	"
1 17	46 84	"
1 36	47 22	$K_2Cr_2O_7 + K_2Cr_4O_{13}$
1 36	47 31	"
1 40	47 67	"
1 24	48 23	$K_2Cr_4O_{13}$
1 35	51 66	"
1 10	53 81	"
1 08	55 63	"
1 16	56 93	"
0 96	57 63	"
1 16	59 46	"
0 91	59 87	"
0 81	60 16	"
0 70	61 76	$K_2C_4O_{13} + CrO_3$
0 62	61 77	"
0 57	61 78	"
0 67	61 86	"
	61 51	CrO_3
	61 52	"
	61 55	"
	61 57	"

(Koppel and Blumenthal, Z anorg 1907, 53
245)System K_2O, CrO_3, H_2O at 20°

100 g of the sat solution contain		Solid phase
g K_2O	g CrO_3	
2 21	42 92	$K_2Cr_2O_7 + K_2Cr_2O_7$
2 20	43 28	"
2 10	44 02	$K_2Cr_2O_7$
2 02	45 28	"
2 01	46 24	"
2 00	48 46	$K_2C_2O_7 + K_2C_4O_{13}$
1 94	48 62	$K_2Cr_4O_{13}$
1 62	49 01	"
0 62	62 80	$K_2Cr_4O_{13} + CrO_3$

(Koppel and Blumenthal, Z anorg 1907, 53
243)System K_2O, CrO_3, H_2O at 30°

100 g of the sat solution contain		Solid phase
g K_2O	g CrO_3	
46 8		$KOH, 2H_2O$
26 89	0 94	K_2CrO_4
22 25	3 06	"
19 52	6 99	"
18 65	13 72	"
18 60	17 00	"
18 70	17 03	"
19 12	20 30	"
19 35	21 00	$K_2CrO_4 + K_2Cr_2O_7$
15 04	16 85	$K_2Cr_2O_7$
14 77	16 51	"
12 28	14 57	"
11 20	13 11	"
4 98	10 48	"
3 07	19 34	"
2 42	28 21	"
2 35	33 77	"
2 30	36 78	"
2 30	40 41	"
2 50	44 50	$K_2Cr_2O_7 + K_2Cr_2O_7$
2 25	49 95	$K_2Cr_2O_7 + K_2Cr_4O_{13}$
1 35	53 39	$K_2Cr_4O_{13}$
0 69	62 81	$K_2C_4O_{13} + CrO_3$
	62 52	CrO_3

(Koppel and Blumenthal, Z anorg 1907, 53
235)System K_2O, CrO_3, H_2O at 60°

100 g of the sat solution contain		Solid phase
g K_2O	g CrO_3	
50 0		KOH, H_2O
32 98	0 53	K_2CrO_4
21 05	9 15	"
20 70	8 99	"
20 25	14 43	"
20 32	16 56	"
20 67	21 94	"
20 72	22 00	"
20 68	23 49	$K_2CrO_4 + K_2Cr_2O_7$
20 55	23 74	$K_2Cr_2O_7$
14 53	20 82	"
13 36	20 93	"
10 01	21 24	"
10 01	21 24	"
8 39	26 95	"
7 65	31 49	"
7 54	32 92	"
6 86	39 64	"
7 06	49 84	$K_2CrO_4 + K_2Cr_2O_7$
6 51	50 40	$K_2Cr_2O_7$
5 33	52 70	"
5 49	52 79	"
5 06	53 42	"
5 12	53 58	"
5 30	53 70	"

System K_2O , CrO_3 , H_2O at 60° —Continued

100 g of the sat solution contain		Solid phase
g K_2O	g CrO_3	
5 01	54 09	$K_2Cr_3O_{10} + K_2Cr_4O_{13}$
4 06	54 73	
3 29	54 91	"
2 95	55 43	"
3 01	56 41	"
2 50	58 05	"
2 31	58 69	"
2 00	60 69	"
2 05	61 25	"
1 70	61 27	"
1 79	61 29	"
1 57	62 57	"
1 27	65 77	$K_2Cr_4O_{13} + CrO_3$
	65 12	

(Koppel and Blumenthal, Z anorg 1907, **53** 240)System K_2O , CrO_3 , H_2O at the cryohydric pt

Cryohydric pt	100 g of the solution contain		Solid phase
	g K_2O	g CrO_3	
-11 5°	17 18	18 11	$K_2CrO_4 + K_2Cr_2O_7$
-30 0°	1 18	42 51	
-39 0°	0 79	45 69	$K_2Cr_3O_{10} + K_2Cr_4O_{13}$

(Koppel and Blumenthal, Z anorg 1907, **53** 263-5)B-pt of solutions of $CrO_3 + K_2O + Aq$

B pt	100 g of the solution contain		Solid phase
	g K_2O	g CrO_3	
109°	30 01	11 92	K_2CrO_4
105 8	23 8	25 3	
106 8	24 3	30 5	$K_2CrO_4 + K_2Cr_2O_7$
104 8	16 4	35 6	
114 0	16 8	59 2	$K_2Cr_3O_{10} + K_2Cr_4O_{13}$
127 0		71 2	

(Koppel and Blumenthal, Z anorg 1907, **53** 255)Potassium chromate, K_2CrO_4 Easily sol in H_2O

Sol in 2 pts H_2O at 18.7° (Abt.)
 100 pts H_2O at 1° dissolve 43.87 pts K_2CrO_4 and solution has sp gr of 1.3032 (Michel and Krafft A ch (3) 41 478)

1 pt dissolves in 2.07 pts H_2O at 15.5° (Thomson)1 pt dissolves in 1.75 pts H_2O at 17.5° , and in 1.67 pts H_2O at 100° (Moser)100 pts H_2O dissolve at—

0°	10°	20°	30°	
58 90	60 92	62 94	64 96	pts K_2CrO_4
40°	50°	60°	70°	
66 98	69 00	71 02	73 04	pts K_2CrO_4
80°	90°	100°		
75 06	77 08	79 10		pts K_2CrO_4

(Alluard, C R 59 500)

100 pts H_2O dissolve at—

0°	10°	27.37°	42.1°	
61 5	62 1	66 3	70 3	pts K_2CrO_4
63 6°	93 6°	106 1°		
74 9	79 7	81 8		pts K_2CrO_4

(Nordenskjöld and Lindström, Pogg 136 314)

100 pts $K_2CrO_4 + Aq$ sat at $10-12^\circ$ contain 37.14 pts salt (v Hauer, J pr 103 114)100 pts H_2O at 19.5° dissolve 62.3 pts K_2CrO_4 , and solution has sp gr of 1.3787 (Schiff, A 109 326)Sat $K_2CrO_4 + Aq$ contains at—

34°	53°	79°
39 7	40 3	41 8% K ₂ CrO ₄
96°	120°	157°
42 6	44 0	45 4% K ₂ CrO ₄

(Étard, A ch 1894, (7) 2 550)

100 cc sat $K_2CrO_4 + Aq$ contain 53 g K_2CrO_4 at 15° (Kohlrausch, B A B 1897 90)100 pts H_2O dissolve 64.91 pts K_2CrO_4 at 30° , or 100 g of solution contain 39.36 g K_2CrO_4 (Schreinemakers, Chem Weekbl 1905, 1 837)100 g H_2O dissolve

54 57 g	K_2CrO_4	at—	11 37° (cryohydric pt)
57 11 g	"	"	0°
65 13 g	"	"	30°
74 60 g	"	"	60°
88 80 g	"	"	105 8° (b-pt of sat sol)

(Koppel, Z anorg 1907, **53** 262)64.62 g K_2CrO_4 at sol in 100 g H_2O at 25° (Amadori, Real Att Inc 1912, (5) **21**, I 667)

Sp gr of $K_2CrO_4 + Aq$ at 19.5°

% K_2CrO_4	Sp gr	% K_2CrO_4	Sp gr	% K_2CrO_4	Sp gr
1	1 0080	15	1 1287	28	1 2592
2	1 0161	16	1 1380	29	1 2700
3	1 0243	17	1 1474	30	1 2808
4	1 0325	18	1 1570	31	1 2921
5	1 0408	19	1 1667	32	1 3035
6	1 0492	20	1 1765	33	1 3151
7	1 0576	21	1 1864	34	1 3268
8	1 0663	22	1 1964	35	1 3386
9	1 0750	23	1 2066	36	1 3505
10	1 0837	24	1 2169	37	1 3625
11	1 0925	25	1 2274	38	1 3746
12	1 1014	26	1 2379	39	1 3868
13	1 1104	27	1 2485	40	1 3991
14	1 1195				

(Kremers, and Schiff, calculated by Gerlach, Z anal 8 288)

K_2CrO_4 dissolved in 2 pts H_2O has sp gr, 1 28, 3 pts, 1 21, 4 pts, 1 18, 5 pts, 1 15, 6 pts, 1 12, 7 pts, 1 11, 8 pts, 1 10 (Moser) Sp gr of sat solution at 8° = 1 368 (Anthon, 1837)

Sp gr of sat $K_2CrO_4 + Aq$ containing 24.26% K_2CrO_4 = 1 2335 at 18°/4° (Slotte, W Ann 1881, 14 18)

Sp gr of $K_2CrO_4 + Aq$ at 25°

Concentration of $K_2CrO_4 + Aq$	Sp gr
1-normal	1 0935
1/2 " "	1 0475
1/4 " "	1 0241
1/8 " "	1 0121

(Wagner, Z phys Ch 1890, 5 36)

Sat $K_2CrO_4 + Aq$ boils at 107° (Kremers)

Sat $K_2CrO_4 + Aq$ boils at 104.2° under 718 mm pressure (Alluard)

Freezing point of sat $K_2CrO_4 + Aq$ = -12.5° (Rudorff)

By dissolving K_2CrO_4 in 2 pts H_2O , the temp is lowered 10° (Moser)

100 pts sat solution of K_2CrO_4 and K_2SO_4 contain 37.14 pts of the two salts at 10-12° (v Hauel, J pr 103 114)

Solubility of $K_2CrO_4 + K_2SO_4$ in H_2O at 25° (G per 100 g H_2O)

K_2CrO_4	K_2SO_4	K_2CrO_4	K_2SO_4
63.09	0.76	20.83	5.75
61.39	1.17	14.65	7.12
58.40	1.84	7.81	8.98
51.81	2.36	4.36	10.25
40.93	3.33	1.94	10.86
27.36	4.82		

(Amadou, Real Att Line 1912, (5) 21, I 667)

Insol in liquid NH_3 (Franklin, Am C J 1898, 20 829)

100 g sat solution in glycol at 15.4° contains 1.7 g K_2CrO_4 (de Coninck, C C 19 II 183)

Insol in benzonitrile (Naumann, 1914, 47 1370)

Insol in methyl acetate (Naumann, 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Insol in acetone (Naumann, B 1904, 4329, Eidmann, C C 1899 II, 1014)

+4 H_2O Easily sol in H_2O and in NH_4C +Aq (Wesch, Dissert 1909)

Potassium dichromate, $K_2Cr_2O_7$

Sol in H_2O , with slight absorption of heat Less sol in H_2O than K_2CrO_4

Sol in 9.6 pts H_2O at 17.3° (Thompson) 10 13.7° (Moser)

100 pts H_2O at 15° dissolve 9.126 p $K_2Cr_2O_7$, and solution has sp gr = 1.06 (Michel and Kraft, A ch (3) 41 478)

100 pts H_2O dissolve pts $K_2Cr_2O_7$ A = according to Alluard (C R 59 500), K according to Kremers (Pogg 92 497)

t°	A	K	t°	A	K
0	4.6	4.97	60	45.0	50.5
10	7.4	8.5	70	56.7	
20	12.4	13.1	80	68.6	73.0
30	18.4		90	81.1	
40	25.9	29.1	100	94.1	102.0
50	35.0				

Solubility in H_2O at high temperature 100 pts H_2O dissolve pts $K_2Cr_2O_7$ at t°

t	100 K CrO_7	t	100 K CrO_7
117	125.3	148	200.6
129	153.8	180	262.7

(Hilden und Shenstone, Phil Trans 1884 23)

Solubility of K_2CrO_4 in H_2O at t°

t	K CrO_4	t	% K CrO_4
-1	4.1	92	42.8
+1	4.3	97	44.0
6	5.6	101	48.0
7	6.1	120	52.0
12	7.2	130	54.4
15	8.5	150	60.8
20	10.4	157	62.8
29	14.2	178	66.6
36	16.6	215	76.9
57	28.2	291	89.7
61	30.2	312	91.8
65	32.0	360	97.4
70	34.4		

(Étard, A ch 1894, (7) 2 550)

100 g H_2O dissolve 10.1 g $\text{K}_2\text{Cr}_2\text{O}_7$ at 15.5° (Greenish and Smith, Pharm J 1901, 66 774)

100 pts H_2O at 30° dissolve 18.12 pts $\text{K}_2\text{Cr}_2\text{O}_7$ (Schreinemakers, Chem Weekbl 1905 1 837)

100 g H_2O dissolve
 4.50 g $\text{K}_2\text{Cr}_2\text{O}_7$ at -0.63° (cryohydric pt)
 4.64 g " " 0°
 18.13 g " " 30°
 45.44 g " " 60°
 108.2 g " " 104.8° (b-pt of sat sol)
 (Koppel, Z anorg 1907, 53 263)

100 cc sat solution contain 11.43 g $\text{K}_2\text{Cr}_2\text{O}_7$ at 20° (Sherrill and Eaton, J Am Chem Soc 1907, 29 1643)

100 g sat $\text{K}_2\text{Cr}_2\text{O}_7$ contain
 5.52 g $\text{K}_2\text{Cr}_2\text{O}_7$ at 4.81°
 15.17 " " 30.10°
 17.77 " " 35.33°
 (Le Blanc and Schmandt, Z phys Ch 1911, 77 614)

100 g sat $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$ at 35.03° contains 17.72 g $\text{K}_2\text{Cr}_2\text{O}_7$ (Le Blanc, Z phys Ch 1913, 86 335)

$\text{K Cr O} + \text{Aq}$ sat at 5 has sp gr 1.065 (Anthon 1837)

Sp gr of $\text{K Cr}_2\text{O}_7 + \text{Aq}$ at 19.5°

% $\text{K Cr}_2\text{O}_7$	Sp gr	% $\text{K}_2\text{Cr}_2\text{O}_7$	Sp gr
1	1.007	9	1.065
2	1.015	10	1.073
3	1.022	11	1.080
4	1.030	12	1.085
5	1.037	13	1.097
6	1.043	14	1.102
7	1.050	15	1.110
8	1.056		

(Kiemers, calculated by Gerlach, Z anal 8 288)

Sp gr of $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$ containing 4.71% $\text{K}_2\text{Cr}_2\text{O}_7 = 1.0325$ at 11°/4°, containing 6.97% $\text{K Cr O} = 1.0493$ at 10.6°/4° (Slotte, W Ann 1881, 14 18)

Sat $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$ boils at 104° (Kiemers), 103.4° (Alluard)

Insol in alcohol
 Sl sol in liquid NH_3 (Linkin, Am Ch J 1898, 20 829)

Insol in alcohol (Reinutzer, Zeit angew Ch 1913, 26 456)

100 g sat solution in glycol contain 6 g $\text{K}_2\text{Cr}_2\text{O}_7$ (de Coninck, Bull acad roy Belg 1905, 257)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in acetone and in methylal (Eidmann, C C 1899 II, 1014)

Potassium trichromate, $\text{K}_2\text{Cr}_3\text{O}_{10}$

Easily sol in H_2O and alcohol (Bothe, J pr 46 184)

Not deliquescent, decomp by H_2O in chromic acid and $\text{K}_2\text{Cr}_2\text{O}_7$ (Jager and Kruss, B 22 2041)

Potassium tetrachromate, $\text{K}_2\text{Cr}_4\text{O}_{13}$

Very deliquescent, and easily sol in H_2O (Schwarz, Dingl 186 31)

Not deliquescent. Decomp by H_2O (Jager and Kruss, B 22 2042)

Potassium samarium chromate, $\text{K}_2\text{Sm}_2(\text{CrO}_4)_4 + 6\text{H}_2\text{O}$

Precipitate (Cleve)

Insol in ethyl acetate (Naumann, B 1904, 37 3601)

Potassium sodium chromate, $3\text{K}_2\text{CrO}_4, \text{Na}_2\text{CrO}_4$

Sol in H_2O (v Hauer, J pr 83 359)

64.2 pts are sol in 100 pts H_2O at 14° (Zehenter, M 1897, 18 49)

Potassium strontium chromate, $\text{K}_2\text{Sr}(\text{CrO}_4)_2$

Ppt Decomp by H_2O (Groger, Z anorg 1907, 54 187)

Decomp by H_2O Stable in contact with solutions containing

at 11.5°, 2.914 pts K_2CrO_4 per 100 pts H_2O
 at 27.5°, 4.123 " " " " "
 at 50°, 5.942 " " " " "
 at 76°, 7.920 " " " " "
 at 100°, 9.784 " " " " "

(Barre, C R 1914, 158 496)

Potassium thallium chromate, $\text{K CrO}_4, \text{Tl}_2\text{CrO}_4$

(Lachaud and Lepierre, Bull Soc (3) 6 232)

+2 H_2O Rapidly hydrolyzed by H_2O unless a large excess of the CrO_4 ion is present

Readily sol in dil mineral acids

Difficulty sol in $\text{K}_2\text{Cr}_2\text{O}_7 + \text{Aq}$ (Hawley, J Am Chem Soc 1907, 29 304)

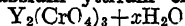
Potassium uranyl chromate, $\text{K}_2\text{CrO}_4, 2(\text{UO}_2)\text{CrO}_4 + 6\text{H}_2\text{O}$

Decomp by boiling with H_2O Sol in acidified H_2O (Formanek, A 257 103)

$\text{K CrO}_4, (\text{UO}_2)\text{CrO}_4 + \text{H}_2\text{O}, 2\text{K CrO}_4, 3(\text{UO}_2)\text{CrO}_4 + 7\text{H}_2\text{O}, 3\text{K}_2\text{CrO}_4, 4(\text{UO}_2)\text{CrO}_4 + 7\text{H}_2\text{O}$, and $\text{K CrO}_4, 3(\text{UO}_2)\text{CrO}_4 + 14\text{H}_2\text{O}$
 Precipitates (Wiesner, C C 1882 777)

Potassium ytterbium chromate, basic, $2\text{KYb}(\text{CrO}_4)_2 + \text{Yb}(\text{OH})_3 + 15\frac{1}{2}\text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 151)

Potassium yttrium chromate, K_2CrO_4 ,

Ppt (Cleve)

Potassium zinc chromate, basic, K_2O , $5ZnO$, $4CrO_3 + 6H_2O$, or K_2O , $4ZnO$, $3CrO_3$, $+3H_2O$ Slightly sol in cold, decomp by hot H_2O (Wohler) K_2O , $4ZnO$, $3CrO_3 + 3H_2O$ Insol in cold, decomp by hot H_2O (Groger, M 1904, 25 520)**Potassium zinc chromate, $K_2Zn(CrO_4)_2 + 2H_2O$** Ppt Decomp by H_2O (Groger, Z anorg 1907, 54 189)**Potassium dichromate chloride mercuric chloride, $K_2Cr_2O_7 \cdot 2KCl \cdot 4HgCl_2 + 2H_2O$** Solution in H_2O sat at 20.5° contains 6.78% salt Salt is much more sol in hot H_2O (Stromholm, Z anorg 1912, 75 278)**Potassium chromate iodate**

See Chromiodate, potassium

Potassium chromate magnesium sulphate, K_2CrO_4 , $MgSO_4 + 9H_2O$ Sol in H_2O (Étard, C R 85 443)**Potassium chromate mercuric chloride, K_2CrO_4 , $2HgCl_2$** Easily sol in H_2O Sol in dil $HCl + Aq$ (Darby)**Potassium dichromate mercuric chloride, $K_2Cr_2O_7$, $HgCl_2$** Ether or absolute alcohol dissolves out $HgCl_2$ (Millon, A ch (3) 18 388)Can be crystallized from H_2O (Jager and Küss, B 22 2046)**Potassium chromate mercuric cyanide, $2K_2CrO_4$, $3Hg(CN)_2$** Easily sol in H_2O $+H_2O$ (Dexter)Formula is $K_2CrO_4 \cdot 2Hg(CN)_2$ (Clarke and Sterne, Am Ch J 3 352)**Potassium dichromate mercuric cyanide, $K_2Cr_2O_7$, $Hg(CN)_2 + 2H_2O$** Sol in H_2O (Wyruboff, J B 1880 309)**Potassium chromate phosphate**

See Phosphochromate, potassium

Potassium chromate sulphate, K_2CrO_4 , $6K_2SO_4$ Easily sol in H_2O (Boutron-Chalard)**Potassium chromate tellurate**

See Chromotellurate, potassium

Rubidium chromate, Rb_2CrO_4 Sol in H_2O (Piccard, J pr 86 455)Solubility in H_2O at t°

t°	% Rb_2CrO_4
— 7	36 65
0	38 27
10 3	40 22
20	42 42
30	44 11
40	46 13
50	47 44
60 4	48 90

(Schreinemakers and Filippo, Chem Weekbl 1906, 3 157)

Rubidium dichromate, $Rb_2Cr_2O_7$ Sol in H_2O (Grandeau, A ch (3) 67 227)Very sl sol in H_2O , 5% at 10° , 8% at 26° , 35% at 60° (Wyruboff, Bull Soc Min 1881, 4 129)100 pts H_2O dissolve 10.46 pts $Rb_2Cr_2O_7$ at 30° The solution contains 9.47% salt (Schreinemakers and Filippo, Chem Weekbl 1906, 3 157)Two forms of crystals Figures denote pts salt per 100 pts H_2O t° 14° 26° 43°

Monoclinic form 4.45 8.00 16.52

Triclinic form 4.40 7.91 16.57

(Wyruboff, Bull Soc 1908, (4) 3 7)

Solubility of monoclinic and triclinic forms

T, mp	Pts of salt in 100 pts H_2O		T, mp	Pts of salt in 100 pts H_2O	
	Mono clinic	Tri clinic		Mono clinic	Tri clinic
18°	5.42	4.96	40°	13.22	12.90
24°	6.94	6.55	50°	18.94	18.77
30°	9.08	8.70	60°	28.1	27.3

(Stortenbeker, C C 1907, II 1558)

Rubidium dichromate chloride mercuric chloride, $Rb_2Cr_2O_7$, $2RbCl$, $4HgCl_2 + 2H_2O$ Sol in H_2O Solution sat at 20.5° contains 5.35% salt (Stromholm, Z anorg 1912, 75 284)**Silver (argentous) chromate, Ag_4CrO_4**

Sol in dil acids (Wohler und Rautenberg)

Existence very doubtful

Silver chromate, Ag_2CrO_4 Absolutely insol in H_2O Sol in acids, ammonia, and alkali chromates + Aq (Warrington, A 27 12)Appreciably sol in cold, and still more in hot H_2O (Menneke, A 261 341)100 ccm H_2O dissolve 0.064 gram Ag_2CrO_4 at 100° , 100 ccm H_2O containing 50 grains

of the following salts dissolve the given amts of Ag_2CrO_4 at 100° NaNO_3 , 0.064 gram, KNO_3 , 0.192 gram, NH_4NO_3 , 0.320 gram, $\text{Mg}(\text{NO}_3)_2$, 0.256 gram (Carpenter, J S C I **5** 236)

According to electrical conductivity of $\text{Ag}_2\text{CrO}_4 + \text{Aq}$, 1 l H_2O dissolves 28 mg Ag_2CrO_4 at 18° (Kohlrausch and Rose, Z phys Ch **12** 241)

1 l H_2O dissolves 25 mg Ag_2CrO_4 at 18° (Kohlrausch, Z phys Ch 1904, **50** 356)

25 mg are contained in 1 l of sat solution at 18° Solubility increases unusually rapidly with temp (Kohlrausch, Z phys Ch 1908, **64** 168)

Sol in 26,378 pts cold H_2O and 9116 pts H_2O at 100° (Koninek and Nihoul, Zeit anorg Ch 1891, **5** 295)

1 l H_2O dissolves 1.2×10^{-4} gram atoms of silver at 25° (Abegg and Cox, Z phys Ch 1903, **46** 11)

1 l H_2O dissolves 0.029 g Ag_2CrO_4 at 25° (Schafer, Z anorg 1905, **45** 310)

1 l H_2O dissolves 0.0256 g Ag_2CrO_4 at 18° , 0.0341 g at 27° , 0.0534 g at 50° (Whitby Z anorg 1910, **67** 108)

Sol in hot $\text{NH}_4\text{OH} + \text{Aq}$ of sp gr 0.94 (15.63% NH_3), sl sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ of sp gr 0.91 (24.99% NH_3) (Margosches, Z anorg 1904, **41** 73)

Solubility of Ag_2CrO_4 in $\text{NH}_4\text{OH} + \text{Aq}$ at 25°

Mols NH_4OH per l	Mols $\times 10^3$ Ag_2CrO_4 per l
0.01	2.004
0.02	4.169
0.04	8.595
0.08	17.58

(Sherrill and Russ, J Am Chem Soc 1907, **29** 1662)

Sl sol in very conc $\text{K}_2\text{CrO}_4 + \text{Aq}$ Practically insol in $\text{AgNO}_3 + \text{Aq}$ (Margosches)

Solubility of Ag_2CrO_4 in $\text{HNO}_3 + \text{Aq}$ at 25°

Mols HNO_3 per l	Milhat per l		Solid Phase
	Cr	Ag	
0.01	3.157	6.315	Ag_2CrO_4
0.015	3.730		"
0.02	4.177	8.356	"
0.025	4.567		"
0.03	5.200		"
0.04	5.803	11.62	"
0.05	6.380		"
0.06	6.833		"
0.07	7.333		"
0.075	7.477	14.85	" + Ag_2CrO_4
0.08	7.260	15.45	"
0.10	5.647	19.01	"
0.13	4.293	23.89	"
0.14	3.948	25.63	"

(Sherrill and Russ, J Am Chem Soc 1907, **29** 1663)

Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 829)

1 l 65% alcohol dissolves 0.0129 g Ag_2CrO_4 at ord temp (Guerini, Dissert 1912)

Insol in H_2O containing acetic acid in presence of large excess of AgNO_3 (Gooch and Weed, Am J Sci 1908, (4) **26** 85)

Practically insol in glacial acetic acid but somewhat sol in dil acetic acid It behaves in a similar manner toward propionic, lactic and other organic acids The red modification is more sol than the greenish-black (Margosches, Z anorg 1906, **51** 233)

Silver dichromate, $\text{Ag}_2\text{Cr}_2\text{O}_7$

Sl sol in H_2O Easily sol in HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$ (Warington)

Decomp by boiling with H_2O into CrO_3 and Ag_2CrO_4 (Jager and Kruss, B **22** 2050)

Decomp by cold H_2O (Autenrieth, B 1902, **35** 2061)

1 pt is sol in 12,000 pts H_2O at 15° (Mayer, B 1903, **36** 1741)

Solubility in H_2O at $25^\circ = 7.3 \times 10^{-3}$ atoms Ag per l Decomp by $\text{HNO}_3 + \text{Aq}$ (less than 0.06 N) with separation of Ag_2CrO_4 (Sherrill and Russ, J Am Chem Soc 1907, **29** 1674)

Solubility of Ag_2CrO_7 in $\text{HNO}_3 + \text{Aq}$ at 25°

Mols HNO_3 per l	Milhat per l		Solid Phase
	Cr	Ag	
0	32.20	5.390	$\text{Ag}_2\text{CrO}_4 + \text{Ag}_2\text{CrO}_7$
0.01	25.06	6.131	"
0.02	20.21	7.148	"
0.04	13.59	9.529	"
0.06	11.10	11.10	Ag_2CrO_7
0.08	11.10	11.10	"
0.08 + 0.1 AgNO_3	6.624		"

(Sherrill and Russ, J Am Chem Soc 1907, **29** 1664)

Silver uranyl chromate, $2\text{Ag}_2\text{CrO}_4, \text{UO}_2\text{CrO}_4$
Ppt (Forminek, A **257** 110)

Silver chromate ammonia, $\text{Ag}_2\text{CrO}_4, 4\text{NH}_3$

Decomp by H_2O Sol in warm conc $\text{NH}_4\text{OH} + \text{Aq}$ (Mitscherlich, Pogg **12** 141)

Silver dichromate mercuric cyanide, $\text{Ag}_2\text{Cr}_2\text{O}_7, \text{Hg}(\text{CN})_2$

Sol in cold H_2O very sol in hot H_2O without decomp (Kruss, Z anorg 1895, **8** 456)

$\text{Ag}_2\text{Cr}_2\text{O}_7, 2\text{Hg}(\text{CN})_2$ Scarcely sol in cold more readily in hot H_2O Sol in hot $\text{HNO}_3 + \text{Aq}$, putting on cooling (Durby, Chem Soc **1** 24)

Sodium chromate, basic, $\text{Na}_4\text{CrO}_5 + 13\text{H}_2\text{O}$

Sol without decomp in H_2O

Sat solution at 30° contains 41.3%

Na_2CrO_5 (Schreinemakers, Z phys Ch 1906, **55** 93)

Deliquescent
Solubility in H_2O at t°

t°	0°	10°	20 5°
% Na_2CrO_5	33 87	35 58	38 05
t°	27 7°	35°	37°
% Na_2CrO_5	40 09	44 09	45 13

(Mylius and Funk, Gm -K **3** I, 1379)

$\text{Na}_2\text{CrO}_5 + \text{Aq}$ sat at 18° contains 37 50% Na_2CrO_5 , and has sp gr = 1 446 (Mylius and Funk, B 1900, **33** 3688)

Sodium chromate, Na_2CrO_4

100 cem of solution sat at 18° contain 54 g Na_2CrO_4 (Kohlrausch, B A B **1897** 90)

Solubility in H_2O at t°

t°	% Na_2CrO_4
70	55 15
80	55 53
100	55 74

(Mylius and Funk, Gm -K **3** I, 1379)

$\text{Na}_2\text{CrO}_4 + \text{Aq}$ sat at 18° contains 40 10% Na_2CrO_4 , and has sp gr = 1 432 (Mylius and Funk, B 1900, **33** 3686)

See also +4, 6, and $10\text{H}_2\text{O}$

Sp gr of $\text{Na}_2\text{CrO}_4 + \text{Aq}$ at $t^\circ/4^\circ$

t°	17 4°	17 1°	20 7°
% Na_2CrO_4	5 76	10 62	14 81
Sp gr	1 0576	1 1125	1 1644

(Slotte, W Ann 1881, **14** 18)

$+4\text{H}_2\text{O}$ Sat solution at 30° contains 46 62% Na_2CrO_4 (Schreinemakers, Z phys Ch 1906, **55** 93)

Solubility in H_2O at t°

t	% Na_2CrO_4	t	% Na_2CrO_4
25 6	46 08	49 5	50 93
31 5	47 05	54 5	52 28
36	47 98	59 5	53 39
40	48 97	65	55 2
45	50 20		

(Mylius and Funk Gm -K **3** I, 1379)

Solubility in H_2O at t°

t	% Na_2CrO_4	Mols H_2O to 1 mol anhydrous salt	Mols anhydrous salt to 100 mols H_2O
28 9	46 47	10 37	9 64
29 7	46 54	10 34	9 67
31 2	47 08	10 12	9 88

(Salkowski B 1901, **34** 1948)

$+6\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	% Na_2CrO_4	Mols H_2O to 1 mol anhydrous salt	Mols anhydrous salt to 100 mols H_2O
17 7	43 65	11 60	8 62
19 2	44 12	11 40	8 77
21 2	44 64	11 16	8 96
23 2	45 27	10 88	9 19
24 7	45 75	10 77	9 37
26 6	46 28	10 45	9 57

(Salkowski, B 1901, **34** 1948)

$+10\text{H}_2\text{O}$ Deliquescent (Kopp, A **4** 99) Easily sol in H_2O Melts in cryst H_2O at 23° (Berthelot)

Sp gr of solution sat at 18° = 1 409, and contains 38 1% Na_2CrO_4 (Mylius and Funk B 1897, **30** 1718)

Solubility in H_2O at t°

t°	% Na_2CrO_4
0	24 04
10	33 41
18 5	41 65
19 5	44 78
21	47 40

(Mylius and Funk, Gm -K **3** I, 1379)

Sp gr of solution at 15° containing 40 1% Na_2CrO_4 = 1 432 (Mylius, B 1900, **3** 3688)

Sl sol in alcohol (Mosci)

100 g absolute methyl alcohol dissolv 0 345 g Na_2CrO_4 at 25° (de Bruyn, Z phy Ch **10** 783)

Insol in acetone (Naumann B 1904, **3** 4329)

Sodium dichromate, $\text{Na}_2\text{Cr}_2\text{O}_7$

More sol in H_2O than Na_2CrO_4

Solubility in H_2O at t°

t	% $\text{Na}_2\text{Cr}_2\text{O}_7$
93	51 19
98°	51 2

(Mylius and Funk Gm -K **3** I 1380)

Sp gr of aqueous solution containing

1	5	10	15	20	25%	$\text{Na}_2\text{Cr}_2\text{O}_7$
1 007	1 035	1 071	1 105	1 141	1 171	

30 35 40 45 50%, $\text{Na}_2\text{Cr}_2\text{O}_7$

1 208	1 24	1 280	1 313	1 34

(Stenley C N **54** 194)

Sp gr of sat solution containing 63 92% $\text{Na}_2\text{Cr}_2\text{O}_7$ at 18° = 1 745 (Mylius and Funk B 1900, **33** 3688)

Sl sol in liquid NH_3 (Franklin Am Ch J 1898, **20** 829)

Sol in acetone (Naumann, B 1904, 37 4328)

+2H₂O Deliquescent

100 pts H₂O dissolve at—

0° 15° 30° 80° 100° 139°
107 2 109 2 116 6 142 8 162 8 209 7 pts salt

(Stanley, C N 54 194)

Solubility in H₂O at t°

t	% Na ₂ Cr ₂ O ₇
0	61 98
17	63 82
34 5	67 36
52	71 76
72	76 90
81	79 80

(Mylius and Funk, Gm-K 3 I, 1380)

100 g H₂O at 30° dissolve 197 6 g Na₂Cr₂O₇, or sat solution at 30° contains 66 4% Na₂Cr₂O₇ (Schrenemakers, Z phys Ch 1906, 55 97)

100 ccm of a solution of sodium dichromate in alcohol contain 5 133 g Na₂Cr₂O₇ + 2H₂O at 19 4° The solution decomp rapidly (Reinitzer, Zeit angew Ch 1913, 26 456)

The composition of the hydrates formed by Na₂Cr₂O₇ at different dilutions is calculated from determinations of the lowering of the fr = pt produced by Na₂Cr₂O₇ and of the conductivity and sp gr of Na₂Cr₂O₇ + Aq (Jones, Am ch J 1905, 34 317)

Sodium trichromate, NaCr₃O₁₀

Deliquescent Very sol in H₂O (Stanley, C N 54 194)

+H₂O Sat solution at 30° contains 80% Na₂Cr₃O₁₀ (Schrenemakers, Z phys Ch 1906, 55 94)

Solubility in H₂O at t°

t°	0°	15°	55°	99°
% Na ₂ Cr ₃ O ₁₀	50 03	80 44	52 68	85 78

(Mylius and Funk, Gm-K 3 I, 1380)

Sp gr of sat solution containing 80 6% Na₂Cr₃O₁₀ at 18° = 2 059 (Mylius and Funk B 1900, 33 3688)

Sodium tetrachromate, Na₄Cr₄O₁₃ + 4H₂O

Solubility in H₂O at t°

t°	0°	16°	22°
% Na ₄ Cr ₄ O ₁₃	72 19	74 19	76 01

(Mylius and Funk, Gm-K 3 I, 1380)

Deliquescent

Sat solution at 18° contains 74 6% Na₄Cr₄O₁₃ and has sp gr = 1 926 (Mylius and Funk, B 1900, 33 3688)

Sodium uranyl chromate, Na₂CrO₄

2(UO₂)CrO₄ + 10H₂O

Easily sol in H₂O (Formánek, A 257 108)

100 pts of the solution in H₂O contain 52 52 pts of the anhydrous salt at 20° (Rumbach, B 1904, 37 432)

Sodium chromate silicate, Na₂O, Cr₂O₃, 2SiO₂ + 14H₂O

Not decomp by HCl + Aq (Singer, Disser 1910)

2Na₂O, 3Cr₂O₃, 6SiO₂ Not decomp by boiling conc acids except HF (Weyberg C B Miner, 1908 519)

5Na₂O, 2Cr₂O₃, 11SiO₂ (Weyberg)

3Na₂O, 2Cr₂O₃, 9SiO₂ (Weyberg)

Strontium chromate, SrCrO₄

Somewhat sol in H₂O Sol in 840 pts H₂O (Meschevskij, Z anal 21 399), sol in 831 8 pts H₂O at 15° (Fresenius, Z anal 29 419)

100 cc H₂O dissolve 0 4651% at 10° 1% at 20°, 2 417% at 50°, 3% at 100° (Reichard, Ch Z 1903, 27 877)

Easily sol in HCl, HNO₃, or H₂CrO₄ + Aq

Sol in 512 pts 0 5% NH₄Cl + Aq at 15°

Sol in 63 7 pts 1% HC H₃O + Aq at 15°

Sol in 348 8 pts solution containing 0 75% NH₄C₂H₃O₂, 4 drops HC H₃O, and 6 drops (NH₄)₂CrO₄ + Aq (Fresenius)

100 ccm NH₄Cl + Aq sat at bpt dissolve 1 g SrCrO₄ (Dumesnil, A ch 1900 7) 20 125)

50 ccm alcohol (29%) dissolve 0 0066 g SrCrO₄

50 ccm alcohol (53%) dissolve 0 001 g SrCrO₄ (Fresenius, Z anal 30 672)

Strontium dichromate, SrCr₂O₇

Easily sol in H₂O

Strontium trichromate, SrCr₃O₁₀ + 3H₂O

Very deliquescent, and sol in H₂O (Preis and Ravmann, B 13 340)

Strontium chromate mercuric hydrogen chloride, SrCrO₄, 2HgCl₂, HCl

According to Stromholm 1:1 SrCl₂:SrCrO₄:4HgCl₂ + H₂O

Recryst from H₂O (Imbert and Belugon Bull Soc 1897 (3) 17 471)

2SrCrO₄, 6HgCl₂, HCl (Imbert and Belugon)

Thallos chromate, TlCrO₄

100 pts H₂O dissolve 0 05 pt at 60° (Rupp and Zimmer, Z anorg 1902 33 157)

Ppt Insol in cold moderately conc HC H₃O + Aq or in very dil HNO₃ + Aq and very sl sol on boiling therewith Dil NH₄OH, and Na₂CO₃ + Aq have the same action Attacked by very dil HCl + Aq Sol in hot conc HCl + Aq Decomp by dil H₂SO₄ + Aq (Carstanjen)

1 l KOH+Aq (112 g per l) dissolves about 3.5 g Ti_2CrO_4 on boiling, which separates out on cooling

Boiling conc KOH+Aq (31% KOH) dissolves 15 g Ti_2CrO_4 per litre (Lepierre and Lachaud, C R 113 196)

Thalious dichromate, $\text{Ti}_2\text{Cr}_2\text{O}_7$

Insol in H_2O , etc Has the same properties as Ti_2CrO_4

Thalious trichromate, $\text{Ti}_2\text{Cr}_3\text{O}_{10}$

Sol in 2814 pts H_2O at 15° , and 438.7 pts at 100° (Crookes)

Thallic chromate

Ppt

Thorium chromate, basic, $\text{Th}(\text{OH})_2\text{CrO}_4$

Ppt, unstable in solution (Palmer, Am Ch J 1895, 17 278)

Thorium chromate, $\text{Th}(\text{CrO}_4)_2 \cdot \text{H}_2\text{O}$

Ppt Sol in HCl and NH_4Cl +Aq 1 pt is sol in 284 pts H_2O at 22° (Palmer, Am Ch J 1895, 17 375 and 278)

+ $3\text{H}_2\text{O}$ Ppt (Haber, M 1897, 18 689)
+ $8\text{H}_2\text{O}$ Insol in H_2O (Chydenius, Pogg 119 54)

Tin (stannous) chromate

Ppt Sol in dil acids (Berzelius)

Tin (stannic) chromate

Ppt (Leykauf, J p 19 127)

Uranyl chromate, basic, $\text{UO}_3 \cdot 2(\text{UO}_2)\text{CrO}_4 \cdot 8\text{H}_2\text{O}$

Ppt (Orloff, Ch Z 1907, 31 375)

$\text{UO}_3 \cdot (\text{UO}_2)\text{CrO}_4 \cdot 6\text{H}_2\text{O}$ (Orloff)

Uranyl chromate, $(\text{UO}_2)_2\text{CrO}_4 \cdot 3\text{H}_2\text{O}$

1 pt is sol in 133 pts H_2O at 15° , slowly sol in alcohol to give a solution which is decomp on boiling (Orloff, Ch Z 1907, 31 375)

+ $11\text{H}_2\text{O}$ Very sol in H_2O (Formáněk, A 257 108)

Yttrium chromate

Deliquescent Easily sol in H_2O (Bailin)

Zinc chromate, basic, $4\text{ZnO} \cdot \text{Cr}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$

(Groger, Z anorg 1911, 70 135)

+ $5\text{H}_2\text{O}$ Insol in H_2O , sol in hot H_2CrO_4 +Aq, slowly sol in NH_4OH +Aq (Malaguti and Sarzeau, A ch (3) 9 431)

$3\text{ZnO} \cdot \text{Cr}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (Groger)
 $2\text{ZnO} \cdot \text{Cr}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (Briggs, Z anorg 1907, 56 254)

+ $1\frac{1}{2}\text{H}_2\text{O}$ Ppt Insol in H_2O Sol in hot H_2CrO_4 +Aq (Prussen and Phillipona, A 149 92)

+ $2\text{H}_2\text{O}$ Ppt Not wholly insol in H_2O (Prussen and Phillipona)

$3\text{ZnO} \cdot 2\text{CrO}_3 \cdot \text{H}_2\text{O}$ (Groger)

Zinc chromate, ZnCrO_4

Insol in H_2O , very sol in acids, decomp by boiling with H_2O (Schulze, Z anorg 1895, 10 154)

Insol in liquid NH_3 (Franklin, Am J 1898, 20 830)

Insol in acetone (Naumann, B 1894, 37 4329)

+ H_2O (Groger, Z anorg 1911, 70 1)

Zinc dichromate, $\text{ZnCr}_2\text{O}_7 \cdot 3\text{H}_2\text{O}$

Hygroscopic

Very sol in H_2O and sl decomp by boiling (Schulze, Z anorg 1895, 10 153)

Zinc trichromate, $\text{ZnCr}_3\text{O}_{10} \cdot 3\text{H}_2\text{O}$

Deliquescent, very sol in H_2O (Groger, Z anorg 1910, 66 10)

Zinc chromate ammonia, $\text{ZnCrO}_4 \cdot \text{NH}_3 \cdot \text{H}_2\text{O}$

Decomp by H_2O (Groger, Z anorg 1908, 58 417)

$\text{ZnCrO}_4 \cdot 4\text{NH}_3 \cdot 5\text{H}_2\text{O}$ Decomp by H_2O Sol in NH_4OH +Aq Insol in alcohol and ether (Malaguti and Sarzeau, A ch (3) 9 431)

+ $3\text{H}_2\text{O}$ Efflorescent Decomp by H_2O Easily sol in dil acids and NH_4OH +Aq (Bieler, A 151 223)

$2\text{ZnO} \cdot 3\text{CrO}_3 \cdot 10\text{NH}_3 \cdot 10\text{H}_2\text{O}$ P (Malaguti and Sarzeau)

Zinc dichromate mercuric cyanide, $\text{ZnCr}_2\text{O}_7 \cdot 2\text{Hg}(\text{CN})_2 \cdot 7\text{H}_2\text{O}$

Very sol in H_2O Stable in aqueous solution at 100° (Kluss, Z anorg 1895, 3 460)

Perchromic acid

See Perchromic acid

Chromicomolybdic acid, $(\text{CrO}_3)_2 \cdot 12\text{MoO}_3 \cdot 28\text{H}_2\text{O}$

Slowly sol in H_2O (Hall, J Am Chem Soc 1907, 29 708)

Ammonium chromicomolybdate, $3(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \cdot 12\text{MoO}_3 \cdot 20\text{H}_2\text{O}$

Sol in H_2O (Sturtevant, J p 61 457, H 1, J Am Chem Soc 1907, 29 695)

+ $26\text{H}_2\text{O}$ (Muckwald, Dissert, 1895)

Ammonium barium chromicomolybdate, $(\text{NH}_4)_2\text{O} \cdot 2\text{BaO} \cdot \text{Cr}_2\text{O}_3 \cdot 12\text{MoO}_3 \cdot 20\text{H}_2\text{O}$

(Hall, J Am Chem Soc 1907, 29 707)

Barium chromicomolybdate, 4BaO , Cr_2O_3 , $12\text{MoO}_3 + 15\text{H}_2\text{O}$, 4BaO , Cr_2O_3 , $12\text{MoO}_3 + 18\text{H}_2\text{O}$, 5BaO , Cr_2O_3 , $12\text{MoO}_3 + 16\text{H}_2\text{O}$

Ppts (Hall, J Am Chem Soc 1907, **29** 705)

Lead chromicomolybdate, 4PbO , Cr_2O_3 , $12\text{MoO}_3 + 22\text{H}_2\text{O}$, and $+24\text{H}_2\text{O}$

Ppts (Hall, J Am Chem Soc 1907, **29** 706)

Mercurous chromicomolybdate, $8\text{Hg}_2\text{O}$, Cr_2O_3 , $12\text{MoO}_3 + 16\text{H}_2\text{O}$

Ppt (Hall, J Am Chem Soc 1907, **29** 707)

Potassium chromicomolybdate, K_2O , Cr_2O_3 , 3MoO_3

Sol in $\text{HCl} + \text{Aq}$ with evolution of Cl (Bradbury, Z anorg 1894, **7** 46)

$3\text{K}_2\text{O}$, Cr_2O_3 , $12\text{MoO}_3 + 20\text{H}_2\text{O}$ Sol in 38.51 pts H_2O at 17° (Struve, Hall) $+24\text{H}_2\text{O}$ (Hall)

$4\text{K}_2\text{O}$, Cr_2O_3 , $12\text{MoO}_3 + 15\text{H}_2\text{O}$ (Hall, J Am Chem Soc 1907, **29** 709)

$7\text{K}_2\text{O}$, $2\text{Cr}_2\text{O}_3$, $24\text{MoO}_3 + 32\text{H}_2\text{O}$ (Hall)

Silver chromicomolybdate, $5\text{Ag}_2\text{O}$, Cr_2O_3 , $12\text{MoO}_3 + 17\text{H}_2\text{O}$

Ppt (Hall)

Sodium chromicomolybdate, $3\text{Na}_2\text{O}$, Cr_2O_3 , $12\text{MoO}_3 + 21\text{H}_2\text{O}$

Efflorescent Easily sol in H_2O (Struve)

Chromic sulphuric acid

See Sulphochromic acid

Chromicyanhydric acid,

$\text{H}_3\text{Cr}(\text{CN})_6(?)$

Insol in H_2O (Kaiser, A Suppl **3** 163)

Ammonium chromicyanide, $(\text{NH}_4)_3\text{Cr}(\text{CN})_6$

Easily sol in H_2O (Kaiser, A Suppl **3** 163)

Cupric chromicyanide, $\text{Cu}_3[\text{Cr}(\text{CN})_6]_2$

Ppt Insol in dil or conc acids, except on heating Insol in NH_4OH , or $\text{KOH} + \text{Aq}$ (Kaiser)

Lead chromicyanide, basic, $3\text{Pb}(\text{CN})_2$, $2\text{Cr}(\text{CN})_3$, $\text{Pb}(\text{OH})$

Ppt Sol in HNO_3 , $\text{NaOH} + \text{Aq}$, or Pb salts $+ \text{Aq}$ (Kaiser)

Potassium chromicyanide, $\text{K}_3\text{Cr}(\text{CN})_6$

Very sol in H_2O

100 pts cold H_2O dissolve 30.9 pts salt Insol in absolute alcohol, but somewhat sol in dil alcohol

Sol in conc H_2SO_4 without decomp (Kaiser, A Suppl **3** 170)

Silver chromicyanide, $\text{Ag}_3\text{Cr}(\text{CN})_6$

Insol in all solvents, excepting $\text{KCN} + \text{Aq}$ (Kaiser)

Sol in large excess of $\text{HCl} + \text{Aq}$ Sl sol in cold, easily sol in hot conc HNO_3 Very sol in conc H_2SO_4 Insol in hot or cold acetic acid (Cruser, Dissert 1896)

Chromisulphocyanhydric acid

$\text{H}_3\text{Cr}(\text{SCN})_6$

Known only in aqueous solution

Ammonium chromisulphocyanide,

$(\text{NH}_4)_3\text{Cr}(\text{SCN})_6 + 4\text{H}_2\text{O}$

Easily sol in H_2O (Rossler, A **141** 185)

Barium chromisulphocyanide, $\text{Ba}_3[\text{Cr}(\text{SCN})_6]_2 + 16\text{H}_2\text{O}$

Deliquescent, and sol in H_2O (R)

Lead chromisulphocyanide, $\text{Pb}_3[\text{Cr}(\text{SCN})_6]_2$, $4\text{PbO}_2\text{H}_2 + 8\text{H}_2\text{O}$

Insol in H_2O , but decomp thereby into— $\text{Pb}_2[\text{Cr}(\text{SCN})_6]_2$, $4\text{PbO}_2\text{H}_2 + 5\text{H}_2\text{O}$ Insol in H_2O

Potassium chromisulphocyanide, $\text{K}_3\text{Cr}(\text{SCN})_6 + 4\text{H}_2\text{O}$

Sol in 0.72 pt H_2O and 0.94 pt alcohol

Silver chromisulphocyanide, $\text{Ag}_3\text{Cr}(\text{SCN})_6$

Insol in H_2O or conc $\text{HNO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$

Sodium chromisulphocyanide, $\text{Na}_3\text{Cr}(\text{SCN})_6 + 7\text{H}_2\text{O}$

Deliquescent, sol in H_2O

Chromium,

Two modifications—(a) Not attacked by H_2O Easily sol in cold $\text{HCl} + \text{Aq}$ Sl sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Deville) Easily sol in a hot mixture of 1 pt H_2SO_4 and 20 pts H_2O (Regnault, A ch **62** 357) Easily sol in warm conc H_2SO_4 (Gmelin) Very slowly sol in hot $\text{HNO}_3 + \text{Aq}$ (Vauquelin) Insol in dil or conc $\text{HNO}_3 + \text{Aq}$ (Deville) Very slowly (Richter), not at all (Berzelius) sol in hot aqua regia Easily sol in $\text{HF} + \text{Aq}$ (β) Insol in all acids, even aqua regia (Fremy), probably contains Si

Pure Cr is sol in conc H_2SO_4 , HCl and dil HNO_3 , sol in $\text{HgCl}_2 + \text{Aq}$

Insol in fuming HNO_3 and aqua regia (Moissan, C R **1894** 119, 187)

Cr prepared by aluminothermic method is sol in haloid acids to form chromic and chromous salts, even in absence of air (Döring, J pr 1902, (2) **66** 65, 1906, (2) **73** 393)

Aluminothermic Cr is active in contact

with HCl, HBr, HI, HF, H_2SO_4 , $\text{H}_2\text{C}_2\text{O}_4$, i.e., sol in cold conc or warm dil acids. Is inactive in contact with conc HNO_3 , $\text{H}_2\text{Cr}_2\text{O}_4$, HClO_3 , HClO_4 , H_3PO_4 , KOH, citric, formic, acetic and tartaric acids. Cause attributed to a different electric state (Hittorf, Z phys Ch 1898, 25 729)

Chromium ammonia compounds

See—

Bromotetramine chromium compounds,
 $\text{BrCr}(\text{NH}_3)_4\text{X}_2$

Bromopurpleochromium compounds,
 $\text{BrCr}(\text{NH}_3)_5\text{X}_2$

Chlorotetramine chromium compounds,
 $\text{ClCr}(\text{NH}_3)_4\text{X}_2$

Chloropurpleochromium compounds,
 $\text{ClCr}(\text{NH}_3)_5\text{X}_2$

Diamine chromium sulphocyanides,
 $\text{Cr}(\text{NH}_3)_2(\text{SCN})_4\text{M}$

Erythrochromium compounds,
 $(\text{HO})\text{Cr}_2(\text{NH}_3)_{10}\text{X}_2$

Iodopurpleochromium compounds,
 $\text{ICr}(\text{NH}_3)_5\text{X}_2$

Iodotetramine chromium compounds,
 $\text{ICr}(\text{NH}_3)_4\text{X}_2$

Luteochromium compounds, $\text{Cr}(\text{NH}_3)_6\text{X}_3$

Rhodochromium compounds,
 $(\text{HO})\text{Cr}_2(\text{NH}_3)_{10}\text{X}_5$

Rhodosechromium compounds,
 $(\text{HO})_3\text{Cr}_2(\text{NH}_3)_6\text{X}_3$

Roseochromium compounds,
 $\text{Cr}(\text{NH}_3)_5(\text{OH})_2\text{X}_4$

Xanthochromium compounds,
 $(\text{HO})_2\text{Cr}(\text{NH}_3)_5\text{X}_2$

Chromium arsenide, CrAs

Insol in mineral acids (Dieckmann, Z anorg 1914, 86 294)

Cr_2As_3 Insol in mineral acids (Dieckmann)

Chromium azoimide, CrN_3

Pptd by addition of alcohol and ether
Insol in H_2O (Curtius, J pr 1900, (2) 61 410)

Chromium boride, CrB

Insol in HCl, dil H_2SO_4 , HF, $\text{HF} + \text{HNO}_3$
Sl sol in HNO_3 and in aqua regia (Wedekind, B 1907, 40 299)

Sol in cold dil or conc HCl, HF, and H_2SO_4 (Jassonneix, C R 1906, 143 1151)

Cr_3B_2 Sol in conc or dil HF, HCl, H_2SO_4 , insol in HNO_3 or alkalis + Aq (Jassonneix)

Chromous bromide, CrBr_2

Sol in H_2O Not deliquescent in dry air (Moissan, C R 92 1051)

Chromic bromide, CrBr_3

Anhydrous Insol in H_2O , but dissolves at once in presence of the least trace of CrBr_2 (Bauk, A 111 382)

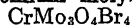
+ $6\text{H}_2\text{O}$ Deliquescent Very sol in H_2O
 H_2O dissolves more than 2 pts crystals at ord temp Very sol in alcohol Insol in ether (Recoura, C R 110 1029)

Blue modification Insol in alcohol (Recoura, C R 110 1193)

Very hygroscopic Easily sol in alcohol and acetone Insol in ether (Werne A 1902, 322 343)

+ $8\text{H}_2\text{O}$ Sol in H_2O (Varenne, C R 93 727)

Chromium molybdenyl bromide,



Apparently wholly insol in dil acids
Sol in hot conc HCl + Aq with decomp
Insol in $\text{M}_2\text{CrO}_4 + \text{Aq}$ (Atterberg)

+ $2\text{H}_2\text{O}$ Apparently wholly insol in dil acids

Sol in hot conc HCl + Aq with decomp
Insol in $\text{M}_2\text{CrO}_4 + \text{Aq}$ (Atterberg)

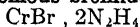
Chromic rubidium bromide, CrBr_3 , 2R Br + H_2O

Sol in H_2O with decomp (Werner A 1902, 322 345)

Chromic bromide ammonia

See Bromotetramine chromium bromide

Chromous bromide hydrazine,



Insol in H_2O Sol in acids Insol in alcohol, ether and similar solvents (Tru e, B 1913, 46 1507)

Chromium carbide, Cr_3C

(Moissan C R 1894, 119 187)

Cr_3C_2 Does not decomp H_2O at ord temp or at 100° , insol in conc HCl, HF, and aqua regia sol in dil HCl (slowly), insol in fused KOH sol in fused KNO_3 (Moissan, Bull Soc 1894 (3) 117 1016)

Chromium iron carbide, $3\text{Fe}_3\text{C} \cdot 2\text{Cr}_3\text{C}$

Decomp by H_2O , sol in gaseous hydrocarbons, insol in HNO_3 and aqua regia (Williams, C R 1898, 127 484)

Chromium tungsten carbide, CW , 3Cr

Not attacked by acids

Slowly attacked by fused KOH or alkali carbonates Rapidly decomp by fused alkali nitrates or KClO_3 (Moissan, C R 1903, 137 294)

Chromous chloride, CrCl_2

Deliquescent Very sol in H_2O with evolution of much heat (Moberg, J pr 29 1)

Practically insol in ether Moderately sol in absolute alcohol, methyl alcohol, and acetaldehyde (Rohland, Z anorg 1899, 21 39)

+ $1\frac{1}{2}$ H₂O (Moissan, A ch (5) 25 40)
+2H₂O (Knight and Rich, Chem Soc 1911, 99 89)
+3H₂O (Knight and Rich)

Chromic hydrogen chloride, 3CrCl₃, 2HCl + 13H₂O

Decomp by H₂O (Recoura, C R 100 1227)

Sl sol in liquid NH₃ (Gore, Am Ch J 1898, 20 827)

Chromic chloride, CrCl₃

Anhydrous—*Peach-blossom-colored modification* Insol in pure H₂O (Pelgrot), but by long continued boiling of the finely divided salt with H₂O, traces are dissolved with decomp Not decomp by boiling conc H₂SO₄, or other acids, even aqua regia

Easily sol with evolution of heat in H₂O containing only $\frac{1}{40,000}$ pt CrCl₃ (Pelgrot, J pr 36 150) Also sol in presence of traces of SnCl₂ (5 mg SnCl₂ cause 1 g CrCl₃ to dissolve), FeCl₃, Cu₂Cl₂, Na₂S₂O₃, and other reducing substances, chlorides without reducing properties have no effect (Pelouze, A ch (3) 14 251) TiCl₃ and SO₂ have similar solvent action (Ebelmen, A ch (3) 20 390), also Zn+dil acids (Moberg)

Insol in dil alkalis+Ag, very slowly decomp by boiling conc alkalis or alkali carbonates+Ag (Fellenberg, Pogg 50 76)

Difficulty sol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in CS (Arctowski, Z anorg 1894, 6 257)

Insol in acetone (Eidmann, C C 1899 II, 1014)

Practically insol in absolute ethyl alcohol, methyl alcohol, acetaldehyde and ether (Rohland, Z anorg 1899, 21 39)

Yellow Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Violet modification Very sol in H₂O to form a green solution (Moberg, J pr 44 325)

The violet mod is almost insol in H₂O but if $\frac{1}{20,000}$ pt chromous chloride is present, it is readily sol (Rohland, Z anorg 1899, 21 39)

+4H₂O Sl deliquescent Very sol in H₂O, alcohol and ethyl acetate (Godeffroy, Bull Soc (2) 43 229)

+6H₂O Deliquescent Sol in H₂O, but probably decomp to CrOCl₂

Practically insol in ether Moderately sol in absolute ethyl alcohol, methyl alcohol and acetaldehyde (Rohland, Z anorg 1899, 21 39)

"Monochlorochromic chloride" is sol in ether and fuming HCl(1 1) (Bjerrum, B 1906, 39 1599)

Green modification

Solubility in H₂O at 25°

25 g green CrCl₃+6H₂O and 10 g H₂O

Time	Total Solubility in %	Composition of the sat solution	
		% violet salt	% green salt
$\frac{1}{4}$ hr	58 36	8 30	91 70
$\frac{1}{2}$ hr		12 57	87 43
4 hrs	63 27	24 80	75 20
1 day	68 50	37 64	62 36
2 days		40 90	59 10
3 "	68 95	42 78	57 22
11 "		42 84	57 16
13 "		42 39	57 61
19 "	68 58	42 62	57 38

(Ohe, Z anorg 1906, 51 55)

Solubility of green CrCl₃+6H₂O in H₂O at 32°

10 g CrCl₃+6H₂O and 4 g H₂O

Time	Total solubility in %	Composition of the dissolved substance		Solid phase
		% violet salt	% green salt	
7'	63 69	12 87	87 13	Almost all dissolved
45'	66 24	21 43	78 57	
2 ^h 5'	69 53	34 53	65 47	
48 ^h	69 33	45 27	54 73	
* 11 dys	70 81	45 27	54 73	

* First 8 days at 35°

(Ohe, Z anorg 1907, 53 276)

Solubility of green CrCl₃+6H₂O in H₂O at 35°

10 g CrCl₃+6H₂O and 3 3 g H₂O

Time	Total solubility in %	Composition of the dissolved substance	
		% violet salt	% green salt
8'	65 85	16 47	83 53
38'	66 74	25 02	74 98
1 ^h	66 21	25 45	74 55
2 ^h 10'	68 90	31 47	68 53
4 ^h	70 79	36 28	63 72
23 ^h	71 34	42 95	57 05
72 ^h	70 79	42 88	57 12

(Ohe, l c)

If a solution saturated with the green hexahydrate below 32° is cooled, the decahydrate separates out, if the solution is saturated above 32°, both the decahydrate and hexahydrate separate out on cooling (Ohe, l c)

*Violet modification*Solubility in H₂O at 25°25 g violet CrCl₃ + 6H₂O and 10 ccm of a 35% solution of green CrCl₃ + 6H₂O

Time	Total Solubility in %	Composition of the sat solution	
		% violet salt	% green salt
1 1/6 hr	65 49	84 05	15 95
5 "		84 47	15 53
29 "		78 16	21 84
2 dys	70 47	73 19	26 81
4 "		68 71	31 29
5 "		60 66	39 34
5 dys, 6 hrs	76 38	60 36	39 64
6 dys		65 10	34 90
8 "		65 80	34 20
10 "	73 26	58 08	41 92
12 "		41 40	58 60

(Olie, Z anorg 1906, 51 57)

Solubility in H₂O at 25°25 g violet CrCl₃ + 6H₂O and 10 g H₂O

Time	Total Solubility in %	Composition of the sat solution	
		% violet salt	% green salt
1/6 hr	61 99	98 47	1 53
4 1/2 hrs		96 70	3 30
1 dy		91 54	8 46
2 "	63 88	83 37	16 63
4 "		69 11	30 89
5 "		62 20	37 80
7 "	70 68	62 72	37 28
8 "		54 63	45 37
12 "		46 39	53 61
13 "	72 11	47 66	52 34
26 "		48 55	51 45

(Olie, l c)

+6 1/2 H₂O *Green modification* 100 pts H₂O dissolve 130 pts salt at 15° Sol in alcohol (Recoura, C R 102 518)

Grayish-blue modification Very sol in H₂O (Recoura, C R 102 548)

+10H₂O Very deliquescent, melts in crystal H₂O at 6-7° Very sol in H₂O, alcohol, and ethyl acetate (Godeffroy)

Easily sol in H₂O, can be recryst from H₂O Sol in alcohol and ether (Werner, B 1906, 39 1827)

*Green modification*Solubility of green CrCl₃ + 10H₂O in H₂O at 29°142 g CrCl₃ + 10H₂O and 25 g H₂O

Time	Total solubility in %	Composition of the dissolved substance		Solid phase
		% violet salt	% green salt	
7'	61 35	8 71	91 29	CrCl ₃ + 10H ₂ O
20'	62 46	9 90	90 10	"
1 ^h 55'	65 04	25 05	74 95	"
4 ^h 30'	67 41	32 90	67 10	CrCl ₃ + 6H ₂ O
24 ^h	69 44	42 93	57 07	all dissolved
28 ^h		31 78	68 22	CrCl ₃ + 10H ₂ O
29 ^h	67 59	33 65	66 36	CrCl ₃ + 6H ₂ O
48 ^h	69 42	42 17	57 83	"
72 ^h	68 69	43 80	56 20	"

(Olie, Z anorg 1907, 53 275)

The composition of the hydrates formed by CrCl₃ at different dilutions is calculated from determinations of the lowering of t_f and of the conductivity and sp gr of CrCl₃ + 4aq (Jon, Am Ch J 1905, 34 310)

Chromic glucinum chloride, CrCl₃, Gl₂O + H₂O

Sol in H₂O with decomp (Neumann, 244 329)

Chromic lithium chloride, CrCl₃, 2LiCl - 4H₂O

Very hygroscopic

Sol in ice water but solution soon decomposes

Easily sol in alcohol (Werner, B 1901, 34 1603)

[Cr(OH₂)Cl₂]₂ · 11 + 4H₂O

Very hygroscopic Sol in ice cold H₂O and in alcohol (Werner, B 1901, 34 160)

Chromic magnesium chloride, CrCl₃, MgCl₂ + H₂O

Decomp by H₂O (Neumann)

Chromic phosphoric chloride, CrCl₃, PCl₅

Decomp by H₂O (Gronlund)

Chromium platinum chloride

See chloroplatinate, chromium

Chromic potassium chloride, CrCl₃, KCl

Decomp by H₂O

CrCl₃, 2KCl + H₂O (Neumann, A 24 329)

CrCl₃, 3KCl Easily sol in H₂O with decomp (Fremy, A ch (3) 12 361)

Chromic rubidium chloride, $\text{CrCl}_3 \cdot 2\text{RbCl} + \text{H}_2\text{O}$

Decomp by H_2O (Neumann, A 244 329)

Slowly sol in cold, rapidly sol in hot H_2O with decomp (Werner, B 1901, 34 1603)
 $\text{CrCl}_3 \cdot 3\text{RbCl} + 8\text{H}_2\text{O}$ Unstable Decomp by alcohol (Werner, B 1906, 39 1830)

Chromic sodium chloride, $\text{CrCl}_3 \cdot \text{NaCl}$

Sol in H_2O (Berzelius)

$\text{CrCl}_3 \cdot 3\text{NaCl}$ Sol in H_2O (Berzelius)

Chromic thallium chloride, $\text{CrCl}_3 \cdot 3\text{TlCl}$

Sol with decomp in H_2O (Neumann, A 244 329)

Chromic chloride ammonia

See Chlorotetramine chromium chloride

Chromous chloride hydrazine, $\text{CrCl}_2 \cdot 2\text{N}_2\text{H}_4$

Insol in H_2O Sol in acids Insol in alcohol, ether and similar solvents (Traube, B 1913, 46 1506)

Chromic chloride ferric oxide

Fe_2O_3 is easily sol in dil, difficultly sol in conc $\text{CrCl}_3 + \text{Aq}$ (Béchamp A, ch (3) 57 311)

Chromous fluoride, CrF_2

Sl sol in H_2O , hot H_2SO_4 or dil HNO_3
 Sol in boiling HCl Insol in alcohol (Poulenc, C R 1893, 116 254)

Chromic fluoride, CrF_3

Perfectly sol in H_2O (Berzelius)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

+ $3\text{H}_2\text{O}$ Insol in H_2O (Werner and Costachescu, B 1908, 41 4243)

+ $3\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O (Poulenc, C R 1893, 116 255)

+ $6\text{H}_2\text{O}$ Sl sol in H_2O (Werner and Costachescu, B 1908, 41 4242)

+ $9\text{H}_2\text{O}$ Violet modification Very sl sol in H_2O Insol in alcohol Sol in HCl , and $\text{KOH} + \text{Aq}$ (Fehrb, Gazz ch it 20 582)

Chromium hexafluoride, CrF_6

Decomp by H_2O with evolution of heat (Berzelius)

Correct composition is CrO_2F_2 (Oliveri, Gazz ch it 16 218)

Chromic cobaltous fluoride, $\text{CrF}_3 \cdot \text{CoF}_2 + 7\text{H}_2\text{O}$

Easily sol in H_2O (Petersen, J pr (2) 40 60)

Chromic cupric fluoride, $\text{CrCuF}_5 + 5\text{H}_2\text{O}$

Can be cryst from $\text{HF} + \text{Aq}$ (Higley, J Am Chem Soc 1904, 26 630)

Chromic nickel fluoride, $\text{CrF}_3 \cdot \text{NiF}_2 + 7\text{H}_2\text{O}$

Somewhat more sol in H_2O than CrF_3 , $\text{CoF}_2 + 7\text{H}_2\text{O}$ (Petersen, J pr (2) 40 61)

Chromic potassium fluoride, $\text{CrF}_3 \cdot 3\text{KF}$

Nearly insol in H_2O (Christensen, J pr (2) 35 161)

$\text{CrF}_3 \cdot 2\text{KF} + \text{H}_2\text{O}$ Nearly insol in H_2O
 Sol in conc $\text{HCl} + \text{Aq}$ (Christensen)

Chromic sodium fluoride, $\text{CrF}_3 \cdot 2\text{NaF} + \text{H}_2\text{O}$

(Wagner, B 19 896)

Chromic thallous fluoride, $2\text{CrF}_3 \cdot 3\text{TlF}$

Sol in hot H_2O , less sol in cold Sl sol in HF (Ephraim, Z anorg 1909, 61 242)

Chromic zinc fluoride, $\text{CrF}_3 \cdot \text{ZnF}_2 + 7\text{H}_2\text{O}$

Can be cryst from $\text{HF} + \text{Aq}$ (Higley, J Am Chem Soc 1904, 26 630)

Colloidal solution is perfectly clear (Biltz, B 1902, 35 4433)

Chromous hydroxide, CrO_2H

Decomp by H_2O , especially if hot (Pellet, A ch (3) 12 539)

Slowly sol in cold conc acids, even aqua regia, almost insol in dil acids (Moberg, J pr 43 119)

Chromic hydroxide, $\text{Cr}_2\text{O}_3 \cdot x\text{H}_2\text{O}$, probably $\text{Cr}_2\text{O}_3\text{H}_6$

Insol in H_2O Easily sol in acids Easily sol in cold KOH , or $\text{NaOH} + \text{Aq}$, much less sol in cold $\text{NH}_4\text{OH} + \text{Aq}$, the presence of NH_4Cl has no influence upon solubility in $\text{NH}_4\text{OH} + \text{Aq}$ (Fresenius) Insol in $\text{NH}_4\text{OH} + \text{Aq}$ if it has been thoroughly washed

Insol in $\text{KCN} + \text{Aq}$, but sl sol in $\text{KCN} + \text{HCN} + \text{Aq}$ (Rodgers, 1834)

Gradually sol in dil $\text{FeCl}_3 + \text{Aq}$, after three months, 2 mols $\text{Cr}_2\text{O}_3\text{H}_6$ are dissolved by 1 mol FeCl_3 without pptn of FeO_2H_6 (Béchamp, A ch (3) 57 296)

Also sol in $\text{CrCl}_3 + \text{Aq}$, in four months, $1\frac{1}{2}$ mols $\text{Cr}_2\text{O}_3\text{H}_6$ are dissolved by 1 mol CrCl_3 (Béchamp)

Sol in $\text{Cr}(\text{NO}_3)_3 + \text{Aq}$, and clear solution formed as long as 3 mols HNO_3 are present for 8 mols Cr_2O_3 (Ordway, Sill Am J (2) 27 197)

Chromic hydroxide, pptd by alkalis is easily sol in excess of the reagent, after being dried in a vacuum, however, it is insol in alkalis (Herz, Z anorg 1901, 28 344)

Freshly pptd it is sol in aq alkali, but it is readily changed into a modification which is insol (Herz, Z anorg 1902, 31 352)

The solubility of chromic hydroxide in an

aqueous solution of red chromic chloride is not directly proportional to the concentration of the latter—a basic chloride is probably formed (Fischer, *Z anorg* 1904, **40** 43)

Not pptd in presence of Na citrate (Spiller)

Insol in amylamine+Aq, not pptd in presence of alkali tartrates, sugar, etc

$\text{Cr}_2\text{O}_3\text{H}_2 + 4\text{H}_2\text{O}$ Difficultly sol in acids

$\text{Cr}_2\text{O}_3\text{H}_2 + \text{H}_2\text{O}$ Extremely hygroscopic

Exists in a soluble modification, obtained by dialysis, solution can be diluted with pure H_2O , but gelatinizes with traces of salts (Graham, *Roy Soc Trans* 1861 183)

$\text{Cr}_2\text{O}_3(\text{OH})$ Insol in boiling dil HCl+Aq

$\text{Cr}_2\text{O}(\text{OH})_4$ (Guignet's green) Scarcely sol in boiling HCl+Aq (Salvetat, *C R* 48 295)

Guignet gave formula as $2\text{Cr}_2\text{O}_3 + 3\text{H}_2\text{O}$

Chromochromic hydroxide, $\text{Cr}_3\text{O}_4, \text{H}_2\text{O} (?)$

Slightly attacked by acids (Peligot, *A ch* (3) 12 539)

Chromous iodide, CrI

Easily sol in H_2O (Moissan, *A ch* (5) 25 401)

Chromic iodide, $\text{CrI}_3 (?)$

Insol in cold, sol in hot H_2O , but no separation occurs on cooling (Berlin)

+9 H_2O Hygroscopic Sol in alcohol and acetone Insol in CHCl_3 (Higley, *J Am Chem Soc* 1904, **26** 628)

Chromous iodide hydrazine, $\text{CrI} \cdot 2\text{N}_2\text{H}_4$

(Traube, *B* 1913, **46** 1507)

Chromium nitride, CrN

Insol in dil acids and alkalis, conc HNO_3 , HCl or HF+Aq, even on heating Slowly sol in hot aqua regia or cold H_2SO_4 Sol in cold solutions of alkali hypochlorites (Ufer, *A* 112 281)

Insol in HCl, HNO_3 and aqua regia (Férey, *Bull Soc* 1901 (3) 25 618)

Unacted upon by acids at ordinary temperatures (Smits, *Chem Soc* 1897, **72** (2) 33)

Cr_2N_2 Slowly attacked by conc HNO_3 and by $\text{HNO}_3 + \text{HCl}$ All other reagents act without action (Henderson and Gullett, *J Soc Chem Ind* 1908, **27** 357)

CrN_3 See Chromium azonide

Chromous oxide, CrO

Insol in HNO_3 and dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in HCl (Férey, *Bull Soc* 1901, (3) 25 619)

Chromic oxide, Cr_2O_3

When ignited is nearly insol in acids, but dissolves in H_2SO_4 by long boiling Insol in liquid HCl (Gore)

Insol in acetone (Fidmann, *C C* 1 19 II, 1014)

Solubility in (calcium succate+sugar)+Aq

1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 1.07 g Cr_2O_3 , 1 l solution containing 296.5 g sugar and 24.2 g CaO dissolves 0.56 g Cr_2O_3 , 1 l solution containing 174.4 g sugar and 14.1 g CaO dissolves 0.20 g Cr_2O_3 (Bodenbender, *J B* 1 15 600)

See also Chromic hydroxide

+ H_2O The compound to which Bunsen gave the formula Cr_3O_8 Insol in acids, but easily attacked by HNO_3 (Férey, *Bull Soc* 1901, (3) 25 620)

Chromochromic oxide, $\text{Cr}_3\text{O}_4 = \text{CrO}, \text{Cr}_2\text{O}_3$

Known only in form of hydroxide, which see

+3 H_2O Stable in dry air Decomposes in moist air (Bauge, *C R* 1898, **127** 552)

Cr_2O_5 , or $\text{Cr}_2\text{O}_6 (?)$ Insol in acids (in aqua regia (Bunsen, *Pogg* 91 622)

Not obtainable (Geuther, *A* 118 66)

Formula is $\text{CrO}_3 + \text{H}_2\text{O}$ (Férey)

Chromium trioxide, CrO_3

Deliquescent, and very sol in H_2O to form solution of H_2CrO_4 or $\text{H}_2\text{Cr}_2\text{O}_7$

Solubility in H_2O at t°

t°	0°	15°	50°	100°
% CrO_3	62.08	62.38	64.55	66.39

(Mylius and Funk, *Gm K* 3 1 1332)

Sat $\text{CrO}_3 + \text{Aq}$ contains at

0°	20°	60°
61.54	62.52	65.12% CrO_3

(Koppel und Blumenthal *Z anorg* 1907 **33** 228)

The system $\text{CrO}_3 - \text{H}_2\text{O}$ has been studied at temp from 0° to -74° In the limit of concentration investigated from 0—71% CrO_3 , no hydrate of CrO_3 crystallizes from aq solution (Kremann, *M* 1911, **32** 62)

Sat $\text{CrO}_3 + \text{Aq}$ contains at

82°	100°	115°
66	67.4	68.4% CrO_3

(Kremann, *M* 1911, **32** 620)

Solubility in H₂O at °

t°	% by wt CrO ₃	Solid phase
-0 9°	3 6	Ice
-1 9	7 8	"
-3 7	11 5	"
-4 8	14 1	"
-10 95	24 9	"
-11 7	25 2	"
-18 75	33 5	"
-25 25	39 2	"
-43 5	49 1	"
-60	53 3	"
-20	61 7	CrO ₃
0	62 24	"
+24 8	62 88	"
40	63 50	"
65	64 83	"
90	68 5	"
122	70 7	"
193-196	100	"

Buchner and Prins, Z phys Ch 1912, **81**
114)

Sp gr of CrO₃+Aq at t°

t°	Sp gr	% CrO ₃
16 0	1 0606	8 25
18 0	1 0679	8 79
14 5	1 0694	8 79
19 5	1 0957	12 34
19 0	1 1569	19 33
20 9	1 20269	31 83
20 1	1 20264	31 83
12 0	1 20714	31 83
35 0	1 20940	32 59
18 6	1 21914	32 59
15 2	1 22106	32 59
9 7	1 22384	32 59
22 0	1 3441	37 77
19 2	1 3448	37 82
22 0	1 34416	37 82
	1 7028	62 23

(Zettnow Pogg **143** 474)

Sp gr of CrO₃+Aq (H CrO₄+Aq) M =
according to Mendeleeff at 15°, Z = ac-
cording to Zettnow, calculated by Ger-
lach (Z and **27** 360)

CrO ₃	M	Z	CrO ₃	M	Z
5	1 036	1 037	35	1 324	1 312
10	1 076	1 076	40	1 383	1 373
15	1 119	1 118	45	1 445	1 440
20	1 166	1 162	50	1 510	1 512
25	1 215	1 208	55	1 579	1 587
30	1 268	1 258	60		1 656

B-pt of CrO₃+Aq at ord pressure

B pt	G CrO ₃ in 100 g of the solution
102°	10 81
104	24 08
107	36 47
110 5	45 15
116	54 56
120	61 54
127	71 24 sat solution

(Koppel and Blumenthal, Z anorg 1907, **53**
254)

Sol in H₂SO₄, the solubility is least when
the acid contains 66% H₂SO₄ (Schrotter),
84.5% H₂SO₄ (Bolley)

Verv sol in H₂SO₄ of 1.85 sp gr Sl sol
in cold KHSO₄+Aq (Fritzsche)

The statement that CrO₃ is insol in acids
is incorrect 2.85 g (ignited) are sol in HNO₃,
to the extent of 2.58 g 0.81 g (ignited) are
sol in HNO₃ to the extent of 0.77 g (Jovit-
schitsch, M 1909, **30** 48)

Practically insol in POCl₃ (Walden, Z
anorg 1910, **68** 312)

Sl sol in liquid NH₃ (Franklin, Am Ch
J 1898, **20** 827)

Sol in alcohol with decomp

Sol in anhydrous ether

Sol in acetic anhydride (Fry, J Am
Chem Soc 1911, **33** 700)

Sol in acetone (N₂)

Sol in benzonitrile (Franklin, Am Ch
J 1898, **20** 827)

Sol in methyl acetate (Naumann, B
1909, **42** 3790)

Difficultly sol in ethyl acetate (Nau-
mann, B 1910, **43** 314)

Chromium oxide, Cr₂O₃ = 2Cr O₃ CrO₃

Cr₂O₃ = 3Cr₂O₃, 2CrO₃

CrO = Cr₂O₃, CrO₃

Cr₂O₁₂ = Cr₂O₃, 3CrO₃

Cr₆O₁₈ = Cr₂O₃, 4CrO₃

See **Chromate, chromium**

Chromium peroxide, Cr₂O₇(²)

More sol in ether than in H₂O Ether
solution is somewhat more stable than aque-
ous solution (Aschoff, J pr **81** 401)

Formula is Cr₂O₇ H₂O (Mosses C R
97 96)

Chromium peroxide ammonia, CrO₄, 3NH₃

Sol in H₂O with partial decomp

Sl sol in NH₄OH+Aq

Sol with decomp in 20% acetic acid
(Hofmann, B 1905 **38** 3060)

Chromium tetroxide potassium cyanide,

CrO₄, 3KCN

Sol in H₂O Insol in other ordinary
solvents (Wiede, B 1899, **32**, 381)

Chromic oxychloride

From Cr_2O_3 Sol in H_2O as long as 1 mol CrCl_3 is present for $2\frac{1}{2}$ mols $\text{Cr}_2\text{O}_3\text{H}_6$ (Ordway, Sil Am J (2) 27 197)

$\text{Cr}_2\text{O}_3, 2\text{CrCl}_3$ Sol in H_2O (Kletzensky, Zeit Ch 1866 277)

$\text{Cr}_2\text{O}_3, \text{CrCl}_3 = \text{CrOCl}$ Anhydrous Only partly sol in H_2O

+ $3\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O (Peligot)

$\text{Cr}_2\text{O}_3, 4\text{CrCl}_3 + 6\text{H}_2\text{O} = \text{Cr}_2\text{OCl}_4 + 2\text{H}_2\text{O}$ (Peligot, J pr 37 38)

+ $9\text{H}_2\text{O} = \text{Cr}_2\text{OCl}_4 + 3\text{H}_2\text{O}$ Sol in H_2O (Moberg), $= \text{Cr}_2(\text{OH})_2\text{Cl}_4 + 2\text{H}_2\text{O}$ (Schiff, A 124 157)

$\text{Cr}_2\text{O}_3, 7\text{CrCl}_3 = \text{Cr}_2\text{OCl}_7$ Very sol in H_2O with decomp (Besson and Fournier, C R 1909, 148 1194)

$\text{Cr}_2\text{O}_3, 8\text{CrCl}_3 + 24\text{H}_2\text{O}$ Sol in H_2O (Moberg), $= \text{Cr}_2(\text{OH})\text{Cl}_6 + 4\text{H}_2\text{O}$ (Schiff, l c)

$(\text{CrO}_3)_2\text{Cl}_2$ (Pascal, C R 1909, 148 1464)

$\text{Cr}_2\text{O}_3\text{Cl}_4$ Insol in H_2O (Pascal, C R 1909, 148 1464)

From CrO_3

See Chromyl chloride

Chromic oxychloride potassium chloride, $\text{CrOCl}_3, 2\text{KCl}$

Decomp in the air

Sol in conc HCl without decomp (Weinland, B 1906, 39 4043)

Chromic oxychloride rubidium chloride, $\text{CrOCl}_3, 2\text{RbCl}$

Decomp in the air

Sol in conc HCl without decomp (Weinland, B 1906, 39 4045)

Chromium oxyfluoride, CrO_2F_2

See Chromyl fluoride

Chromium phosphide, CrP

Insol in acids, but a trace dissolves in aqua regia Insol in $\text{HF} + \text{Aq}$ (Berzelius)

Not attacked by acids or by aqua regia (Granger, C N 1898, 77 228)

Insol in all acids except a mixture of HNO_3 and HF (Maronneau, C R 1900, 130 658)

Insol in mineral acids (Dieckmann, Z anorg 1914, 86 295)

Insol in aqua regia (Granger, C R 1897, 124, 191)

CrP_3 Insol in mineral acids (Dieckmann Z anorg 1914, 86 295)

Chromous selenide, CrSe

(Moissan, C R 90 817)

Chromic selenide, Cr_2Se_3

Insol in H_2O (Moissan, C R 90 817)

Chromic potassium selenide, $\text{K}_2\text{Cr}_2\text{Se}_4$

Insol in HCl Easily sol in conc HN (Milbauer, Z anorg 1904, 42 451)

Chromium silicide, Cr_2Si

Sol in fused KNO_3 , insol in cold HCl d aqua regia

Insol in $\text{HF} + \text{Aq}$ (Moissan, C R 18 121 625)

CrSi_2 Sol in HF Insol in HCl d aqua regia (Chalmot, Am Ch J 1897, 69)

Cr_2Si_2 Insol in dil HCl , sol in wa n conc HCl and in HF , insol in HNO_3 d H_2SO_4 (Lebeau, C R 1903, 136 1330)

Cr_3Si Sol in HF , insol in other aci s, sol in fused KOH and fused alkali nitra s and carbonates (Zettel, C R 1898, 1 834)

Chromous sulphide, CrS

Insol in H_2O or $\text{K}_2\text{S} + \text{Aq}$ (Peligot) Easily sol in acids (Moissan, C R 817)

Sol in cold conc acids

Sol in molten alkalis (Mourlot, C 1895, 121 944)

Min *Daubrehte*

Chromic sulphide, Cr_2S_3

Insol in H_2O or alkali sulphides + Aq l attacked by $\text{HCl} + \text{Aq}$ (W Muller, Po 127 404)

$\text{HNO}_3 + \text{Aq}$ decomposes or not accordi g to method of preparation Easily decomp by aqua regia

Insol in caustic alkalis + Aq

Insol in $\text{K}_2\text{S} + \text{Aq}$ (Berzelius)

Chromochromic sulphide, $\text{Cr}_3\text{S}_4 = \text{CrS}, \text{Cr}_2\text{S}_3$

Insol in H_2O , HCl , or dil $\text{H}_2\text{SO}_4 + \text{A}$ Easily sol in $\text{HNO}_3 + \text{Aq}$ (Grogg, W A 81 (2) 531)

Chromic zinc sulphide, Cr_2ZnS_4

(Grogg W A B 1880, 81 334)

Chromicyanhydric acid**Cadmium chromicyanide, $(\text{Cd})_2(\text{Cr}(\text{CN})_6)_2$**

Readily sol in excess of KCN and $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by conc HCl , HNO_3 or H_2SO_4 Slowly decomp by co

rapidly by hot dil HCl , HNO_3 , or H_2SO_4 Quickly dissolved by aqua regia

Decom by boiling with Na_2O_2 , by $\text{NaOH} + \text{Aq}$ a l by $\text{Na}_2\text{CO}_3 + \text{Aq}$ Slowly decomp by boili

acetic acid (Cruser and Miller, J A Chem Soc 1906, 28 1136)

Cobaltous chromicyanide, $\text{Co}_2[\text{Cr}(\text{CN})_6]$

Sol in cold, readily sol in hot conc H_2O or H_2SO_4 Sl sol even in boiling cor

HNO₃ Slowly sol in cold dil H₂SO₄, HCl or HNO₃. Readily sol in boiling dil HCl or H₂SO₄. Decomp but not entirely dissolved by aqua regia. Readily sol in an excess of KCN. Decomp by NH₄OH, NaOH or Na₂CO₃+Aq. Decomp by boiling with Na₂O₂. Insol in cold or boiling acetic acid (Cruser and Miller)

Cuprous chromicyanide, Cu₂Cr(CN)₆

Sol in KCN, cold conc or boiling dil HNO₃+Aq. Slowly sol in cold conc H₂SO₄, still more slowly sol in dil H₂SO₄ but rapidly sol in hot dil and conc H₂SO₄. Readily decomp by aqua regia. Decomp by dil or conc HCl, slowly going into solution in the cold, but quickly on boiling (Cruser and Miller)

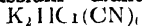
Cupric chromicyanide, Cu₂[Cr(CN)₆]₂

Slowly sol in cold dil HCl, HNO₃ or H₂SO₄ on boiling the first two readily dissolve it, but the H₂SO₄ dissolves it only slowly. Sol in aqua regia or cold conc H₂SO₄. Readily sol in cold or hot conc HCl. Decomp by cold, dissolved by boiling HNO₃. Decomp by boiling Na₂O₂+Aq. Decomp by NH₄OH, NaOH or Na₂CO₃+Aq. Readily sol in an excess of KCN+Aq. Insol in cold acetic acid (Cruser and Miller)

Nickel chromicyanide, Ni₃[Cr(CN)₆]₂

Slowly sol in cold, readily sol in hot dil HCl, HNO₃ or H₂SO₄. Slowly sol in cold, readily sol in hot conc H₂SO₄, HCl or HNO₃. Slowly decomp by cold, rapidly by boiling aqua regia. Readily sol in excess of KCN. Sol in NH₄OH+Aq. Decomp by NaOH, Na₂CO₃+Aq or Na₂O₂+Aq. Insol in cold dil sol in boiling acetic acid (Cruser and Miller)

Potassium thallous chromicyanide,



(Fischer and Benzian, Ch Z 1902, 26 50)

Thallous chromicyanide, Hg₂Cl(CN)₄

Easily sol in H₂O (Fischer and Benzian, Ch Z 1902, 26 50)

Zinc chromicyanide, Zn₃[Cr(CN)₆]₂

Insol in H₂O. Sol in excess of NH₄OH, NaOH and KCN+Aq. Decomp by Na₂CO₃+Aq. Sol in cold dil HCl. Slowly sol in dil H₂SO₄ and in dil HNO₃. By boiling with dil acids a clear solution is quickly obtained (Cruser, Dissert 1906)

Chromisulphocyanhydric acid

Cæsium chromisulphocyanide,



Less sol in H₂O than K salt (Osann, Dissert 1907)

Lithium chromisulphocyanide,



Extremely deliquescent (Osann)

Rubidium chromisulphocyanide,



Appreciably less sol in H₂O and alcohol than the K salt (Osann)

Chromocyanidic acid, H₂Cr(CN)₆

Decomp rapidly on air. Sol in H₂O (Moissan, A ch (6) 4 144)

Potassium chromocyanide, K₄Cr(CN)₆

Very sol in H₂O, 100 pts H₂O dissolve 32.33 pts at 20°. Much more sol in hot H₂O. Insol in alcohol, ether, benzene, or chloroform (Moissan, A ch (6) 4 136)

Above salt was K₃Cr(CN)₆ (Christensen) +3H₂O (Christensen, J pr (2) 31 166)

Chromiodic acid, CrO₃, HIO₃+2H₂O

Deliquescent (Berg, C R 104 1514)

Ammonium chromiodate, CrO₃, NH₄IO₃+H₂O

Moderately sol in H₂O (Berg)

Lithium chromiodate, CrO₃, LiIO₃+H₂O

Very sol in H₂O (Berg)

Magnesium chromiodate

Sol in H₂O (Berg)

Potassium chromiodate, CrO₃, KIO₃

Sol in H₂O (Berg)

+H₂O=KCrIH₂O₇. Sl decomp by H₂O (Blomstrand, J pr (2) 40 331)

Silver chromiodate, CrO₃, AgIO₃

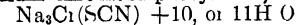
Sl attacked by cold, rapidly decomp by hot H₂O (Berg, C R 111 42)

Sodium chromiodate, CrO₃, NaIO₃+H₂O

Very sol in H₂O (Berg)

Chromosulphocyanhydric acid

Sodium chromosulphocyanide,



Unstable

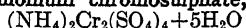
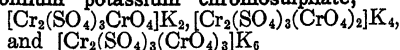
Decomp by H₂O (Koppel, Z anorg 1905, 45 360)

Chromosulphuric acid, H₂Cr(SO₄)₄

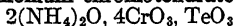
Sol in H₂O in all proportions, but solution is easily decomp on standing or boiling (Recoura, Bull Soc (3) 9 586)

H₄Cr₂(SO₄)₆ As above

H₆Cr₂(SO₄)₆ As above

Ammonium chromosulphate,Sol in H_2O after a few minutes (Recoura)**Chromium potassium chromosulphate,**Sol in H_2O (Recoura, Bull Soc 1897, (3) 17 934)**Potassium chromosulphate, $\text{K}_2\text{Cr}_2(\text{SO}_4)_4 + 4\text{H}_2\text{O}$** Sol in H_2O in a few minutes (Recoura, Bull Soc (3) 9 590)**Sodium chromosulphate, $\text{Na}_2\text{Cr}_2(\text{SO}_4)_4 + 10\text{H}_2\text{O}$**

As K salt (Recoura)

Chromotelluric acid**Ammonium chromotellurate,**Sol in H_2O (Berg, C R 1911, 152 1588)**Potassium chromotellurate,**Sl sol in cold H_2O without decomp
Sol in boiling H_2O (Berg, Bull Soc 1911, (4) 9 583)**Chromous acid, $\text{H}_2\text{Cr}_2\text{O}_4 = \text{Cr}_2\text{O}_3, \text{H}_2\text{O}$**

Chromic hydroxide shows slightly acid properties, and salts corresponding to the above acid are known

Aluminum ferrous magnesium chromite (chrome iron ore), $(\text{Fe}, \text{Mg})\text{O}, (\text{Cr}, \text{Al})_2\text{O}_3$ Insol in H_2O or acids, even a mixture of H_2SO_4 and HF (Ebelmen)**Barium chromite, BaCr_2O_4** Insol in H_2O (Gaber Bull Soc (2) 27 436)**Barium tetrachromite, $\text{BaO} \cdot 4\text{Cr}_2\text{O}_3$** Undecomposed by steam at red heat insol in HCl , H_2SO_4 , HNO_3 , sol in fused $\text{KOH} + \text{KNO}_3$ decomp in the air (Dufau C R 1896, 122 1120)**Cadmium chromite, CdCr_2O_4**

Not attacked by acids (Viard C R 109 142)

Calcium chromite, CaCr_2O_4 Insol in H_2O (Gaber, Bull Soc (2) 27 436)Insol in HCl , HF , HNO_3 , H_2SO_4 , sol in gaseous HCl and HF at red heat, sol in fused KOH , KNO_3 , KClO_3 , K_2CO_3 (Dufau, C R 1895, 121 690) $2\text{CaO}, \text{Cr}_2\text{O}_3$ Insol in H_2O , KOH , $\text{NH}_4\text{OH} + \text{Aq}$, slowly decomp by H_2O or $\text{M}_2\text{CO}_3 + \text{Aq}$, insol in sugar solution (Pelouze, A ch (3) 33 9) $4\text{CaO}, \text{Cr}_2\text{O}_3$ Attacked by H_2O (Morris, C R 1894, 119 188)**Cobaltous chromite, CoCr_2O_4**

(Elliot, Dissert, Gottingen, 1862)

Cuprous chromite, $\text{Cu}_2\text{O}, \text{Cr}_2\text{O}_3$ Insol in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.4) (Wohler, Z phys Ch 1908, 62 445)**Cupric chromite basic, $5\text{CuO}, 4\text{Cr}_2\text{O}_3$**

(Wohler, Z phys Ch 1908, 62 445)

Cupric chromite, CuCr_2O_4 Not attacked by $\text{HNO}_3 + \text{Aq}$ (Persoz, A ch (3) 25 283)Not attacked by conc HCl

Insol in dil acids (Wohler, Z phys Ch 1908, 62 446)

 $\text{CuO}, 3\text{Cr}_2\text{O}_3$ (Rosenfeld, B 1879, 1 958)**Glucinum chromite, GlCr_2O_4** Insol in H_2O (Mallard, C R 105 1260)**Iron (ferrous) chromite (chrome iron ore)**

See Chromite, aluminum ferrous magnesian

Iron (ferroferric) chromite, $\text{FeO}, \text{Fe}_2\text{O}_3, \text{Cr}_2\text{O}_3$ Not attacked by $\text{HCl} + \text{Aq}$ (Ebelmen)**Iron (ferrous) magnesium chromite**Insol in $\text{HCl} + \text{Aq}$ Slightly attacked by H_2SO_4 **Lead chromite, PbCr_2O_4** Ppt Insol in $\text{KOH} + \text{Aq}$ (Chance, C R 43 927)**Lithium chromite, $\text{Li}_2\text{Cr}_2\text{O}_4$**

Very sl sol in acids (Weyberg, C R 1906 II 1659)

Magnesium chromite, $\text{MgO} \cdot 2\text{Cr}_2\text{O}_3$ Insol in H_2O (Nichols, Sil Am J (4) 47 16) MgCr_2O_4 Insol in acids or alkalis, except boiling H_2SO_4 (Schweitzer, J pr 3 259)

Could not be obtained (Viard, Bull Soc (3) 5 934)

Easily attacked by boiling $\text{H}_2\text{SO}_4 + \text{Aq}$ Less easily by HCl or $\text{HF} + \text{Aq}$ not attacked by boiling HNO_3 (Dufau, C R 1896, 123 886) $2\text{MgO}, \text{Cr}_2\text{O}_3$ Insol in H_2O or acid (Nichols) $5\text{MgO}, 4\text{Cr}_2\text{O}_3$ Insol in acids (Viard, C R 112 1003) $3\text{MgO}, 2\text{Cr}_2\text{O}_3$ As above (V)

Manganese chromite, $MnCr_2O_4$

Entirely insol in acids (Fbelmen, A ch (3) 33 44)

Zinc chromite, $ZnCr_2O_4$

Insol in acids and alkalis (Viard, C R 109 142)

+xH₂O (Chancel, C R 43 927)
3ZnO, 2Cr₂O₃ As above (Viard, C R 112 1003)

6ZnO, 5Cr₂O₃ As above (V)
8ZnO, 3Cr₂O₃ (Groger M 1904, 25, 520)

Chromovanadic acid

Ammonium chromovanadate, 2(NH₄)₂O, 2CrO₃, V₂O₅+7H₂O

Sol in H₂O (Ditte, C R 102 1105)

Chromyl amide, CrO₂(NH₂)

Sol in H₂O (Ohly, C N 1899, 80 134)

Chromyl subchloride, (CrO₂)₂Cl₂

Deliquescent, sol in H₂O with decomp, insol in dry ether (Pascal, C R 1909, 148, 1463)

Chromyl chloride (chlorochromic acid) CrO₂Cl

Decomp by H₂O with evolution of much heat Sol in glacial acetic acid without decomposition

Sol in CCl₄, C₆H₆ (mol wt det.) (Oddo, Gazz ch it 1899, 29 (2) 318, Chem Soc 1900, 78 (2) 75)

Trichromyl chloride, Cr₃O₇Cl₂

Deliquescent Sol in H₂O with gradual decomposition Sol in conc HCl+aq (Thorpe, Chem Soc (2) 8 31)

Scarcely sol in CS₂
Sol in alcohol and ether (Rawson, C N 1889 59 155)

Chromyl chlorides

From Cr₂O₃

See Chromium oxychlorides

Chromyl chloride nitrogen trioxide,

Cr₂(Cl₅)₇, 2N₂O

Sol in H₂O with decomp (Thomson, C R 1899, 129 528)

Chromyl fluoride, CrOF

Decomp by H₂O with evolution of heat (Olivier, Gazz ch it 16 218)

Clay

See Silicate, aluminum, Al₂O₃, SiO₂+2H₂O

Cobalt, Co

Not attacked by H₂O

Sol in dil HCl, or H₂SO₄, or HNO₃+aq
Conc hot H₂SO₄, and HNO₃ decomp with evolution of SO₂ or NO gas

Exists also in passive state See Iron (Nickles, J pr 61 186)

Sol in conc KOH+aq when in finely divided state (Winkler, J pr 91 211)

Sol in NH₄OH+aq in presence of air (Hodgkinson and Bellairs, C N 1895, 71 73)

Cobalt ammonia compounds

See—

Anhydrooxycobaltamine compounds,

[Co(NH₃)₆]₂ $\left[\begin{array}{c} \text{Cl} \\ \text{O(OH)} \end{array} \right] \text{X}_4$

Bromotetramine cobaltic compounds,

BrCo(NH₃)₄X₂

Bromopurpureocobaltic compounds,

BrCo(NH₃)₅X₂

Carbonatotetramine cobaltic compounds,

(CO₃)Co(NH₃)₄X

Chlorotetramine cobaltic compounds,

ClCo(NH₃)₄X

Chloropurpureocobaltic compounds,

ClCo(NH₃)₅X

Croceocobaltic compounds,

Co(NH₃)₄(NO₂)₂X

Decamine cobaltic sulphite,

Co₂(NH₃)₁₀(SO₃)₃

Diamine cobaltic nitrites,

Co(NH₃)₂(NO₂)₄M

Dichrocobaltic compounds, Co(NH₃)₃X₃

Flavocobaltic compounds,

(NO₂)₂Co(NH₃)₄X

Fuscocobaltic compounds,

(OH)Co(NH₃)₄X₂

Iodotetramine cobaltic compounds,

ICo(NH₃)₄X₂

Luteocobaltic compounds, Co(NH₃)₆X₃

Melanocobaltic compounds,

[Co(NH₃)₃Cl]₂, NH₄Cl

Nitratotetramine cobaltic compounds,

(NO₃)Co(NH₃)₄X₂

Nitratopurpureocobaltic compounds,

(NO₃)₂Co(NH₃)₅X

Nitritocobaltic compounds,

(NO)₂Co(NH₃)₅X

Octamine cobaltic compounds,

Co(NH₃)₈X₆

(= Tetramine cobaltic compounds,

Co(NH₃)₄X₃

Oxycobaltamine compounds,

Co(NH₃)₁₀(OOH)₄X₄

Praseocobaltic compounds, Co(NH₃)₄X₃

Purpureocobaltic compounds,

Co(NH₃)₅X₃

Roseocobaltic compounds,

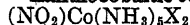
Co(NH₃)₅(OH)₂X₃

Sulphatotetramine cobaltic compounds,

(SO₄)Co(NH₃)₄X

Sulphatopurpureocobaltic compounds,

(SO₄)Co(NH₃)₅X

"Tetramine cobaltic" compounds,**Xanthocobaltic compounds****Cobalt arsenide, CoAs**

As Co_3As_2 (Ducelliez, C R 1908, 147 425)

CoAs_2 As Co_3As_2 (Ducelliez, C R 1908, 147 425)

Co_2As_3 As Co_3As_2 (Ducelliez, C R 1908, 147 425)

Co_3As_2 Very sl attacked by hot conc HCl, less by H_2SO_4 . Easily sol in HNO_3 and aqua regia. Sl attacked by fused alkalis and alkali carbonates (Ducelliez, C R 1908, 147 425)

CoAs_2 Min *Skutterudite* Sol in HNO_3 + Aq, with separation of As_2O_3

Cobalt arsenide sulphide, CoAs_2 , CoS_2

Min *Cobaltite* Sol in HNO_3 + Aq, with separation of S and As_2O_3

Glauco-dote Completely sol in HNO_3 + Aq

Cobalt azoimide, basic, $\text{Co}(\text{OH})\text{N}_3$

Insol in H_2O

Sol in HN_3 + Aq (Curtius, J pr 1898, (2) 58 300)

Cobalt potassium azoimide, KN_3 , $\text{Co}(\text{N}_3)_2$

Sol in H_2O , Aq solution decomp on boiling (Curtius, J pr 1898, (2) 58 301)

Cobalt boride, Co_2B

Attacked by HNO_3 (Jassonneix, C R 1907, 145 240)

CoB Decomp by moist air and by alkali nitrates, chlorates, hydroxides and carbonates, decomp by steam at red heat and by acids (Moissan, C R 1896, 122 425)

Not attacked by HCl, rapidly attacked by HNO_3 . Not attacked by dil but decomp by conc H_2SO_4 . Rapidly attacked by aqua regia (Moissan, A ch 1896, (7) 9 272)

CoB_2 (Jassonneix, C R 1907, 145 241)

Cobaltous bromide, CoBr_2

Deliquescent Sol in H_2O , alcohol, and ether

Sat CoBr_2 + Aq contains at

50° 75° 97°
66.7 66.8 68.1% CoBr_2

(Etard, A ch 1894, (7) 2 542)

Nearly insol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Sol in $\text{SO}_2\text{Cl}(\text{OH})$ (Walden)

Sol in quinaline (Beckmann and Gabel, Z anorg 1906, 51 236)

1g CoBr_2 is sol in 9.74g methyl acetate at 18°. Sp gr 1.8°/4° of sat solution = 1.013 (Naumann, B 1909, 42 3792)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

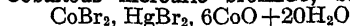
Sol in acetone (Eidmann, C C 189, II 1014, Naumann, B 1904, 37 4328)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 24)

+2, and 6 H_2O (Hartley, Chem Soc () 12 214)

Cobaltous hydrazine bromide hydrazine, 2CoBr_2 , $4\text{N}_2\text{H}_4\text{HBr}$, $\text{N}_2\text{H}_4(?)$

Sol in H_2O with decomp (Ferratini, C 1912 1613)

Cobaltous mercuric bromide, basic,

(Mailhe, A ch 1902, (7) 27 369)

Cobalt stannic bromide

See Bromostannate, cobalt

Cobaltous bromide ammonia, CoBr_2 , 6NH_3

Sol in H_2O with residue of cobalt hydroxide (Rammelsberg, Pogg 55 245)

Cobaltous bromide hydrazine, CoBr_2 , $2\text{N}_2\text{H}_4$

Decomp by boiling with H_2O (Franze, Z anorg 1908, 60 270)

Cobalt carbonyl, $\text{Co}(\text{CO})_4$

Insol in H_2O . More or less sol in CS_2 ether, alcohol and $\text{Ni}(\text{CO})_4$. Relative stable with non-oxidizing acids. Quick decomp by oxidizing acids (Mond, Hir and Cowap, C N 1908, 98 165)

Cobaltous chloride, CoCl

Deliquescent Sol in H_2O with evolution of heat 100 pts H_2O dissolve 4.5 pts CoCl at 0° (Engel, A ch (6) 17 355)

100 pts sat CoCl + Aq at 1° contain pt CoCl

t	100 CoCl	t	100 CoCl	t	100 CoCl
-22	24.7	25	31.4	56	48.4
-4	28.0	34	37.5	78	48.8
+7	31.2	41	39.8	94	50.5
11	31.3	45	41.7	96	51.2
12	32.5	49	46.7	112	52.5

(Etard, C R 113 699)

Sp gr of CoCl + Aq containing

5 10 12 20 25% CoCl
1.0496 1.0997 1.1579 1.2245 1.3002

Sat solution, 1.3613

(Franz, J pr (2) 5 284)

Sp gr of CoCl + Aq containing in 1000 g H_2O , g CoCl + 6 H_2O

119 g (= 1/2 mol) 238 357 476 594
1.055 1.101 1.141 1.177 1.200

833 952 1071 1190
1.238 1.264 1.287 1.309

Containing g CoCl_2 (anhydrous)—
 65 g (= $\frac{1}{2}$ mol) 130 195 260 325 390
 1 058 1 112 1 164 1 213 1 260 1 304
 (Gerlach, Z anal 28 466)

Sp gr of $\text{CoCl}_2 + \text{Aq}$ at room temp containing
 7 97 14 858 22 27% CoCl_2
 1 0807 1 1613 1 2645
 (Wagner, W Ann 1883, 18 267)

Sp gr of $\text{CoCl}_2 + \text{Aq}$ at 20° containing M
 g mols of salt per liter

M 0 01 0 025 0 05 0 075
 Sp gr 1 001159 1 003052 1 006065 1 009190

M 0 10 0 25 0 50 0 75
 Sp gr 1 012386 1 03049 1 05492 1 09118

M 1 0 1 5 2 0
 Sp gr 1 11847 1 17502 1 23637
 (Jones and Pearce, Am Ch J 1907, 38 711)

Sp gr of $\text{CoCl}_2 + \text{Aq}$ at 25°

Concentration of $\text{CoCl}_2 + \text{Aq}$	Sp gr
1—normal	1 0571
$\frac{1}{2}$ —	1 0286
$\frac{1}{4}$ —	1 0144
$\frac{1}{8}$ —	1 0058

(Wagner, Z phys Ch 1890, 5 37)

Solubility in $\text{HCl} + \text{Aq}$ at 0° $\frac{\text{CoCl}_2}{2} = \frac{1}{2}$ mols
 CoCl_2 in mgs in 10 ccm of solution
 $\text{HCl} = \text{mols}$ HCl in mgs in ditto H_2O
 $= \text{g}$ H_2O

$\frac{\text{CoCl}_2}{2}$	HCl	$\text{CoCl}_2 + \text{HCl}$	Sp gr	H ₂ O
62 4	0	62 4	1 343	9 36
58 525	3 7	62 2	1 328	9 34
50 8	11 45	62 25	1 299	9 27
37 25	25 2	62 45	1 248	9 13
12 85	55 0	67 85	1 167	
4 75	74 75	79 50	1 150	8 46
12 0	104 5	116 5	1 229	7 5
25 0	139 0	164 0	1 323	

(Engel, A ch (6) 17 355)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Sol in alcohol

Sat solution in alcohol (0 792 sp gr) contains 23 66 % CoCl_2 and has sp gr = 1 0107 (Winkler, J pr 91 209)

Very sol in ether

100 pts absolute ether dissolve only 0 021 g CoCl_2 (Bodtker, Z phys Ch 1897, 22 511)

100 g formic acid (95% c) dissolve 6 2 g CoCl_2 at 20° (Aschan, Ch Z 1913, 37 1117)

1g CoCl_2 is sol in 271g methyl acetate at 18° Sp gr $18^\circ/4^\circ$ of sat solution = 0 938 (Naumann, B 1909, 42 3791)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

100 pts acetone dissolve 8 62 pts anhydrous CoCl_2 (Krug and McElroy, J Anal Ch 6 184)

0 08 pts sol in 100 pts ethyl acetate at 14°
 0 26 " " " 100 " " " 79°
 9 11 " " " 100 " acetone " 0°
 9 28 " " " 100 " " " 22 5°

(Laszczynski, B 1894, 27, 2286)

Sol in acetone (Eidmann, C C 1899, II 1014)

1 g CoCl_2 is sol in 36 4 g acetone at 18° Sp gr of sat solution $18^\circ/4^\circ = 0 825$ (Naumann, B 1904, 37 4334)

100 g acetonitrile dissolve 4 08 g CoCl_2 at 18° (Naumann and Schier, B 1914, 97 249)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Solubility in pyridine at t°

t°	G CoCl_2 sol in 100 g pyridine	Solid phase
-50 3	0 4200	$\text{CoCl}_2 \cdot 6\text{C}_5\text{H}_5\text{N}$
-45 0	0 4204	
-30 0	0 4221	
-19 6	0 4227	
-10 0	0 4329	
0	0 4326	
+23 0	0 572	$\text{CoCl}_2 \cdot 4\text{C}_5\text{H}_5\text{N}$
25 0	0 578	
34 6	0 755	
37 6	0 760	
44 6	0 959	
47 2	1 029	
51 0	1 172	$\text{CoCl}_2 \cdot 2\text{C}_5\text{H}_5\text{N}$
55 0	1 206	
60 0	1 342	
64 2	1 483	
68 0	1 597	
74 8	2 079	
78 2	2 350	CoCl_2
79 8	2 488	
88 0	3 397	
96 5	7 817	
98 8	8 862	
106 0	14 340	
110 0	16 500	

(Pearce and Moore, Am Ch J 1913 50 226)

Mol weight determined in piperidine, and pyridine (Werner Z anorg 1897, 15 18 and 23)

Sol in urethane (Castoro, Z anorg 1899, 20 61)
 $+ \text{H}_2\text{O}$

+2H₂O Very deliquescent (Bersch, J B 1867 291)
17 16 pts sol in 100 pts acetone at 0°
17 06 " " 100 " " 25°

(Laszczyński, B 1894, 27 2287)
+4H₂O Deliquescent (Bersch)
+6H₂O Not deliquescent Easily sol in H₂O

Solubility of CoCl₂+6H₂O in ethyl alcohol +Aq at 11.5° under addition of increasing amounts of CoCl₂

P = Percent of alcohol by volume
G = Grams of CoCl₂ added
C_c = Grams of CoCl₂ in 5 cc of the solution
C_w = Grams of water in 5 cc of the solution, calculated from

- (1) the water content of the alcohol
- (2) the water of crystallization which had gone into solution
- (3) the water held mechanically in CoCl₂+6H₂O

P	G	C _w	C _c
91 3	0 0	1 375	1 168
98 3	0 0	1 134	1 214
98 3	0 0	1 068	1 181
99 3	0 0	1 045	1 199
"	0 194	0 899	1 204
"	0 400	0 829	1 325
"	0 612	0 764	1 459
"	0 813	0 688	1 568
"	1 022	0 634	1 713
"	1 240	0 553	1 831
"	1 446	0 483	1 943
"	0 650	0 500	2 186

(Bodtker, Z phys Ch 1897, 22 508)

Easily soluble in absolute ethyl alcohol
100 pts absolute alcohol dissolve at room temperature 56 20 pts CoCl₂ Water precipitates CoCl₂+6H₂O from a solution of CoCl₂ in absolute alcohol (Bodtker)

100 pts absolute ether dissolve 0 291g CoCl₂+6H₂O (Bodtker, Z phys Ch 1897, 22 511)

Anhydrous ethylene glycol dissolves 10 6% CoCl₂+6H₂O at 16 4° (de Coninck, Chem Soc 1904, 86, (2) 741)

Cobaltous hydrazine chloride,
CoCl₂, 2N₂H₄HCl+2½H₂O

Sol in H₂O (Ferradini, C A 1912 1613)

Cobaltous iodine chloride, CoCl, 2ICl₃+8H₂O

Decomp by H₂O CCl₄ separates ICl₃ (Weinund and Schlegel milch, Z anorg 1902 30 157)

Cobalt lithium chloride, CoCl, LiCl+5H₂O

Very deliquescent Sol in H₂O with decomp Sol in LiCl+Aq without decomp Sol in alcohol without decomp (Chassavant, A ch (6) 30 27)

Cobaltous mercuric chloride basic, CoCl₂, HgCl₂, 6CoO+20H₂O

(Mailhe, A ch 1902, (7) 27 369)

Cobaltous mercuric chloride, CoCl₂, HgCl₂
Very deliquescent (v Bonsdorff)

Cobaltous thallic chloride, 2TlCl₃, CoCl +8H₂O

Hydrosopic, can be cryst from H₂O (Gewecke, A 1909, 366 222)

Cobaltous tin (stannic) chloride, CoCl₂, SnCl₄+6H₂O

See Chlorostannate, cobaltous

Cobaltous chloride ammonia, CoCl₂, 2NH₃

Decomp by H₂O (F Rose)
CoCl₂, 4NH₃ Decomp by H₂O (H Rose)

CoCl₂, 6NH₃ Decomp by H₂O Sol in dil NH₄OH+Aq with ease, but difficultly in conc NH₄OH+Aq Insol in absolute alcohol (Fremy)

Cobaltous chloride hydrazine, CoCl₂, 2N H₄

Insol in cold H₂O
Slowly decomp by cold, rapidly by hot H₂O

Easily sol in dil acids and NH₄OH+Aq (Franzen, Z anorg 1908, 60 270)

Cobaltous chloride hydroxylamine,
CoCl₂, 2NH OH

Decomp in the air, sol in H₂O (Feldt, B 1894, 27 403)

Cobaltic chloride hydroxylamine,
CoCl₃, 6NH OH

Insol in alcohol
Sol in acidified H₂O without decomp
sol in conc H₂SO₄ without decomp (Feldt B 1894 27 404)

Cobaltous fluoride, CoF

Sl sol in H₂O insol in alcohol and ether, slowly attacked by cold HCl H₂SO₄ or HNO₃+Aq (Poulenc C R 114 1129)

Insol in liquid NH₃ (Gore Am Ch J 1898, 29 527)

+2H₂O Sol in a little H₂O without decomp Decomp into oxyfluoride by boiling with much H₂O Sol in HCl+Aq (Berzelius)

+4H₂O Two modifications

Solubility of α mod at 20° = 2 2328 g/g
β " " = 2 203 g/g

(Costichescu Ann Sci Univ Jassy, 1912 7, 1, 10)

Cobaltic fluoride, CoF₃

Sol in conc H₂SO₄ (Bubrien, Chem Soc 1905, 88, (2) 393)

Cobaltous hydrogen fluoride, $\text{CoF}_2 \cdot 5\text{HF} + 6\text{H}_2\text{O}$

Easily sol in H_2O and dil acids
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ with decomp (Bohm, Z anorg 1905, 43 330)

Cobalt columbium fluoride

See Fluocolumbate, cobalt

Cobaltous iron (ferric) fluoride,

$\text{CoF}_2 \cdot \text{FeF}_3 + 7\text{H}_2\text{O}$

Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 269)

Cobaltous manganic fluoride, $2\text{CoF} \cdot \text{Mn}_2\text{F}_6 + 8\text{H}_2\text{O}$

(Christensen, J pr (2) 34 41)

Cobalt molybdenyl fluoride

See Fluoxymolybdate, cobalt

Cobaltous potassium fluoride, $\text{CoF}_2 \cdot \text{KF}$

Sl sol in H_2O , less in ethyl or methyl alcohol, insol in amyl alcohol or benzene
Decomp by hot H_2SO_4 (Poulenc, C R 114 747)

$+ \text{H}_2\text{O}$ Sl sol in H_2O (Wagner, B 19 896)

$\text{CoF} \cdot 2\text{KF}$

Cobaltous sodium fluoride, $\text{CoF}_2 \cdot \text{NaF} + \text{H}_2\text{O}$

Sol in H_2O (Wagner, B 19 896)

Cobaltous stannic fluoride

See Fluostannate, cobaltous

Cobalt vanadium fluoride

See Fluovanadate, cobalt

Cobaltous hydroxide, $\text{Co}_2\text{O}_3 \cdot \text{H}_2\text{O}$

Insol in H_2O Sol in acids Insol in $\text{KOH} + \text{Aq}$ Sol in ammonium sulphate, chloride, nitrate, or succinate + Aq (Brett)

Sol in warm acetic acid, insol in $\text{NH}_4\text{OH} + \text{Aq}$ and cold $\text{NH}_4\text{Cl} + \text{Aq}$, but sol in warm $\text{NH}_4\text{Cl} + \text{Aq}$ (de Schulten, C R 109 266)

Insol in H_2O and dil $\text{KOH} + \text{Aq}$, somewhat sol in conc $\text{KOH} + \text{Aq}$ easily sol in NH_4 salts + Aq (Fresenius)

Easily sol in $\text{KCN} + \text{Aq}$ (Rodgers, 1834)

Sol in conc $\text{K}_2\text{CO}_3 + \text{Aq}$ (Gmelin)

Not pptd by $\text{KOH} + \text{Aq}$ in presence of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ or NH_4 citrate (Spiller)

Sol in large amt in boiling $\text{NH}_4\text{SCN} + \text{Aq}$ (Grossmann, Z anorg 1908, 58 269)

Insol in methyl, or amyl amine + Aq (Wurtz)

Many non-volatile organic substances prevent its pptn

Cobaltic hydroxide, $3\text{Co}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$

(Mills, Phil Mag (4) 35 257)

$\text{Co}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ Decomp by $\text{HCl} + \text{Aq}$,

gives brown solutions with cold HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$, which soon decomp (Wernicke Pogg 141 120)

$\text{Co}_2\text{O}_3 \cdot \text{H}_2\text{O} = \text{CoO} \cdot \text{Co}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ Sol in warm HCl

HNO_3 , and H_2SO_4 , with decomp (Proust)
Sol in cold H_3PO_4 , H_2SO_4 , HNO_3 , or $\text{HCl} + \text{Aq}$, but decomp on standing or warming (Winkelblech)

Sol in racemic, tartaric oxalic or citric acid as cobaltous salt

Sol in conc acetic acid without immediate decomp (Remele) Solution is not decomp by boiling Sol in warm sat $(\text{NH}_4)_2\text{C}_2\text{O}_4 + \text{Aq}$ with decomp

Not attacked by cold or hot $\text{NH}_4\text{OH} + \text{Aq}$
Insol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$

Sol when freshly pptd in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Geuther, A 123 157)

Cobaltocobaltic hydroxide, $\text{Co}_3\text{O}_4 \cdot 3\text{H}_2\text{O}$

Insol in H_2O Sol in oxalic acid, solution decomp by heat Sol in $\text{HCl} + \text{Aq}$ with evolution of Cl (Gibbs and Genth, Sil Am J (2) 23 257)

$\text{Co}_3\text{O}_4 \cdot 7\text{H}_2\text{O}$ Sol in weak acids, especially $\text{HC H}_3\text{O}_2$ without decomp (Fremy)

$\text{Co}_3\text{O}_4 \cdot 6\text{H}_2\text{O}$ Min Heterogeneous Sol in dil $\text{HCl} + \text{Aq}$ with evolution of Cl

Cobaltous iodide, CoI

Deliquescent, and very sol in H_2O

100 pts sat $\text{CoI} + \text{Aq}$ at t° contain
pts CoI

t	Pts CoI	t	Pts CoI	t	Pts CoI
-22	52 4	14	61 6	60	79 2
-8	56 7	25	66 4	82	80 7
-2	58 7	34	73 0	111	80 9
+9	61 4	46	79 0	156	83 1

(Etard C R 113 699)

Sol in $\text{SO} (\text{OCH}_3)$ (Walden Z anorg 1902, 29 388)

Sol in SOCl_2 (Walden Z anorg 1900 25 216)

Sol in POCl_3 (Walden Z anorg 1900 25 212)

Sol in S Cl_2 (Walden Z anorg 1900 25 217)

Nearly insol in AsBr_3 (Walden Z anorg 1902, 29 374)

Sol in AsCl_3 (Walden Z anorg 1900 25 214)

Easily sol in alcohol
Sol in acetone (Fidmann C C 1899 II 1014) (Naumann, B 1904 37 452)

Sol in quinoline (Beckmann and Gabel Z anorg 1906, 51 236)

Sol in methylacetate (Naumann B 1900 42, 3790)

$+ 2\text{H}_2\text{O}$
 $+ 4\text{H}_2\text{O}$ Very deliquescent (Etard)

+6H₂O (Hartley, Chem Soc (2) 12 214)
 +9H₂O Very hygroscopic (Bolschakoff, C C 1898, II 660)

Cobaltous lead iodide, 2 CoI₂, PbI₂+3H₂O
 Decomp by H₂O (Mosnier, A ch 1897, (7) 12 412)

Cobaltous mercuric iodide, CoI₂, HgI₂ + 6H₂O

Partially decomp by H₂O
 Sol in alcohol and acetone (Dobroserdoff, C C 1901, II 332)

CoI₂, 2HgI₂+6H₂O Decomp by H₂O, sol in alcohol and acetone (Dobroserdoff, C C 1901, II 332)

Cobaltous iodide ammonia, CoI₂, 4NH₃

Decomp by H₂O Sol in NH₄OH+ Aq (Rammelsberg, Pogg 48 155)

CoI₂, 6NH₃ Insol in NH₄OH+ Aq (Rammelsberg)

Cobaltous iodide hydrazine, CoI₂, 2N H₄

Sl sol in H₂O Easily sol in acids (Franzen, Z anorg 1911, 70 147)

Cobaltic octamine compounds

See Octamine cobaltic compounds

Cobaltous oxide, CoO

Insol in H₂O Easily sol in dil or conc HCl or HNO₃+Aq Slowly sol in cold, but easily in hot dil H₂SO₄+Aq, acetic, or tartaric acid +Aq Insol in NH₄OH+ Aq Sol in hot NH₄Cl+ Aq, KOH, or NaOH+ Aq (Rose)

Insol in NH₄Cl or NH₄NO₃+Aq (Brett, 1834)

Insol in K₂CO₃+Aq Sol in boiling Co and Ni nitrates +Aq, with pptn of the oxides (Persoz)

Easily sol in dil acids, even tartaric, acetic, and oxalic acids Not attacked by NH₄OH+ Aq Sol in 13% NH₄Cl+ Aq with evolution of NH₃, also in NH₄SCN+ Aq Sol in warm conc NaOH, and KOH+ Aq (Zimmerman, A 232 324)

Solubility in (calcium sucrose + sugar) + Aq
 1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 1.56 g CoO 1 l solution containing 296.5 g sugar and 24.2 g CaO dissolves 0.29 g CoO (Bodenbender, J B 1865 600)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 827)

See also Cobaltous hydroxide

Cobaltic oxide, Co₂O₃

Decomp by most acids, even in the cold, with formation of cobaltous salts Sol in acetic acid without immediate decomp

See also Cobaltic hydroxide

Cobaltocobaltic oxide, Co₃O₄=CoO, Co₂O₃

Insol in boiling conc HCl, HNO₃, or aqua regia Sol by long standing with H₂SO₄ (Gibbs and Genth, Sill Am J (2) 23 257)

See also Cobaltocobaltic hydroxide

Co₃O₄=2CoO, Co₂O₃

Co₃O₄=4CoO, Co₂O₃ Not attacked by boiling dil HNO₃ or H₂SO₄+Aq (Beetz)

Co₃O₄=6CoO, Co₂O₃+20H₂O Sol in dil acids, with residue of Co₂O₃, which dissolves on warming (Gentele, J pr 69 131 +8H₂O As above (Gentele))

Cobaltous oxychloride, CoCl₂ 3CoO+ 3½H₂O

Ppt Very sl sol in H₂O (Haber mann M 5 432)

Cobaltous oxychloride hydroxylamine, CoOCl, 2NH₂OH

Insol in H₂O, unstable, insol in alcohol (Feldt, B 1894, 27 404)

Cobaltous oxyfluoride, CoO, CoF+H₂O

Ppt (Berzelius Pogg 1 26)

Cobaltous oxyiodide, CoO, CoI₂

Insol in H₂O (Rammelsberg)

Cobaltous oxysulphide, CoO, CoS

Cold HCl+ Aq dissolves out CoO, hot HCl+ Aq decomp with evolution of H₂S (Arfvedson, Pogg 1 64)

Cobalt phosphide, Co P

Sol in conc HNO₃ Slowly attacked by HCl and H₂SO₄ (Munroe, C R 1900 130 658)

Sol in HNO₃, aqua regia and in fused alkalis (Gauger, Bull Soc 1896, (3) 15 1089)

Co P₃ Insol in HNO₃ and aqua regia stable in the air even when heated (Gauger, Bull Soc 1896, (3) 15 1087)

Co₂P₂ Insol in conc HCl+ Aq Sol in HNO₃+ Aq (Rose Pogg 24 332)

Cobalt subseleide, Co Se

Sol in bromine water

Only sl attacked by boiling fuming HCl (Fonzes-Diacon, C R 1900 131 704)

Cobalt monoseleide, CoSe

(Little, A 112 211)

Cobalt diseleide CoSe

Sol in Br₂+Aq

Only sl attacked by boiling fuming HCl (Fonzes-Diacon, C R 1900, 131 705)

Cobalt sesquiselemdie, Co_2Se_3 Sol in $\text{Br}_2 + \text{Aq}$ Only sl attacked by boiling fuming HCl (Fonzes-Diacon, C R 1900, 131 704)**Cobalt selenide, Co_3Se_4** Sol in $\text{Br}_2 + \text{Aq}$ Only sl attacked by boiling fuming HCl (Fonzes-Diacon, C R 190, 131 704)**Cobalt silicide, Co_2Si** Sol in HF and aqua regia Insol in cold H_2O Decomp by steam at red heat Sol in fused alkali carbonates (Vigouroux, C R 1895, 121 687) CoSi Insol in HNO_3 and H_2SO_4 Sol in aqua regia and HCl , and in fused KOH (Lebeau, C R 1901, 132 557)Not attacked by dil or conc HNO_3 , or conc H_2SO_4 Sol in aqua regia and in conc HCl Not attacked by dil alkali hydroxides + Aq , attacked by fused alkali (Lebau, Bull Soc 1901, (3), 25 540) CoSi_2 Sl sol in hot conc HCl and hot conc alkali + Aq Sol in HF , insol in HNO_3 and H_2SO_4 (Lebeau, C R 1902, 135 476)**Cobaltous sulphide, CoS** *Anhydrous* Easily sol in acids, even HCl , but only slowly in the latter case (Hjortdahl, C R 65 75)Not attacked by cold dil $\text{HCl} + \text{Aq}$ (Ebelmen, A ch (3) 25 94)Min *Seypoorte*+ H_2O 1 l H_2O dissolve 41.62 + 10⁻⁶ moles CoS at 18° (Weigel, Z phys Ch 1907, 58 294)

Sol in conc mineral acids, very sl sol in cold dil acids, scarcely sol in acetic acid (Wackenroder)

Sol when still moist in $\text{SO} + \text{Aq}$ (Berthier)Easily sol in HNO_3 , but only very sl sol in $\text{HCl} + \text{Aq}$ Not pptd from very dil acid solutions by H_2S Insol in H_2O , alkalies and alkali carbonates, or sulphides + Aq (Fresenius)Insol in NH_4Cl and $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)When pptd by $(\text{NH}_4)_2\text{S} + \text{Aq}$, shows a brown colour in presence of 200,000 pts H_2O (Pfaff)Tartaric acid, etc does not hinder the pptn by $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Rose)Sol in potassium thiocarbonate + Aq (Rosenblatt, Z anal 26 15)Sol in N_2S_x or $\text{K}_2\text{S}_x + \text{Aq}$ (de Koninck, Zeit angew Ch 1891 202)**Cobaltic sulphide, Co_2S_3** Partially decomp by $\text{HCl} + \text{Aq}$, sol in $\text{HNO}_3 + \text{Aq}$ with decompositionSl attacked by $\text{HCl} + \text{Aq}$, and slowly even by aqua regia (Schneider, J pr (2) 9 209)**Min Cobalt pyrite**+ H_2O Insol in $\text{KCN} + \text{Aq}$ (Fleck J pr 97 303) More sol in $\text{HCl} + \text{Aq}$ than CoS (Dingler, Berz, J B 10 130)**Cobaltocobaltic sulphide, Co_3S_4** Min *Lamonte* Sol in warm $\text{HNO}_3 + \text{Aq}$, with residue of S **Cobalt disulphide, CoS_2** Not attacked by alkalis or acids except HNO_3 and aqua regia (Setterberg Pogg 7 40)**Cobalt sulphide, Co_3S_3** Easily sol in hot HCl with evolution of H_2S (and $\text{H}^?$) (Proust)**Cobalt potassium sulphide, $\text{K Co}_{11}\text{S}_{10}$** Slowly sol in cold HCl and aqua regia Quickly sol in warm aqua regiaSol in HF and H_2SO_4 only on warmingInsol in $(\text{NH}_4)_2\text{S}$, organic acids, alkalies, 12% $\text{HCl} + \text{Aq}$ and $\text{KCN} + \text{Aq}$ (Mullbauer, Z anorg 1904, 42 447)**Cobalt telluride, CoTe**

(Fabre, C R 105 673)

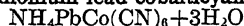
Cobalt decamine sulphurous acid

See Decamine cobaltisulphurous acid

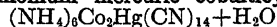
Cobaltic acid**Potassium cobaltate, $\text{K Co}_9\text{O}_{16} + 2\text{H}_2\text{O}$, or $3\text{H}_2\text{O}$** Insol in H_2O (Pebal, A 100 262), but decomp by long boiling Sol in conc acids K_2O , rCoO_2 Sol in H_2O (Winkler, J pr 91 351)

Does not exist (Donath W A B 102, 2b 71)

Cobaltcyanhydric acid, $\text{H Co}(\text{CN})_6 + 1/2\text{H}_2\text{O}$ Deliquescent Very sol in H_2O and only sl decomp on boilingSol in $\text{HCl} + \text{Aq}$ without decomp even on boiling Sl sol in conc more sol in dil $\text{HNO}_3 + \text{Aq}$ Not decomp by boiling conc $\text{HNO}_3 + \text{Aq}$ or aqua regia Insol in conc sl sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in alcohol Insol in ether (Zwenger A 162 157)**Ammonium cobaltcyanide, $(\text{NH})_4\text{Co}(\text{CN})_6 + 1/2\text{H}_2\text{O}$** Very sol in H_2O , sl sol in alcohol**Ammonium barium cobaltcyanide, $\text{NH}_4\text{BaCo}(\text{CN})_6 + \text{H}_2\text{O}$** Sol in H_2O (Weselsky)**Ammonium calcium cobaltcyanide, $\text{NH}_4\text{CaCo}(\text{CN})_6 + 10\text{H}_2\text{O}$** Sol in H_2O

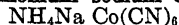
Ammonium lead cobalticyanide,

Sol in 831 pts H_2O at 18° , and sl sol in 93% alcohol (Schuler)

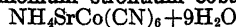
Ammonium mercuric cobalticyanide,

Sol in H_2O with decomp

Insol in alcohol (Soenderop, Dissert 1899)

Ammonium sodium cobalticyanide,

Only sl sol in H_2O (Weselsky, B 2 598)

Ammonium strontium cobalticyanide,

Sol in H_2O (W)

Barium cobalticyanide, basic, $\text{Ba}_3[\text{Co}(\text{CN})_6]_2$, BaO_2H

Not very stable Cannot be recryst without partial decomp (W)

Barium cobalticyanide, $\text{Ba}_3[\text{Co}(\text{CN})_6] + 10\text{H}_2\text{O}$

Sl efflorescent Very sol in H_2O Insol in alcohol

Barium cobalticyanide chloride,

Sol in H_2O without decomp (W)

Barium lithium cobalticyanide, $\text{BaLiCo}(\text{CN})_6 + 15\text{H}_2\text{O}$

The most sol of the double cobalticyanides (Weselsky)

Barium potassium cobalticyanide,

Sol in H_2O (W)

Bismuth cobalticyanide $\text{BiCo}(\text{CN})_6$

Ppt (Mathews J Am Chem Soc 1900, 22 275)

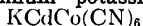
+ $5\text{H}_2\text{O}$ Moderately stable with dil min acids, more stable with conc acids than Cd or Zn comp

Decomp by NH_3 and alkalis (Fischer and Cuntze Ch Z 1902, 26 872)

Cadmium cobalticyanide, $\text{Cd}[\text{Co}(\text{CN})_6] + 7\frac{1}{2}\text{H}_2\text{O}$

Attacked by strong min acids only when hot Behaves as Zn salt, toward conc H_2SO_4 and dil and conc HCl

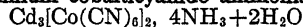
Insol in $\text{K}_2\text{Co}(\text{CN})_6 + \text{Aq}$ Sol in NH_4OH and $\text{NH}_4\text{Cl} + \text{Aq}$ (Fischer and Cuntze, Ch Z 1902, 26 573)

Cadmium potassium cobalticyanide,

Not attacked by H_2O (Fischer and Cuntze, Ch Z 1902, 26, 873)

Cadmium sodium cobalticyanide,

(Fischer and Cuntze, Ch Z 1902, 26 873)

Cadmium cobalticyanide ammonia,

(Fischer and Cuntze, Ch Z 1902, 26 873)

$\text{Cd}_3[\text{Co}(\text{CN})_6]_2, 5\text{NH}_3 + 3\text{H}_2\text{O}$ (Fischer and Cuntze, Ch Z 1902, 26 873)

$\text{Cd}_3[\text{Co}(\text{CN})_6]_2, 7\text{NH}_3$ (Fischer and Cuntze, Ch Z 1902, 26 873)

$\text{Cd}_3[\text{Co}(\text{CN})_6]_2, 9\text{NH}_3 + 2\text{H}_2\text{O}$ (Fischer and Cuntze, Ch Z 1902, 26 873)

Calcium potassium cobalticyanide,

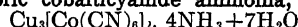
Sol in H_2O (W)

Cobaltous cobalticyanide, $\text{Co}_3[\text{Co}(\text{CN})_6]_2 + 14\text{H}_2\text{O}$

Insol in H_2O and acids Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$

Cupric cobalticyanide, $\text{Cu}_3[\text{Co}(\text{CN})_6]_2 + 7\text{H}_2\text{O}$

Insol in H_2O and acids Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Cupric cobalticyanide ammonia,

Sol in H_2O (Zwenger)

Lead cobalticyanide, basic, $\text{Pb}_3[\text{Co}(\text{CN})_6]_2, 3\text{PbO}_2\text{H}_2 + 11\text{H}_2\text{O}$

Insol in H_2O or alcohol, somewhat sol in hot $\text{Pb}(\text{C}_2\text{H}_3\text{O}) + \text{Aq}$ (Schuler)

Lead cobalticyanide, $\text{Pb}_4[\text{Co}(\text{CN})_6] + 4\text{H}_2\text{O}$

Very sol in H_2O Insol in alcohol (Zwenger)

+ $7\text{H}_2\text{O}$ Sol in 177 pts H_2O at 18° , and 163 pts at 19° Insol in absolute alcohol Sl sol in 93% alcohol (Schuler, W A B 79 302)

Lead potassium cobalticyanide, $\text{PbKCo}(\text{CN})_6 + 3\text{H}_2\text{O}$

Sol in 674 pts H_2O at 18° and much more easily in hot H_2O Insol in absolute, sl sol in 93% alcohol (Schuler)

Lead cobalticyanide nitrate, $\text{Pb}_4[\text{Co}(\text{CN})_6]_2, \text{Pb}(\text{NO}_3)_2 + 12\text{H}_2\text{O}$

Sol in 1691 pts H_2O at 18° , 1679 pts at 19° , and much less hot H_2O

Nearly insol in 93% alcohol (Schuler)

Mercurous cobalticyanide, $\text{Hg}_2\text{Co}(\text{CN})_6$

Ppt Decomp by HCl Not attacked by cold, but by hot conc H_2SO_4 Not attacked by HNO_3 , acetic or oxalic acid Decomp by alkalis + Aq (Miller and Mathews, J Am Chem Soc 1900 22 64)

Mercuric cobaltcyanide, $\text{Hg}_2[\text{Co}(\text{CN})_6]_2$

Sl sol in H_2O , decomp by boiling
 Insol in alcohol and ether Not attacked
 by HCl (Soenderop, Dissert, 1899)

**Mercuric potassium cobaltcyanide,
 $\text{K}_6\text{HgCo}_2(\text{CN})_{14}$**

Sol in H_2O with decomp Insol in al-
 cohol Sl sol in ether (Soenderop, Dissert,
 1899)

$\text{K}_6\text{Hg}_3\text{Co}_4(\text{CN})_{24}$ (Soenderop, Dissert
 1899)

**Mercuric sodium cobaltcyanide,
 $\text{Na}_6\text{Hg}_3\text{Co}_4(\text{CN})_{24} + 4\text{H}_2\text{O}$**

Extremely deliquescent (Soenderop,
 Dissert, 1899)

Nickel cobaltcyanide, $\text{Ni}_3[\text{Co}(\text{CN})_6]_2 + 12\text{H}_2\text{O}$

Insol in H_2O and acids Not attacked by
 boiling $\text{HCl} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$
 Decomp by $\text{KOH} + \text{Aq}$

**Nickel cobaltcyanide ammonia,
 $\text{Ni}_3[\text{Co}(\text{CN})_6]_2 \cdot 4\text{NH}_3 + 7\text{H}_2\text{O}$**

Insol in H_2O

Potassium cobaltcyanide, $\text{K}_3\text{Co}(\text{CN})_6$
Easily sol in H_2O Insol in alcohol**Potassium strontium cobaltcyanide,
 $\text{K}_2\text{SrCo}(\text{CN})_6 + 9\text{H}_2\text{O}$**
Sol in H_2O (Weselsky)**Potassium thallium cobaltcyanide,
 $\text{K}_3\text{Tl}[\text{Co}(\text{CN})_6]$**

More sol in H_2O than corresponding
 K salt (Fischer und Benzin Ch Z 1902,
 26 49)

**Potassium zinc cobaltcyanide,
 $\text{K}_2\text{ZnCo}(\text{CN})_6 + 3\text{H}_2\text{O}$**
(Fischer und Cuntze, Ch Z 1902, 26 873)**Potassium cobaltcyanide mercuric chloride,
 $2\text{K}_3\text{Co}(\text{CN})_6 + 3\text{HgCl}_2$**
(Soenderop Dissert 1899)**Potassium cobaltcyanide mercuric iodide,
 $4\text{K}_3\text{Co}(\text{CN})_6 + \text{HgI}_2$**

Sol in H_2O with subsequent decomp
 Sol in alcohol and ether with decomp
 (Soenderop Dissert, 1899)

Silver cobaltcyanide, $\text{Ag}_3\text{Co}(\text{CN})_6$

Insol in H_2O and acids Sol in $\text{NH}_4\text{OH} +$
 Aq

**Silver cobaltcyanide ammonia, $\text{Ag}_3\text{Co}(\text{CN})_6 \cdot$
 $\text{NH}_3 + \frac{1}{2}\text{H}_2\text{O}$**
Insol in H_2O (Zwenger)**Sodium cobaltcyanide, $\text{Na}_3\text{Co}(\text{CN})_6 + 2\text{H}_2\text{O}$**
Easily sol in H_2O , insol in alcohol**Sodium zinc cobaltcyanide, $\text{NaZnCo}(\text{CN})_6$
 $+ \text{H}_2\text{O}$**
(Fischer and Cuntze, Ch Z 1902, 26 873)**Strontium cobaltcyanide, $\text{Sr}_3[\text{Co}(\text{CN})_6]_2 + 10\text{H}_2\text{O}$**
Very sol in H_2O (Weselsky)**Thallium cobaltcyanide, $\text{Tl}_3\text{Co}(\text{CN})_6$**

100 pts H_2O dissolve 3.6 pts at 0° , 5.86 pts
 at 9.5° , 10.04 pts at 19.5° (Fronmuller, B
 11 91)

Yttrium cobaltcyanide, $\text{YCo}(\text{CN})_6 + 2\text{H}_2\text{O}$
Nearly insol in H_2O (Cleve)**Zinc cobaltcyanide, $\text{Zn}_3[\text{Co}(\text{CN})_6]_2 + 12\text{H}_2\text{O}$**
Sol in $\text{HCl} + \text{Aq}$ and salt is pptd by dilu-
 tion with H_2O Decomp by H_2SO_4 Insol
 in $\text{K}_4\text{Co}(\text{CN})_6 + \text{Aq}$ Sol in NH_4OH and
 $\text{NH}_4\text{Cl} + \text{Aq}$ (Fischer and Cuntze, Ch Z
 1902, 26 873)**Zinc cobaltcyanide ammonia,
 $\text{Zn}_3[\text{Co}(\text{CN})_6]_2 \cdot 5\text{NH}_3$**
Decomp by H_2O and acids (Fischer and
 Cuntze, Ch Z 1902, 26 873)
 $\text{Zn}_3[\text{Co}(\text{CN})_6]_2 \cdot 6\text{NH}_3$ (Fischer and
 Cuntze)
 $+ 3\text{H}_2\text{O}$ (Fischer and Cuntze)
 $\text{Zn}_3[\text{Co}(\text{CN})_6]_2 \cdot 10\text{NH}_3 + 9\text{H}_2\text{O}$ Decomp
 by H_2O (Fischer and Cuntze)**Cobaltumolybdic acid****Ammonium barium cobaltous cobaltumolyb-
date, $\frac{1}{2}(\text{NH}_4)_2\text{O}, 1\frac{1}{2}\text{BaO}, \text{CoO}, \text{CoO},$
 $10\text{MoO}_3 + 15\frac{1}{2}\text{H}_2\text{O}$**
Difficultly sol in H_2O (Friedheim and
 Keller B 1906 39 4306)**Ammonium cobaltous cobaltumolybdate,
 $2(\text{NH}_4)_2\text{O}, \text{CoO}, \text{CoO}, 10\text{MoO}_3 + 12\text{H}_2\text{O}$**
Much more sol in H_2O than $3(\text{NH}_4)_2\text{O}$
 $\text{CoO}, \text{CoO}_2, 12\text{MoO}_3 + 20\text{H}_2\text{O}$ Sp gr of
 cold sat solution = 1.096 (Friedheim and
 Keller)
 $3(\text{NH}_4)_2\text{O}, \text{CoO}, \text{CoO}, 12\text{MoO}_3 + 20\text{H}_2\text{O}$
 100 cc cold sat aqueous solution contain
 3 g of the salt Sp gr of the solution = 1.0234
 Sol in conc HCl
 Decomp by conc H_2SO_4 , by $\text{KOH} + \text{Aq}$
 and by $\text{NaOH} + \text{Aq}$ (Friedheim and Keller)**Barium cobaltous cobaltumolybdate,
 $3\text{BaO}, \text{CoO}, \text{CoO}_2, 9\text{MoO}_3 + 25\text{H}_2\text{O}$**
Sl sol in H_2O (Friedheim and Keller)

Cobaltous potassium cobaltmolybdate,
 $\text{CoO}, 3\text{K}_2\text{O}, \text{CoO}_2, 10\text{MoO}_3 + 10\text{H}_2\text{O}$
 (Kurnakoff, Ch Z 1890, 14 113)

+11H₂O Sol in conc HCl Decomp by
 KOH+Aq and by NaOH+Aq (Friedheim
 and Keller)

$3\text{K}_2\text{O}, \text{CoO}, \text{CoO}_2, 12\text{MoO}_3 + 15\text{H}_2\text{O}$ Sl
 sol in H₂O Sol in conc HCl Decomp by
 KOH+Aq and by NaOH+Aq (Friedheim
 and Keller)

+20H₂O (Kurnakoff, Ch Z 1890, 14
 113)

Potassium cobaltmolybdate,
 $3\text{K}_2\text{O}, \text{CoO}_2, 9\text{MoO}_3 + 6\frac{1}{2}\text{H}_2\text{O}$

Ppt (Hall, J Am Chem Soc 1907, 29
 703)

Cobaltnitrocyanhidric acid

Potassium cobaltnitrocyanide,
 $\text{K}_4\text{Co}_2(\text{CN})_8\text{NO}_2 + 3\text{H}_2\text{O}$

Very sol in H₂O but quickly decomp
 Insol in alcohol (Rosenheim and Kopp-
 pel, Z anorg 1898, 17 68)

Silver cobaltnitrocyanide,
 $\text{Co}_2\text{Ag}_6\text{NO}_2(\text{CN})_{10} + 6\text{H}_2\text{O}$, and +21H₂O
 (Rosenheim and Koppel)

Sodium cobaltnitrocyanide,
 $\text{Na}_6\text{Co}_4(\text{NO}_2)(\text{CN})_{10} + 11\text{H}_2\text{O}$

Very deliquescent Sol in H₂O (Rosen-
 heim and Koppel)

Cobaltisulphurous acid, $\text{H}_6\text{Co}_2(\text{SO}_3)_6$

Not obtained in a solid state (Berglund,
 Acta Lund 1872)

Cobaltisulphites

The cobaltisulphites are insol or at least
 very sl sol in H₂O (Berglund, Acta Lund
 1872 23)

Ammonium cobaltous cobaltisulphite,
 $(\text{NH}_4)_2\text{SO}_3, 2\text{CoSO}_3, \text{Co}_2(\text{SO}_3)_3 + 14\text{H}_2\text{O} =$
 $(\text{NH}_4)_4\text{Co}_2\text{Co}_2(\text{SO}_3)_7 + 14\text{H}_2\text{O}$

Scarcely sol in H₂O, but decomp thereby
 Easily sol in acids, when finely divided,
 also in H₂SO₃+Aq (Berglund)

$2(\text{NH}_4)_2\text{SO}_3, \text{CoSO}_3, \text{Co}(\text{SO}_3)_3 + 8\text{H}_2\text{O} =$
 $(\text{NH}_4)_4\text{CoCo}_2(\text{SO}_3)_6 + 8\text{H}_2\text{O}$ As above
 (Berglund)

Barium cobaltisulphite $3\text{BaSO}_3, \text{Co}(\text{SO}_3)_3 +$
 $12\text{H}_2\text{O} = \text{Ba}_3\text{Co}_2(\text{SO}_3)_7 + 12\text{H}_2\text{O}$

Ppt Insol in H₂O Not attacked by cold
 acids even H₂SO₄, but is decomp by boiling
 therewith (Berglund, Acta Lund 1872)

Bismuth cobaltisulphite, $\text{Bi}_2\text{Co}_2(\text{SO}_3)_6$

Insol in H₂O, dil HNO₃, or HCl+Aq
 (Berglund, Acta Lund 1872 31)

Calcium cobaltisulphite, $\text{Ca}_3\text{Co}_2(\text{SO}_3)_6$
 Ppt Insol in H₂O or HCl+Aq (Berg-
 lund, Acta Lund 1872 30)

Cobaltous cobaltisulphite, $\text{Co}_3\text{Co}_2(\text{SO}_3)_6$
 $3\text{CoSO}_3, \text{Co}_2(\text{SO}_3)_3$

Ppt (Berglund, B 7 470)

Cobaltous potassium cobaltisulphite,
 $\text{CoK}_4\text{Co}_2(\text{SO}_3)_6$

Insol in H₂O (Berglund)

Silver cobaltisulphite, $\text{Co}_2(\text{SO}_3)_3, 3\text{Ag}_2\text{SO}_3$
 Properties as the following comp (Berg-
 lund)

Silver cobaltous cobaltisulphite, $\text{CoSO}_3,$
 $\text{Co}_2(\text{SO}_3)_3, 2\text{Ag}_2\text{SO}_3 + 9\text{H}_2\text{O}$

Insol in H₂O Insol in HNO₃+Aq De-
 comp by HCl or H₂S+Aq (Berglund)

Sodium cobaltous cobaltisulphite

Decomp by H₂O, so that it has not been
 obtained pure (Berglund, Acta Lund 1872
 29)

Cobaltoctamine sulphurous acid

See Octamine cobaltisulphurous acid

Cobaltocobalticyanhidric acid,
 $\text{H}_3\text{Co}_3(\text{CN})_{11}$

Unstable (Jackson and Comey, Am Ch
 J 1897 19, 277)

Barium cobaltocobalticyanide,

$\text{BaHCo}_3(\text{CN})_{11} + 1\frac{1}{2}\text{H}_2\text{O}$

Somewhat sol in H₂O when pure

The crude salt is insol even in hot H₂O
 (Jackson and Comey)

Cupric cobaltocobalticyanide, $\text{Cu}_3\text{Co}_6(\text{CN})_{11}$
 $+ 4\text{H}_2\text{O}$

Ppt (Jackson and Comey)

Potassium hydrogen cobaltocobalticyanide
 $\text{K}_2\text{HCo}_3(\text{CN})_{11} + 2\text{H}_2\text{O}$

Sl sol in cold easily sol in hot H₂O

Insol in alcohol (Jackson and Comey)

$\text{KH}_2\text{Co}_3(\text{CN})_{11} + \text{H}_2\text{O}$ Insol in cold c
 hot H₂O when impure

The pure salt is slowly sol in cold H₂O
 More sol in warm H₂O (Jackson and
 Comey)

Silver cobaltocobalticyanide, $\text{Ag}_3\text{Co}_3(\text{CN})_{11}$
 $+ \text{H}_2\text{O}$

Ppt (Jackson and Comey, B 1896, 24
 1021)

Zinc cobaltocobalticyanide, $\text{ZnHCo}_3(\text{CN})_{11}$
 $+ 3\text{H}_2\text{O}$

Ppt (Jackson and Comey)

Cobaltocyanhydric acid, $H_4Co(CN)_6$

Very unstable Sol in H_2O Insol in alcohol

Cuprous potassium cobaltocyanide, $K_3CuCo(CN)_6$

(Straus, Z anorg 1895, 9 17)

Potassium cobaltocyanide, $K_3Co(CN)_6$

Decomp on air Very deliquescent, and sol in H_2O Insol in alcohol and ether (Descamps, Zeit Ch 1868 952)

Cobaltous acid**Barium cobaltite, $BaCoO_3$**

Insol in H_2O or dil HCl Sol in $HCl + Aq$ (Rousseau, C R 109 64)
 $BaCo_2O_5$ As above (Rousseau)

Cobaltous potassium cobaltite, $3CoO_2, CoO, K_2O$

Rapidly hydrolysed by H_2O
Sol in conc HCl (Bellucci, Chem Soc 1907, 92, (2) 354)

Magnesium cobaltite, $MgCoO_3$

Insol in H_2O, NH_4OH , or $(NH_4)_2CO_3 + Aq$
Easily sol in $NH_4Cl + Aq$, from which it is pptd by $KOH + Aq$ (Berzelius, Pogg 33 126)

Sol in $HF, HCl, HNO_3 + H_2SO_4$, decomp and partially dissolved by $NH_4OH + Aq$, quite stable when heated (Dufau, C R 1896, 123 240)

Potassium cobaltite

According to Bellucci and Dominici the compounds formerly described are more or less decomp by hydrolysis (C C 1907 I, 1530)

Sodium cobaltite

Sol in $NaOH + Aq$, but pptd by diluting the solution

Columbic acid (Niobic acid), $3Cb_2O_5, 4H_2O$, or $3Cb_2O_5, 7H_2O$

Easily sol in HF , very sl sol in $HCl + Aq$, but is sol in H_2O after being treated with $HCl + Aq$ Sol in conc H_2SO_4 Sol in $KOH + Aq$ Insol in $NaOH + Aq$, but becomes sol in H_2O by being treated with $NaOH + Aq$ Sol in boiling $Na_2CO_3 + Aq$ (Rose, Pogg 113 109)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

$Cb_2O_5, 4H_2O$
 $Cb_2O_5, 7H_2O$ (Santesson, Bull Soc (2) 24 52)

Aluminum columbate, $Al_2O_3, 3Cb_2O_5 + 12H_2O$

Ppt (E F Smith, J Am Chem Soc 1908, 30 1652)

Barium columbate, $7BaO, 6Cb_2O_5 + 18H_2O$

Ppt (Bedford, J Am Chem Soc 1905, 27 1218)

Cadmium columbate, CdO, Cb_2O_5

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by $HKSO_4$ at red heat (Larsson, Z anorg 1896, 12 199)

$+ 3\frac{1}{2}H_2O$ Ppt (E F Smith, J Am Chem Soc 1908, 30 1652)

Cæsium columbate, $4Cs_2O, 3Cb_2O_5 + 14H_2O$

Very sol in H_2O (E F Smith, J Am Chem Soc 1908, 30 1654)

$7Cs_2O, 6Cb_2O_5 + 30H_2O$ Ppt (E F Smith, J Am Chem Soc 1908, 30 1655)

Calcium columbate, $2CaO, Cb_2O_5$

Insol in H_2O (Joly, C R 81 266)

CaO, Cb_2O_5 Sol in boiling conc H_2SO_4 , insol in most acids, decomp by $HKSO_4$ at red heat (Larsson, Z anorg 1896, 12 198)

Cobalt columbate, CoO, Cb_2O_5

Sol in conc boiling H_2SO_4 , insol in most acids, decomp by $HKSO_4$ at red heat (Larsson)

Copper columbate, CuO, Cb_2O_5

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by $HKSO_4$ at red heat (Larsson)

$+ 3\frac{1}{2}H_2O$ Ppt (E F Smith, J Am Chem Soc 1908, 30 1652)

Iron (ferrous) columbate, $Fe(CbO_3)_2$

Min *Columbite* Insol in acids

Iron (ferrous) columbate tantalate,

$xFe(TaO_3)_2, yFe(CbO_3)_2$

Min *Tantalite* Not attacked by acids
 $Fe(CbO_3)_2, 4Fe(TaO_3)_2$ Min *Taprohte*

Lithium columbate, $7Li_2O, 6Cb_2O_5 + 26H_2O$

Ppt (E F Smith, J Am Chem Soc 1908, 30 1655)

Magnesium columbate, MgO, Cb_2O_5

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by $KHSO_4$ at red heat (Larsson, Z anorg 1896, 12 196)

$+ 4H_2O$ Precipitate (Rummelsberg)

$+ 7H_2O$ Ppt (E F Smith, J Am Chem Soc 1908, 30 1651)

$4MgO, Cb_2O_5$ Insol in H_2O (Joly, C R 81 266)

$3MgO, Cb_2O_5$ As above

Manganous columbate

Insol in H_2O (Joly, C R 81 266)

$3MnO, 5Cb_2O_5$ Sol in boiling conc H_2SO_4 , insol in most acids, decomp by $HKSO_4$ at red heat (Larsson, Z anorg 1896, 12 201)

Potassium columbate, KCbO_3

Sol in H_2O (Joly, in Fremy's Encyc Ch)
 $\text{K}_2\text{Cb}_2\text{O}_7 + 5\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Santesson)

$\text{K}_2\text{Cb}_2\text{O}_{16} + 5\text{H}_2\text{O}$ Nearly insol in H_2O
 $\text{K}_4\text{Cb}_2\text{O}_7 + 11\text{H}_2\text{O}$ Insol in H_2O (Santesson, Bull Soc (2) 24 53)

$\text{K}_4\text{Cb}_2\text{O}_{22} + 11\text{H}_2\text{O}$ (Santesson)
 $\text{K}_5\text{Cb}_2\text{O}_{13} + 13\text{H}_2\text{O}$ Sol in H_2O

$\text{K}_5\text{Cb}_2\text{O}_{10} + 16\text{H}_2\text{O}$ Efflorescent Sol in H_2O (Marignac, A ch (4) 8 20)

Very sol in H_2O (E F Smith, J Am Chem Soc 1908, 30 1652)

$\text{K}_{14}\text{Cb}_{12}\text{O}_{37} + 27\text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (E F Smith)

$\text{K}_{16}\text{Cb}_{14}\text{O}_{43} + 32\text{H}_2\text{O}$ Sol in H_2O

Potassium sodium columbate, $3\text{K}_2\text{O}, \text{Na}_2\text{O}, 3\text{Cb}_2\text{O}_5 + 9\text{H}_2\text{O}$

Very slightly sol in H_2O Insol in alkalies (Marignac)

Rubidium columbate, $3\text{Rb}_2\text{O}, 4\text{Cb}_2\text{O}_5 + 9\frac{1}{2}\text{H}_2\text{O}$

(E F Smith, J Am Chem Soc 1908, 30 1655)

$4\text{Rb}_2\text{O} + 3\text{Cb}_2\text{O}_5 + 14\text{H}_2\text{O}$ Very sol in H_2O (E F Smith)

Silver columbate, $\text{Ag}_2\text{O}, \text{Cb}_2\text{O}_5 + 2\text{H}_2\text{O}$

Ppt (E F Smith)

$7\text{Ag}_2\text{O}, 6\text{Cb}_2\text{O}_5 + 5\text{H}_2\text{O}$ Insol in H_2O (Bedford, J Am Chem Soc 1905, 27 1218)

Sodium columbate, $\text{NaCbO}_3 + 3\frac{1}{2}\text{H}_2\text{O}$

Completely sol in H_2O (Rose)

Ppt (E F Smith, J Am Chem Soc 1908, 30 1651)

$+ 2\frac{1}{2}\text{H}_2\text{O}$ Sl sol in cold H_2O Insol in $\text{NaOH} + \text{Aq}$ (Santesson)

$2\text{Na}_2\text{O}, 3\text{Cb}_2\text{O}_5 + 9\text{H}_2\text{O}$ Insol in H_2O or $\text{NaOH} + \text{Aq}$ (Santesson)

$8\text{Na}_2\text{O}, 7\text{Cb}_2\text{O}_5$ 1 pt is sol in 195–200 pts H_2O at 14–20°, in ether 75–80 pts or in 103 pts boiling water (Rose)

$7\text{Na}_2\text{O}, 6\text{Cb}_2\text{O}_5 + 32\text{H}_2\text{O}$ Very stable Sol in H_2O (Bedford, J Am Chem Soc 1905, 27 1217)

Thorium columbate, $5\text{Th}_2\text{O}_3, 16\text{Cb}_2\text{O}_5$

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by HKSO_4 at red heat (Larsen, Z anorg 1896, 12 202)

Yttrium columbate, $\text{Y}_2\text{O}_3, \text{CbO}_3$

Insol in H_2O (Joly, C R 81 1261)

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by HKSO_4 at red heat (Larsen)

Zinc columbate, $\text{ZnO}, \text{Cb}_2\text{O}_5$

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by HKSO_4 at red heat (Larsen)

$7\text{ZnO}, 6\text{Cb}_2\text{O}_5 + 25\text{H}_2\text{O}$ Insol in H_2O (Bedford, J Am Chem Soc 1905, 27 1218)

Zirconium columbate, $\text{ZrO}_2, 5\text{Cb}_2\text{O}_5$

Sol in boiling conc H_2SO_4 , insol in most acids, decomp by HKSO_4 at red heat (Larsen)

Percolumbic acid

See Percolumbic acid

Columbium (Niobium), Cb

Scarcely attacked by HCl , HNO_3 , or aqua regia Conc H_2SO_4 dissolves easily on warming

Sol in fused oxidizing agents, sol in hot conc H_2SO_4 and in HF , also in $\text{HF} + \text{HNO}_3$, insol in other acids (Moissan, C R 1901 133 24)

Columbium pentabromide, CbBr_5

(Rose, Pogg 104 422)

Columbium carbide nitride, $3\text{CbC}, 2\text{CbN}$

(Joly, Bull Soc (2) 25 506)

Columbium trichloride, CbCl_3

Not deliquescent, not attacked by H_2O but easily oxidised by $\text{HNO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Roscoe, C N 37 25)

Columbium pentachloride, CbCl_5

Decomp by H_2O with separation of hydrate of Cb_2O_5 Sol in cold $\text{HCl} + \text{Aq}$ forming a solution which soon gelatinises, and separates out CbO_5 by heat or dilution, with hot $\text{HCl} + \text{Aq}$, forms a cloudy solution which does not gelatinise Sol in H_2SO_4 to form clear liquid which gelatinises on heating Sol in $\text{KOH} + \text{Aq}$ Sol in alcohol with slight residue (Rose, Pogg 104 432)

Columbium pentafluoride, CbF_5

Very hygroscopic, sol in H_2O without separation of columbic acid (Ruff, B 1909 42 492)

Columbium fluoride with MF

See Fluocolumbate, M

Columbium hydride, $(\text{CbH})_2$

Insol in HCl , HNO_3 , and dil $\text{H}_2\text{SO}_4 + \text{Aq}$ even on boiling Sol in boiling conc H_2SO_4 and in fused KHSO_4 Sol in cold $\text{HCl} + \text{Aq}$ if not too dilute Also attacked by $\text{KOH} + \text{Aq}$ (Marignac N Arch Phys Nat 31 89)

Not attacked by boiling H_2O , or boiling HCl

Oxidized by hot H_2SO_4 Insol in boiling HNO_3 (Muthmann, A 1907, 355 90)

Columbium hydroxide $\text{CbO}_2, \text{rH}_2\text{O}$

See Columbic acid

Columbium nitride

Not attacked by boiling nitric acid or aqua regia, but sol in a cold mixture of HNO_3 and HF (Rose, Pogg 111 426)

Cb_3N_5 Not attacked by boiling H_2O or HCl Insol in conc HNO_3 , and H_2SO_4

Decomp by fused KOH Not attacked by boiling with $\text{KOH} + \text{Aq}$ (Muthmann, A 1907, 355 94)

Columbium dioxide, Cb_2O_3

Sol when still moist in boiling dil $\text{HCl} + \text{Aq}$ Insol in hot HNO_3 , less sol in aqua regia than in $\text{HCl} + \text{Aq}$ Sol in conc H_2SO_4 after long heating (Rose)

Insol in H_2O , KOH , or conc acids, even when boiling (Delafontaine)

Columbium trioxide, Cb_2O_3

Insol in acids except HF (Smith, Z anorg 1894, 7 28)

Columbium tetroxide, Cb_2O_4

Not attacked by cold or hot H_2O , HCl , HNO_3 , H_2SO_4 , or aqua regia Slightly attacked by boiling $\text{KOH} + \text{Aq}$ (Delafontaine)

Columbium pentoxide, Cb_2O_5

When ignited insol in hot conc H_2SO_4 . When it has not been ignited it forms a clear solution with H_2SO_4 , which can be diluted without forming any precipitate (Rose, Pogg 112 549)

Sol in fused KHSO_4 , which can be diluted with H_2O without causing pptn Insol in HF

Columbium oxybromide, CbOBr_3

Decomp by H_2O into Cb_2O_5 and HBr Sol in hot H_2SO_4 and conc $\text{HCl} + \text{Aq}$ (Rose, Pogg 104 442)

$3\text{H}_2\text{O}$, Cb_2O_4 , $\text{HBr} (?)$ Easily sublimed (Smith, Z anorg 1894, 7 97)

Columbium oxybromide rubidium bromide, CbOBr_3 , 2RbBr

Unstable in moist air Decomp by H_2O (Weinland, B 1905 39 3059)

Columbium oxychloride, CbOCl_3

Attracts H_2O from air without deliquescing and decomposed Decomp with H_2O with evolution of heat Insol in hot or cold $\text{HCl} + \text{Aq}$ Sol by long contact with H_2SO_4 to a cloudy liquid, which clears up on warming, but soon separates out Cb_2O_5 Sol in cold $\text{KOH} + \text{Aq}$ and hot $\text{K}_2\text{CO}_3 + \text{Aq}$ (Rose)

Sol in alcohol, from which it is precipitated by ether (Blomstrand)

$3\text{H}_2\text{O}$, Cb_2O_4 , HCl Sublimate (Smith, Z anorg 1894, 7 97)

Columbium oxychloride rubidium chloride, CbOCl_3 , 2RbCl

Decomp by H_2O (Weinland, B 1906, 39 3057)

Columbium oxyfluoride, CbOF_3

(Joly, C R 81 1266)

Columbium oxyfluoride with MF

See Fluoxycolumbate, and Fluoxyhypocolumbate, M

Columbium oxysulphide, Cb_2OS_3

Insol in boiling $\text{HCl} + \text{Aq}$ Slowly decomp into Cb_2O_5 by boiling with HNO_3 or aqua regia Insol in boiling dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Converted into columbic sulphate, sol in H_2O , by boiling conc H_2SO_4 Sl sol in hot HF Insol in boiling $\text{K}_2\text{S} + \text{Aq}$ (Rose, Pogg 111 193)

Copper, Cu

Copper is not attacked by distilled H_2O , or by NH_4NO_3 , KNO_3 , or $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$, or by a mixture of those salts in solution (Muir, cited by Carnelly, Chem Soc 30 1)

Distilled H_2O has slight action on Cu 100 cem H_2O dissolved from 2 sq dem Cu from 0.035 mg Cu in one hour up to 0.280 mg in 72 hours 100 cem H_2O dissolved 0.44 mg from 6 sq dem in 48 hours Presence of solder diminishes solubility about one-half At 90–100° the amount dissolved is about one-half that at ord temp (Carnelly, Chem Soc 30 1)

100 cem distilled H_2O dissolved only 1 mg Cu from 11.8 sq cm during a week while air free from CO_2 was conducted through the solution When the air contained CO 3 mg were dissolved (Wagner, Dingl 221 259)

100 l sea water dissolved 12.96 g Cu from 1 sq m (Calvert and Johnson, C N 11 171)

Solubility in H_2SO_4

Not attacked by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Vogel, Schw J 32 301)

Action of H_2SO_4 at ordinary temp is very slight even after a long time (Barruel J Pharm 20 13 [1834])

H_2SO_4 has no action below 130 Calvert and Johnson, Chem Soc 19 458

H_2SO_4 acts slightly even at 20°

16.3 g H_2SO_4 (1.843 sp gr) dissolved the following amts from 3 g Cu having a surface of 65 sq cm at the given temp

Temp	Time	Cu dissolved
19°	14 days	About 6
60	120 min	2.5
80	30 "	1.5
100	30 "	1.1
124	30 "	2.7
130	30 "	3.2
137	30 "	3.0
150	30 "	6.2
170	10 "	51.42
195	2 "	22.2
220	1/2 "	70.2
270	few seconds	nearly 100

With dilute acid the action was much less violent, as is seen in the following table—

Tem	Time	Acid	Sp gr	% Cu dissolved
100°	30 min	H ₂ SO ₄	1 843	2 380
100	30 "	2H ₂ SO ₄ , H ₂ O	1 8295	0 585
100	30 "	H ₂ SO ₄ , H ₂ O	1 780	0
100	30 "	H ₂ SO ₄ , 2H ₂ O	1 620	0
130	30 "	H ₂ SO ₄	1 843	32 6
130	30 "	H ₂ SO ₄ , H ₂ O	1 780	1 18
130	30 "	H ₂ SO ₄ , 2H ₂ O	1 620	0
165	15 "	H ₂ SO ₄	1 843	70
165	30 "	H ₂ SO ₄ , H ₂ O	1 780	16 5
165	30 "	H ₂ SO ₄ , 2H ₂ O	1 620	2 7

(Pickering, Chem Soc 33 112)

Cu is very sl attacked by cold HCl+Aq of 1 12 sp gr, but somewhat more on warming. Even less sol in dil HCl+Aq (Lowe, Z anal 4 361)

Sol in warm conc HI+Aq (Rose)

Slowly attacked by H₂SO₄+Aq (Causse, Bull Soc (2) 45 3)

More or less sol in all dil mineral acids and also in organic acids, as acetic, tartaric, etc, when supply of air is afforded, but absolutely insol in the latter acids when air is wholly excluded. The importance of this fact in the use of Cu cooking utensils is manifest.

Easily attacked by ord HNO₃+Aq

With very conc HNO₃+Aq (sp gr 1 52) it becomes passive, as in the case of Fe

Pure dil HNO₃+Aq of 1 07 sp gr or less does not attack Cu at 20°, but if NO₂ or KNO₃ is added the action begins at once. If HNO₃+Aq is more conc the Cu is attacked. HNO₃+Aq of 1 106 sp gr begins to act at -2°, and of 1 217 sp gr at -10°

HNO₃+Aq of 1 512 sp gr attacks Cu violently at 20°, but action soon ceases on account of formation of a crust of Cu(NO₃), insol in pure HNO₃ (Millon, A ch (3) 6 95)

Easily sol in 2N-HClO₃+Aq at 50° (Hendriksen, J Am Chem Soc 1904, 26 756)

Not appreciably sol in anhydrous HF (Poulenc, A ch 1894, (7) 2 12)

When in contact with the air, Cu is soon oxidised by acids, alkalis (especially NH₄OH+Aq), and many fatty bodies

Sol in (NH₄) CO₃+Aq (Traube, B 18 1887)

Slowly sol in NH₄OH+Aq (Schonbein, B A B 1856 580)

Sol in KI+Aq when warm and conc (Rose)

When finely divided, Cu is easily sol in hot FeCl₃+Aq

Action of dilute solutions of salts on solubility of Cu in H₂O

100 ccm solution of the following salts dissolve the amts of Cu given below, from a surface of 1 sq decm in 48 hours

Salts	G salt dissolved in 100 ccm H ₂ O	Mg Cu dissolved
H ₂ O		0 11
KNO ₃	0 01 0 05 5 00	0 07 0 13 0 16
NaNO ₃	0 05 5 00	0 18 0 19
CaSO ₄	0 05	0 11
K ₂ SO ₄	0 05 5 00	0 12 0 28
MgSO ₄	0 05 5 00	0 16 0 34
Na ₂ CO ₃	0 01 0 05 5 00	0 05 0 11 2 80
K ₂ CO ₃	0 05 5 00	0 14 2 35
NaCl	0 01 0 05 5 00	0 05 0 18 7 50
KCl	5 00	8 17
(NH ₄) SO ₄	0 05 5 00	0 66 28 50
NH ₄ NO ₃	0 01 0 05 5 00	0 17 0 66 60 00
NH ₄ Cl	0 05 5 00	0 92 158 75

At 100° the action of KNO₃, K₂SO₄, and NH₄NO₃ is diminished while that of (NH₄) SO₄, Na₂CO₃, and NaCl is increased

Tables are also given for mixtures of the above salts (Cunliffe Chem Soc 30 1)

Solubility of Cu in dilute salt solutions. 11 5 sq cm Cu were used, and the action continued one week, while air with or without CO₂ was passed through the solution continually

100 ccm solution of the following salts dissolved the given amts Cu

Salt	G salt dissolved in 100 ccm H ₂ O	Mg Cu dissolved with out CO ₂	Mg Cu dissolved with CO ₂
NaCl	0 50	4	115
KCl	0 50	4	115
MgCl ₂	0 83	5	112
NH ₄ Cl	1 00	904	138
K ₂ SO ₄	1 00	0	4
KNO ₃	1 00	0	3
Na ₂ CO ₃	1 00	0	
NaOH	0 923	0	
CaO ₂ H ₂	sat	0	

(Wagner, Dingl 221 260)

Distilled H₂O dissolved no Cu from 420 sq mm in 150 hours at ord temp

NH₄NO₃+Aq with less than 0.4 g per litre showed the same result

KNO₃+Aq or (NH₄)₂SO₄+Aq containing 0.1 to 0.2 g per litre dissolved no Cu

H₂O containing carbonates+nitrates, carbonates+sulphates, or chlorides+nitrates also dissolved no Cu

NH₄NO₃+Aq containing 0.4 g per litre dissolved 3 mg per litre after 150 hours contact

From a surface of 2100 sq m of Cu, H₂O charged with CO₂ at ord pressure, and containing the following salts in solution, dissolved the given amts Cu in 120 hours

Salt	G salt dissolved in 1 l H ₂ O	Mg Cu dissolved
H ₂ O		1 0
K ₂ CO ₃	0 2	0 2
CaCl ₂	0 2	1 80
NH ₄ NO ₃	0 02	1 40
NH ₄ NO ₃	0 04	1 40
K ₂ CO ₃ + NH ₄ NO ₃	0 1	
NH ₄ NO ₃ + K ₂ CO ₃	0 02	1 00
K ₂ CO ₃ + NH ₄ NO ₃	0 2	
NH ₄ NO ₃ + CaCl ₂	0 04	0 1
	0 2	3 6

From a surface of 2100 sq m, H₂O charged with CO₂ at pressure of 6 atmos dissolved 0.6 mg in 48 hours

H₂O when charged with CO at 6 atmos and containing

16 mg NH₄NO₃ per litre, dissolved 0.8 mg in 48 hours

80 mg NH₄NO₃ per litre, dissolved 1.4 mg in 48 hours

40 mg K₂CO₃ per litre, dissolved 1.2 mg in 48 hours (Muir, Proc Soc Manchester, 15 31)

Sol in KCN+Aq (Goyder, C N 1894, 69 262)

A solution of (NH₄)₂S₂O₈ containing 0.829 g

in 110 cc dissolves 0.2050-0.2279 g Cu (Turrentine, J phys Chem 1907, 11 625)

Sl attacked by liquid NH₃ (Franklin, Am Ch J 1898, 20 827)

Amts Cu dissolved by action of various oils on 8 sq in Cu by 10 days' exposure and subsequent 67 days—

	Amt Cu dissolved in 10 days	Amt Cu dissolved in subsequent 67 days
Linseed oil	0 3000 grain	0 2435 grain
Olive oil	0 2200 "	0 0200 "
Colza oil	0 0170 "	0 1230 "
Almond oil	0 1030 "	0 1170 "
Seal oil	0 0485 "	0 0315 "
Sperm oil	0 0030 "	0 0575 "
Castor oil	0 0065 "	0 0035 "
Neatsfoot oil	0 1100 "	
Sesame oil	0 1700 "	0 0015 "
Paraffine oil	0 0015 "	

(Watson, C N 36 200)

Qualitative results of the action of various oils on Cu are also given by Thompson (C N 34 176, 200, 219)

½ ccm oleic acid dissolves 0.0157 g Cu in 6 days (Gates, J phys Chem 1911, 15 143)

Sol in an alkaline solution of gelatine (3.54 %) copper gauze dissolved in 48 hours (Lidoff, C C 1899, II 471)

Cuprous acetylde, Cu C₂

Decomp by heating with H₂O or KCN+Aq Decomp by HNO₃ (Keiser, Am Ch J 1892, 14 289)

Not decomp by H₂SO₄, NH₄OH, KOH + Aq or acetic acid, even on warming The dry salt is sol in very dil HCl+Aq without evolution of gas Sol in conc KCN+Aq (Bottger, A 1859, 109 356)

Cupric acetylde, CuC

Easily sol in HCl Turns brown in the air and becomes insol in acids (Phillips, Z anorg 1894, 6 241)

3Cu₂C₂O₃+2H₂O Solubility as that of Cu₂C₂H₄O₃ (Soderbaum B 1897 30 764)

Cu₂C₂H₄O₃ Insol in H₂O When dry is violently decomp by conc H₂SO₄ or not too dil HNO₃ Rapidly decomp by warming with dil acids especially HCl

Insol in NH₄OH+Aq in absence of air partially sol in presence of air

Insol in organic solvents (Soderbaum B 1897, 30 762)

Cuprous acetylde iodide, Cu CI CuI

Ppt (Berthelot and Delepine A ch 1900, (7) 19 54)

Cupric arsenide, Cu_3As_2

(Reinsch, J pr **24** 244)
 Cu_4As_2 (Gehlen)
 Cu_3As_2 Ppt Decomp by acids (Kane, Pogg **44** 471)
 Cu_3As Min *Domeykite* Insol in HCl
 +Aq, sol in HNO_3
 Cu_6As Min *Algodonite*
 Cu_5As Min *Darwinite*

Cuprous azoimide, CuN_3

Insol in H_2O (Curtius)
 Sensitive to sunlight (Wohler, B 1913, **46** 2053)

Cupric azoimide, basic, CuO , CuN_3

Insol in H_2O (Wohler, B 1913, **46** 2055)

Cupric azoimide, CuN_3

Very explosive
 Very sl sol in H_2O Decomp by boiling with H_2O (Curtius, J pr 1898, (2) **58** 296)

Copper azoimide ammonia, CuN_3 , 2NH_3

Ppt Insol in H_2O Easily sol in dil acids (Dennis, J Am Chem Soc **1907** 29, 19)

Copper boride, Cu_3B_2

(Marsden, J B, **1880** 330)

Cuprous bromide, Cu_2Br_2

1 l H_2O dissolves at $18^\circ\text{--}20^\circ$
 0 4320 millimols bromine
 0 3157 " cupric copper
 0 1061 " cuprous copper
 (Bodlander, Z anorg 1902, **31** 460)

Sol in HBr, HCl without decomp, or HNO_3 +Aq with decomp, also in NH_4OH +Aq Insol in boiling conc H_2SO_4 or $\text{HC}_2\text{H}_3\text{O}_2$ +Aq (Berthelot, A ch **44** 385)
 Sol in H_2SO_3 +Aq (Lean and Whatmough, Chem Soc 1898, **73** 151)
 Sol in NaCl, and $\text{Na}_2\text{S}_2\text{O}_3$ +Aq (Renault, C R **59** 319)

Solubility of Cu_2Br_2 in KBr+Aq
 All values recorded in millimols per litre

KBr	Total copper	Cupric copper	Cuprous copper
25	0 119	0 012	0 107
40	0 200	0 013	0 187
60	0 310	0 025	0 285
80	0 423	0 012	0 411
100	0 5836		0 5836
120	0 6934		0 6934
500	8 719		8 719

(Bodlander and Storbeck, Z anorg 1902, **31** 462)

Difficultly sol in methyl acetate (Naumann, B 1909, **42** 3790)

Sol in ethyl acetate (Naumann, B 1910 **43** 314)

Insol in acetone (Naumann, B 1904 **37** 4329, Eidmann, C C **1897**, II 1014)

100 g acetonitrile dissolve 3 86 g Cu_2Br at 18° (Naumann and Schier, B 1914, **47** 249)

Sol in pyridine (Naumann, B 1904, **37** 4609)

Mol weight determined in pyridine methyl and ethyl sulphides (Werner, Z anorg 1897, **15** 19, 26, and 28)

Cupric bromide, CuBr_2

Deliquescent Very sol in H_2O Insol in benzene (Franchimont, B **16** 387)

Very sl attacked by cold or even hot H_2SO_4 (Viard, C R 1902, **135** 169)

Moderately sol in liquid NH_3 (Horr Am Ch J 1908, **39** 219)

100 g 95% formic acid dissolve 0 16 g at 21° (Aschan, Ch Z 1913, **37** 1117)

100 g acetonitrile dissolve 24 43 g CuBr at 18° (Naumann and Schier, B 1914, **47** 249)

Sol in benzonitrile (Naumann, B 1914 **47** 1369)

Sol in methyl acetate (Naumann, B 1909, **42** 3790)

Sol in acetone (Naumann, B 1904, **3** 4328)

Sol in acetone with a brown color (Eidmann, C C **1899**, II 1014)

+ $2\text{H}_2\text{O}$ (?) (Berthelot, A ch 183 **44** 385)

+ $4\text{H}_2\text{O}$ Very sol in H_2O (Sabatier Bull Soc 1894, (3) **11** 677)

Cupric hydrogen bromide, CuBr , HBr $2\text{H}_2\text{O}$

Decomp by H_2O (Sabatier Bull Soc 1894, (3) **11** 681)

+ $10\text{H}_2\text{O}$ (Weinland and Knoll, Z anorg 1905, **44** 116)

Cupric lithium bromide, $\text{CuBr}_2 \cdot 2\text{LiBr} + 6\text{H}_2\text{O}$

Very hygroscopic (Sementschenko, anorg 1899, **19** 336)

Very hygroscopic, decomp by H_2O (Kurnakoff, C C **1899**, I 16)

Cupric potassium bromide, CuBr_2 , KBr

Decomp by H_2O (Sabatier, Bull Soc 1894, (3) **11** 683)

Cuprous bromide ammonia, Cu_2Br_2 , 2NH_3

Stable when dry

Easily sol in HNO_3 and NH_4OH +Aq Other mineral acids and acetic acid separate

CuBr_2 (Richards, Z anorg 1898, **17** 24)

$\text{Cu}_2\text{Br}_2 \cdot 6\text{NH}_3$ (Lloyd)
 $\text{Cu}_2\text{Br}_2 \cdot 3\text{NH}_3$ (Lloyd, J phys Che 1908, **12** 399)

Cupric bromide ammonia, $\text{CuBr}_2 \cdot 2\text{NH}_3$

Sol in $\text{NH}_4\text{Br} + \text{Aq}$ without decomp (Richards, B 23 3790)

$3\text{CuBr}_2 \cdot 10\text{NH}_3$ Decomp by H_2O (Richards, Am Ch J 15 651)

$\text{CuBr}_2 \cdot 3\text{NH}_3$ Completely sol in a little H_2O , but is decomp by dilution Insol in alcohol (Rammelsberg, Pogg 55 246)

$\text{CuBr}_2 \cdot 4\text{NH}_3 + \text{H}_2\text{O}$ 100 pts H_2O dissolve 69.03 pts $\text{CuBr}_2 \cdot 4\text{NH}_3$ at 25° (Pudschies, Dissert)

$\text{CuBr}_2 \cdot 5\text{NH}_3$ As above (Rammelsberg)

$\text{CuBr}_2 \cdot 6\text{NH}_3$ Sol in small amts of H_2O , but decomp on dilution (Richards)

Cupric bromide nitric oxide, $\text{CuBr}_2 \cdot \text{NO}$

Decomp by H_2O (Manchot, B 1914, 47 1607)

Cuprous chloride, Cu_2Cl_2

1.53 g Cu_2Cl_2 dissolve in 100 g H_2O at 21.5° , 1.55 g at 26.5° (Kremann and Noss, M 1912, 33 1206)

Solubility of Cu_2Cl_2 in H_2O in an atmosphere of hydrogen

Solubility is recorded in mg-atoms per l

t°	Total Cu	CuCl_2 by analysis	Cl	Cu Cl ₂ calc	Cu_2Cl_2 by analysis
	2 752	2 124	5 672	0 628	
20 2	2 919	2 254	5 525	0 665	0 420
19 6	2 971	2 294	5 464	0 677	0 474
19 3	2 861	2 245	5 464	0 616	0 499

(Bodlander, Z anorg 1902, 31 12)

Solubility of Cu_2Cl_2 in H_2O in an atmosphere of CO_2

Solubility is recorded in mg-atoms per l

t	Total Cu	CuCl_2 by analysis	Cl	Cu Cl ₂ by analysis	Cu Cl ₂ calc
20 6	2 818		5 235	0 525	
21 7	2 805	2 243	5 430	0 516	0 562
	2 880	2 258	5 312	0 391	0 662
19 7	2 805	2 138	5 390	0 336	0 667

(Bodlander, l c)

Sol in conc $\text{HCl} + \text{Aq}$, insol in dil HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ Not attacked by cold conc H_2SO_4 , and only sl on warming (Rosenfeld, B 12 954) Sol in $\text{NH}_4\text{OH} + \text{Aq}$, sol in hot NaCl , KCl , FeCl_3 , ZnCl_2 , MnCl_2 , etc + Aq 1 mol $\text{Na}_2\text{S}_2\text{O}_3$ in aqueous solution dissolves 1 mol Cu_2Cl_2 (Winkler, J pr 88 428) Sol in KI , I_2 , KCN , or $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Renault, C R 59 558)

Solubility in $\text{HCl} + \text{Aq}$ at 17° $\frac{\text{Cu}_2\text{Cl}_2}{2} =$
 $\frac{1}{2}$ mols CuCl_2 in mgs in 10 ccm solution $\text{HCl} =$ mols HCl in ditto

$\frac{\text{Cu}_2\text{Cl}_2}{2}$	HCl	Sp gr
0 475	8 975	1 050
1 4	15 7	
1 575	18 2	
4 5	34 5	1 080
8 25	47 8	1 135
11 5	57 0	

(Chateher, calc by Engel, A ch (6) 17 377)

Solubility of Cu_2Cl_2 in $\text{HCl} + \text{Aq}$ at 0°

$\frac{\text{Cu}_2\text{Cl}_2}{2}$	HCl	Sp gr
1 5	17 5	1 049
2 9	26 0	1 065
8 25	44 75	1 132
15 5	68 5	1 261
33 0	104 0	1 345

(Engel, l c)

Freshly pptd Cu_2Cl_2 is sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Lean and Whatmough, Chem Soc 1898, 73 150)

Sl sol in normal $\text{NH}_4\text{OH} + \text{Aq}$ only by shaking several hours, a 0.02 normal solution of cuprous copper being obtained (Gaus, Z anorg 1900, 25 258)

Insol in $\text{Na}_2\text{S}_2\text{O}_5 + \text{Aq}$ (Siewert, Gm K 5 1, 893)

Sol in alkyl triphosphites (Arbusoff, C C 1906, II 750)

Solubility in $\text{FeCl}_2 \cdot 4\text{H}_2\text{O} + \text{Aq}$ at 21.5°

In 100 g H_2O		Solid phase
g FeCl_2	g CuCl_2	
	1 535	Cu_2Cl_2
6 015	1 33	"
11 62	1 81	"
16 30	3 11	"
26 305	7 125	"
29 35	8 06	"
33 125	9 565	"
43 75	12 44	"
54 00	17 04	"
66 40	21 60	"
73 20	23 20	"
71 895	21 655	$\text{Cu}_2\text{Cl}_2 + \text{FeCl}_2 \cdot 4\text{H}_2\text{O}$
69 34	11 895	$\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$
65 10		"

(Kremann and Noss, M 1912, 33 1208)

Solubility of Cu_2Cl_2 in $\text{KCl} + \text{Aq}$ at t° Determined in an atmosphere of CO_2

t°	g mol KCl per l	g atoms Cu per l
18 3	0 05	0 002411
16	0 1	0 004702
16	0 2	0 009458
19 2	1 0	0 0970
16 4	2 0	0 3840

(Bodlander and Storbeck, Z anorg 1902, 31 17)

Solubility of Cu_2Cl_2 in $\text{KCl} + \text{Aq}$ at t° Determined in an atmosphere of CO_2
All values recorded in millimols per litre

t°	KCl	Cupric copper	Total copper	Cuprous copper calc	Cl
20°	0	2 222	2 851	0 629	5 436
19	1	1 901	2 385	0 484	5 287
19	2	1 571	2 150	0 589	5 614
19	2 5	1 421	1 955	0 534	6 015
19	3	1 523	1 983	0 460	6 247
16	5	1 008	1 522	0 514	7 525
18	10	0 475	1 236	0 761	11 735
20	15	0 322	1 344	1 022	16 437
19	20	0 324	1 446	1 122	21 356
19	30	0 1308	1 761	1 630	31 911
18	50	0 1038	2 411	2 302	
16	100	0	4 702	4 702	
16	200	0	9 485	9 485	
19	1000	0	97 0	97 0	
16	2000	0	384 0	384 0	

(Bodlander and Storbeck, Z anorg 1902, 31 24)

Solutions of 0.05 = 0.4 normal KCl dissolve Cu_2Cl_2 with the formation of KCuCl_2 , those of higher concentration with the formation of K_2CuCl_3 (Bodlander and Storbeck, Z anorg 1902, 31 41)

Solubility of $\text{Cu}_2\text{Cl}_2 + \text{KCl}$ in H_2O at 22°

G in 1 g of solution		Solid Phase
Cu_2Cl_2	KCl	
0 00115	0 0387	Cu_2Cl_2
0 00405	0 0656	"
0 00861	0 0824	"
0 0137	0 0984	"
0 0219	0 1133	"
0 0390	0 1406	"
0 0484	0 1530	"
0 0675	0 1639	"
0 0719	0 1747	"
0 0863	0 1839	"
0 1043	0 2027	"
0 1084	0 2018	"
0 1021	0 2031	"
0 1204	0 2095	"
0 1332	0 2164	"

Solubility of $\text{Cu}_2\text{Cl}_2 + \text{KCl}$ in H_2O at 22° — Continued

G in 1 g of solution		Solid Phase
Cu_2Cl_2	KCl	
0 1621	0 2330	Cu_2Cl_2
0 1723	0 2384	"
0 1907	0 2374	"
0 2148	0 2516	"
0 2145	0 2506	$\text{Cu}_2\text{Cl}_2 + \text{Cu}_2\text{Cl}_2, 4\text{KCl}$
0 2149	0 2549	$\text{Cu}_2\text{Cl}_2, 4\text{KCl}$
0 1548	0 2387	"
0 1473	0 2363	"
0 1399	0 2357	"
0 1439	0 2389	"
0 1451	0 2363	"
0 1155	0 2320	"
0 1139	0 2350	"
0 0953	0 2359	"
0 0735	0 2349	"
0 0555	0 2389	"
0 0453	0 2404	"
0 0366	0 2433	"
0 0314	0 2503	"
0 0285	0 2499	"
0 0265	0 2523	"
0 0220	0 2628	"
0 0193	0 2687	"
0 0176	0 2698	"
0 0193	0 2703	$\text{Cu}_2\text{Cl}_2, 4\text{KCl} + \text{KCl}$
0 0160	0 2706	KCl
0 0124	0 2668	"
0 0058	0 2632	"
0 0000	0 2568	"

(Bronsted, Z phys Ch 1912, 80 205)

Solubility in $\text{NaCl} + \text{Aq}$

Sat $\text{NaCl} + \text{Aq}$ dissolves 16.9% Cu_2Cl_2 90°, 11.9% at 40°, and 8.9% at 11°
15% $\text{NaCl} + \text{Aq}$ dissolves 10.3% Cu_2Cl_2 90°, 6.0% at 40°, and 3.6% at 14°
5% $\text{NaCl} + \text{Aq}$ dissolves 2.6% Cu_2Cl_2 90°, and 1.1% at 40° (Hunt, Sill Am (2) 49 154)

Solubility in $\text{NaCl} + \text{Aq}$ at 26.5°

In 100 g H_2O		Solid Phase
Cu_2Cl_2	NaCl	
1 55		Cu_2Cl_2
3 15	10 80	"
7 30	20 70	"
40 60	27 00	"
49 10	36 48	"
57 21	44 14	$\text{Cu}_2\text{Cl}_2 + \text{NaCl}$
41 40	55 95	NaCl
18 70	50 90	"

(Kremann and Noss, M 1912, 33 1210)

Solubility of Cu_2Cl_2 in $\text{CuSO}_4 + \text{Aq}$ at t°
Values recorded in millimols per l

t°	Conc of CuSO_4	Cupric copper	Total copper	Cuprous copper calc	Cl
19 7		2 258	2 880	0 622	5 312
16 3	0 49375	2 746	3 125	0 379	4 805
18 6	0 9875	3 145	3 602	0 457	4 908
17 5	1 4812	3 315	3 915	0 600	4 530
19 4	1 975	4 131	4 553	0 422	4 687
20 4	2 4687	4 349	4 786	0 437	4 287
20 5	2 9625	4 625	5 193	0 509	4 256
20 1	4 9375	6 546	7 276	0 730	4 329

(Bodlander and Storbeck, Z anorg 1902, 31 22)

Insol in SbCl_3 (Klemensiewicz, Bull Acad Crac 1908, 6, 485)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20, 827)

Insol in alcohol

Sl sol in ether (Gehlen)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Sol in pyridine (Schroeder, Dissert 1901)

Insol in phosgene (Eidmann, Dissert 1899)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Alexander, Dissert 1899) (Naumann, B 1904, 37 3601)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

100 g acetonitrile dissolve 13 33 g CuCl_2 at 18° (Naumann and Schier, B 1914, 47 249)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in hot benzonitrile and other aromatic nitriles (Werner, Z anorg 1897, 15 7)

Mol weight determined in pyridine methyl and ethyl sulphides (Werner, Z anorg 1897, 15 19, 25 and 28)

Min Nantokite Sol in HCl , HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$

Cupric chloride, CuCl_2

Deliquescent 100 pts H_2O dissolve 70 6 pts CuCl_2 at 0° , 100 pts $\text{CuCl}_2 + \text{Aq}$ contain 41 4 pts CuCl_2 (Engel, A ch (6) 17 350)

100 pts H_2O dissolve 76 2 pts CuCl at $16 1^\circ$, or 100 pts $\text{CuCl}_2 + \text{Aq}$ sat at $16 1^\circ$ contain 43 25 pts CuCl_2 (Rudorff, B 6 484)

100 pts $\text{CuCl}_2 + \text{Aq}$ sat at 17° contain 43 06 pts CuCl_2 at $31 5^\circ$, contain 44 7 pts CuCl_2 Coefficient of solubility = $41 4 + 0 105t$ (Reicher and Deventer, Z phys Ch 5 560)

Sat $\text{CuCl}_2 + \text{Aq}$ contains at

-20°	-5°	$+12^\circ$	17°	32°
37	38 8	39 3	41 7	43 2 $\frac{1}{2}$ CuCl_2
39	55	68	73	91
44 0	46 5	47 9	48 6	51 0 $\frac{1}{2}$ CuCl_2

(Etard, A ch 1894, (7) 2 536)

Sp gr of $\text{CuCl}_2 + \text{Aq}$ at $17 5^\circ$

% CuCl_2	Sp gr	% CuCl_2	Sp gr
5	1 0455	25	1 2918
10	1 0920	30	1 3618
15	1 1565	35	1 4447
20	1 2223	40	1 5284

(Franz, J pr (2) 5 274)

Sp gr of $\text{CuCl}_2 + \text{Aq}$ at $22 9^\circ$, containing in 1000 g H_2O , g $\text{CuCl}_2 + 2\text{H}_2\text{O}$

85 5 (= $\frac{1}{2}$ mol) 171 255 5 g $\text{CuCl}_2 + 2\text{H}_2\text{O}$, 1 057 1 108 1 154

342 427 5 513 g $\text{CuCl}_2 + 2\text{H}_2\text{O}$, 1 197 1 238 1 275

598 5 684 g $\text{CuCl}_2 + 2\text{H}_2\text{O}$, 1 309 1 341

769 5 855 g $\text{CuCl}_2 + 2\text{H}_2\text{O}$, 1 371 1 399

940 5 1 026 g $\text{CuCl}_2 + 2\text{H}_2\text{O}$, 1 425 1 449

Containing CuCl (anhydrous)

67 5 (= $\frac{1}{2}$ mol) 135 202 5 270 g CuCl_2 , 1 059 1 114 1 165 1 213

337 5 405 472 5 g CuCl , 1 257 1 299 1 30

540 607 5 675 g CuCl , 1 379 1 416 1 453

(Gerlach, Z anal 28 465)

Sp gr of $\text{CuCl} - \text{Aq}$ at 0 $S = \text{pts CuCl}$ in 100 pts solution $S = \text{mols CuCl}$ in 100 mols of solution

S	S	S
39 4170	8 00	1 4 $\frac{1}{2}$
35 3839	6 52	1 41 $\frac{1}{2}$
30 9255	5 65	1 352 $\frac{1}{2}$
26 1129	4 51	1 285 $\frac{1}{2}$
20 6697	3 56	1 2204
14 5820	2 25	1 144 $\frac{1}{2}$
8 0732	1 16	1 0 $\frac{1}{2}$

(Charpy, A ch (6) 29 2)

Tables for 7° , 30° , $49 2^\circ$ and 60° are also given by Charpy

Sp gr of $\text{CuCl} - \text{Aq}$ at room temp containing

12 006 21 349 35 027 $\frac{1}{2}$ CuCl , 1 1037 1 2154 1 3512

(Wagner, W Ann 1885 18 273)

Sp gr at 20° of $\text{CuCl}_2 + \text{Aq}$ containing M mols CuCl_2 per liter			
M	0 01	0 05	0 075
Sp gr	1 001208	1 00637	1 009264
M	0 10	0 20	0 50
Sp gr	1 012614	1 030991	1 051479
M	0 75		1 0
Sp gr	1 090912		1 120249
M	1 5		2 0
Sp gr	1 177618		1 234551

(Jones and Pearce, Am Ch J 1907, 38 717)

Sp gr of $\text{CuCl}_2 + \text{Aq}$ at 25°

Concentration of $\text{CuCl}_2 + \text{Aq}$	Sp gr
1—normal	1 0624
$\frac{1}{2}$ —“	1 0313
$\frac{1}{4}$ —“	1 0158
$\frac{1}{8}$ —“	1 0077

(Wagner, Z phys Ch 1890, 5 38)

Much less sol in $\text{HCl} + \text{Aq}$ than in H_2O
 1 l $\text{HCl} + \text{Aq}$ containing 45 pts HCl to 100
 pts H_2O dissolves only 290 g CuCl_2 at 12°;
 whereas 1 l H_2O at 12° dissolves 630 g CuCl_2
 (Ditt, C R 1881, 92 353)

Solubility in $\text{HCl} + \text{Aq}$ at 0° $\frac{\text{CuCl}_2}{2} =$
 $\frac{1}{2}$ mols in milligrammes in 10 cem
 solution $\text{HCl} = \text{mols HCl}$ in ditto, H_2O
 $= \text{g H}_2\text{O}$

$\frac{\text{CuCl}_2}{2}$	HCl	Sum of equiv	Sp gr	H O
91 75	0	91 75	1 490	8 73
86 8	1 5	91 3	1 475	8 74
83 2	7 8	91	1 458	
79 35	10 5	89 8	1 435	8 64
68 4	20 25	88 6	1 389	8 36
50 0	37	87	1 319	8 47
22 8	70 25	93 0	1 231	8 21
23 5	102 5	126	1 288	7 56
26 7	128	154 7	1 323	6 77

(Engel, A ch (6) 17 311)

Not decomp by cold H_2SO_4 Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ Very sol in conc $\text{NaCl} + \text{Aq}$ (Boussingault)Solubility of CuCl in $\text{NH}_4\text{Cl} + \text{Aq}$ at 30°

NH_4Cl	CuCl	Solubility
29 5	0	NH_4Cl
28 6	1 9	$\text{NH}_4\text{Cl} + \text{CuCl} \cdot 2\text{NH}_4\text{Cl} \cdot \text{H}_2\text{O}$
12 1	15 6	$\text{CuCl} \cdot 2\text{NH}_4\text{Cl} \cdot \text{H}_2\text{O}$
2 03	15 2	$\text{CuCl} \cdot 2\text{NH}_4\text{Cl} \cdot \text{H}_2\text{O} + \text{CuCl} \cdot 2\text{H}_2\text{O}$
0	13 95	$\text{CuCl} \cdot 2\text{H}_2\text{O}$

(Schreinemakers, Z phys Ch 1909, 66 688)

See also $\text{NH}_4\text{Cl} + \text{CuCl}_2$ under ammonium chlorideSolubility of $\text{CuCl}_2 + \text{HgCl}_2$ in H_2O at 35°

% HgCl_2	% CuCl_2	Solid Phase
0	44 47	$\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$
21 03	33 50	“
37 30	26 07	“
44 47	23 31	“
50 47	21 50	$\text{CuCl}_2 + \text{HgCl}_2$
52 44	19 40	HgCl_2
52 54	18 46	“
52 81	18 06	“
51 03	14 73	“
49 50	5 94	“
23 87	2 64	“
8 51	8 51	“

(Schreinemakers and Thonus, Proc K Akad Wet 1912, 15 472)

Solubility of $\text{CuCl}_2 + \text{KCl}$ in H_2O at t°

t°	Cl per g of solution		Mols per 100 mols H_2O		
	As CuCl_2	As KCl	CuCl_2	KCl	
39 4	0 120	0 107	5 56	9 93	$\text{CuCl} \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O} + \text{KCl}$
40 0	0 120	0 115	6 39	11 4	
41 0		2	7 1	13 6	
42 0			1	18 8	
90 5	0 158	0 154	14 9	21 4	$\text{CuCl} \cdot \text{KCl} + \text{KCl}$
93 7	0 191	0 156	16 2	26 0	
98 5		17	28 7		$\text{CuCl} \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O} + \text{CuCl} \cdot 3\text{H}_2\text{O}$
0	-	9 84	1 94		
39 6	0 232	0 049	12 9	5 44	
40 1	0 233	0 09	13 7	6 90	
42 9	0 241	0 062	14 8	7 3	
40 2	0 216	0 066	15 8	8 49	$\text{CuCl} \cdot \text{KCl} + \text{CuCl} \cdot 2\text{H}_2\text{O}$
42 6	0 233	0 063	16 8	8 33	
61 2			11 9	11 6	$\text{CuCl} \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O} + \text{CuCl} \cdot \text{KCl}$
72			11 8	1 30	$\text{CuCl} \cdot \text{KCl}$

(Meyrhofer, Z phys Ch 1890, 5 102)

100 g H_2O dissolve 72 6 g $\text{CuCl} + 16 0 \text{ g NaCl}$ (Rudorff, B 6 684)Solubility of $\text{CuCl} + \text{NaCl}$ in H_2O at 30

NaCl	CuCl	Solubility
0		$\text{CuCl} \cdot 2\text{H}_2\text{O}$
3 10	13 95	
1 28	11 14	
0 11	9 10	
10 25	36 86	$\text{CuCl} + \text{NaCl}$
12 02	32 38	NaCl
12 25	32 40	“
13 54	28 64	“
15 40	23 72	“
18 41	16 98	“
20 61	11 03	“
26 47	0	“

(Schreinemakers and de Baat, Z phys Ch 1909, 65 586)

Solubility of CuCl_2 in $\text{CuSO}_4 + \text{Aq}$ at 30°

Composition of the solution		Solid phase
% by wt CuCl_2	% by wt CuSO_4	
0	20 32	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
6 58	13 62	"
15 68	8 93	"
25 67	4 77	"
39 48	3 21	"
42 77	2 89	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O} + \text{CuCl}_2 \cdot 2\text{H}_2\text{O}$
42 47	2 90	"
43 25	1 14	$\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$
43 95	0	"

(Schreinemakers, Z phys Ch 1909, 69 561)

Insol in liq uid NH_3 (Gore, Am Ch J 1898, 20 827)

Sl sol in liq uid HF (Franklin, Z anorg 1905, 46 2)

Sol in alcohol and ether

Sol in 1 pt strong alcohol

100 pts absolute methyl alcohol dissolve 68 pts CuCl_2 at 15.5° , 100 pts absolute ethyl alcohol dissolve 53 pts CuCl_2 at 15.5° (de Bruyn, Z phys Ch 10 783)See also under $\text{CuCl} + 2\text{H}_2\text{O}$ Solubility of $\text{CuCl} + \text{KCl}$ in absolute alcohol at 25°

% CuCl_2	% KCl	Solid Phase
1 27	0 28	$\text{KCl} + \text{KCl}, \text{CuCl}_2$
1 51	0 28	
2 15		$\text{KCl}, \text{CuCl}_2$
5 25		
30 16		$\text{KCl}, \text{CuCl} + \text{CuCl}, \text{C}_2\text{H}_5\text{OH}$
34 17	0 21	
34 45	0 21	"
34 29	0 21	
33 97	0 00	$\text{CuCl}, \text{C}_2\text{H}_5\text{OH}$

(Foote and Walden, J Am Chem Soc 1911, 33 1032)

Solubility of $\text{CuCl} + \text{KCl}$ in acetone at 25°

% CuCl_2	% KCl	Solid Phase
0 34	0 38	$\text{KCl} + \text{KCl}, \text{CuCl}_2$
0 48		
1 50		"
2 06		
2 49	0 27	$\text{KCl}, \text{CuCl} + \text{CuCl}, \text{C}_2\text{H}_5\text{OH}$
2 32		

(Foote and Walden, J Am Chem Soc 1911, 33 1032)

100 g of sat solution of CuCl_2 in ethyl alcohol contains 33.97 g CrCl_2 (Foote and Walden, J Am Chem Soc 1911, 33 1032)Easily sol in acetone (Krug and M Elroy, J Anal Ch 6 184)
Insol in benzene

Solubility in organic solvents

Solvent	t	Sat solution contains % CuCl
Methyl alcohol	22	36.8
	40	37.5
	50	37.1
	60	37.5
Abs ethyl alcohol	0	32.0
	19	35.7
	20	35.9
	38	38.5
	50	41.7
Propyl alcohol	-15	26.8
	19	30.9
	37	30.7
	57	30.3
	62	30.5
Allyl alcohol	-20	23.4
	-4	23.6
	27	22.9
	32	23.3
N-butyl alcohol	0	15.2
	23	15.8
	37	15.7
	55	16.1
	84	16.2
	92	16.7
Ethyl formate	-20	10.2
	+24	9.4
	37	7.4
	50	7.2
Ethyl acetate	+20	3.0
	40	2.5
	72	1.3
Acetone	-20	18.4
	-8	18.8
Isopropyl alcohol	52	11.0
	70	28.3
	84	28.7

(Etard, A ch 1894 (7) 2 560)

See also under $\text{CuCl} + 2\text{H}_2\text{O}$ 1 g CuCl is sol in 1.1 g methyl acetate at 18° . Sp gr 18.4° of the sat solution = 0.939 (Naumann, B 1909, 42 3793)1 g CuCl is sol in 2.49 g ethyl acetate at 18° . Sp gr of sat solution $18.4^\circ = 0.9055$ (Naumann, B 1904, 37 3603)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

1 pt sol in 249.3 pts ethyl acetate at 10° (Alexander, Dissert 1899)

Solubility in acetone

34.7 g acetone dissolve 1 g CuCl_2 at 18°
Sp gr of sat solution 18°/4° = 0.8154 (Naumann, B 1904, 37 4329)

140 pts are sol in 100 pts acetone at 56° (Laszczyński, B 1894, 27 2287)

Sol in acetone and methylal 1 gram dissolves in 34.08 grams of acetone at 18° (Eidmann, C C 1899, II, 1014)

100 pts absolute ether dissolve 0.043 g CuCl_2 (Bodtker, Z phys Ch 1897, 22 511)

Mol weight determined in pyridine and methyl sulphide (Werner, Z anorg 1897, 15 20 and 25)

100 g sat solution in acetonitrile contains 1.57 g CuCl_2 (Naumann and Schier, B 1914, 47 249)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in boiling dipropylamine (Werner, Z anorg 1897, 15 34)

Sol in urethane (Lcy, Z phys Ch 1897, 22 81), (Castoro Z anorg 1899, 20, 61)

+ H_2O (Ditte, A ch (5) 22 551)

Sol in H_2O with slight decomp (Sabatier, Bull Soc 1895, (3) 13 601)

+ $\text{2H}_2\text{O}$ Deliquescent 100 g H_2O dissolve 121.4 g $\text{CuCl} + 2\text{H}_2\text{O}$ at 16.1° (Rudorff)

Aq sol at 35° contains 9.659 Mol % CuCl
" 15° " " 9.934 " "

(Schreinemakers, C C 1911, II 349)

$\text{CuCl} + 2\text{H}_2\text{O} + \text{Aq}$ sat at 30° contains 43.95% CuCl (Meerburg, C C 1904, II 1362)

43.95 g anhydrous CuCl are dissolved in 100 g $\text{CuCl} + \text{Aq}$ at 30° (Schreinemakers, Arch neer Sc 1910 [2] 15 117)

44.47% by weight anhydrous CuCl is dissolved in H_2O at 35° (Schreinemakers and Thonius Verh k Akad Wet Amst 1912, 21 333)

Solubility of $\text{CuCl} + 2\text{H}_2\text{O}$ in ethyl alcohol + Aq at 11°

Percent ethyl alcohol by volume	Gram $\text{CuCl} + 2\text{H}_2\text{O}$ in
99.3	1.175
98.3	1.116
96.3	1.097
95.3	1.070
94.3	1.059

Anhydrous salt dissolves readily in absolute ethyl alcohol, $\text{CuCl} + 2\text{H}_2\text{O}$ is precipitated by H_2O

Solubility of $\text{CuCl}_2 + 2\text{H}_2\text{O}$ in ethyl alcohol + Aq at 11.5° C under addition of increasing amounts of CuCl_2

P = Percent of ethyl alcohol by volume

G = Grams of CuCl_2 added

C_c = Grams of CuCl_2 in 5 cc of the solution

C_w = Grams of water in 5 cc of the solution, calculated from

- (1) the water content of the alcohol
- (2) the water of crystallization which had gone into solution
- (3) the water held mechanically in $\text{CuCl}_2 + 2\text{H}_2\text{O}$

P	G	C_w	C_c
89.3	0.000	0.794	1.137
90.3	"	0.744	1.122
91.3	"	0.695	1.104
92.3	"	0.648	1.090
94.3	"	0.561	1.096
95.3	"	0.517	1.095
96.3	"	0.478	1.116
97.3	"	0.440	1.140
98.3	"	0.396	1.194
99.3	"	0.369	1.208
"	0.223	0.330	1.295
"	0.444	0.290	1.395
"	0.665	0.270	1.506
"	0.887	0.247	1.639
"	1.106	0.223	1.772
"	1.324	0.205	1.921
"	1.540	0.191	2.086
"	1.739	0.179	2.236
"	1.957	0.164	2.400

(Bodtker, Z phys Ch 1897, 22 506-507)

100 pts absolute ether dissolve 0.061 g $\text{CuCl} + 2\text{H}_2\text{O}$ (Bodtker, Z phys Ch 1897 22 511)

0.11 pts are sol in 100 pts ether at 16°

0.11 " " " 100 " " 35°

8.86 " " " " 100 " acetone " 0°

8.92 " " " " 100 " " " 13.5°

(Laszczyński, B 1894 27 2286 and 2287)

Solubility in organic solvents at 10°

Solvent	t	Parts solvent require to dissolve 1 pt $\text{CuCl} + 2\text{H}_2\text{O}$ at t
Pure methyl alcohol	20°	7.3
	18.9	7.6
Ethyl alcohol (95%)	20.3	11.6
	19.6	11.9
Pure acetone	22.1	43.6
	20.0	44.2
90 pts ethyl alcohol (98%) + 10 pts H_2O	21.8	9.0
	23.0	8.5

Solubility in organic solvents at t°—Cont

Solvent	t°	Pts or solvent required to dissolve 1 pt CuCl ₂ + 2H ₂ O at t°
80 pts abs alcohol+20 pts H ₂ O	28 1	6 0
	20 7	6 2
80 pts acetone+20 pts H ₂ O	23 1	5 3
	21 8	5 6
80 pts acetone+20 pts methyl alcohol	23 1	12 0
	24 0	11 6
10 pts methyl alcohol+90 pts ethyl alcohol (98°)	24 2	5 4
	25 0	5 1
20 pts methyl alcohol+80 pts ord ether	24 1	15 1
	22 4	15 7
80 pts abs alcohol+20 pts ord ether	24 1	8 8
	25 0	8 5
Comm methyl alcohol	23 9	5 4
	23 0	5 6
85 pts pyridine+15 pts H ₂ O	24 4	63 4
	23 6	63 7
60 pts pyridine+40 pts H ₂ O	27 3	26 7
	28 0	26 2
75 pts α picoline+25 pts H ₂ O	26 1	51 6
	25 1	52 3
70 pts α picoline+30 pts H ₂ O	26 1	47 3

(de Coninck, C R 1900, 131 59)

Solubility in organic solvents

Sol in propyl alcohol, hot glycol, hot glycerine, hot paraldehyde, hot crys acetic acid, pure acetone, 30% methylamine+*Aq*, pure pyridine, pure α-picoline, acetonitrile, sl sol in isobutyl and amyl alcohols, crystallizable formic acid, ethyl acetate, insol in cold glycol, cold glycerine, cold paraldehyde, benzaldehyde, cold crystallizable acetic acid, ord ether, abs ether, hot and cold CS₂, cold aniline, cold orthotoluidine, methylene chloride, ethyl iodide, propyl iodide, ethylene bromide, benzene, toluene, xylene, ligroin, nitrobenzene, cold piperidine and essence of terebenthine (de Coninck, C R 1900, 131 59)

+5H₂O

Aq sol at 35° contains 2.921 Mol % CuCl₂
15° " 1 11

(Schreinemakers, C C 1911, II 349)

Cuprous hydrogen chloride, CuCl, HCl

Sol in H₂O (Neumann, M 1894, 15 493)Cupric hydrogen chloride, CuCl₂, HCl+3H₂O

Decomp by H₂O Sol in HCl+*Aq* below 0° (Engel, C R 106 273)

CuCl, 2HCl Deliquescent Very sol in H₂O (Alexander, Dissert 1899)

+5H₂O Properties as above (Sabbatier, C R 106 1724)

CuCl₂, 3HCl Sol in H₂O (Neumann M 1894, 15 493)

Cupric gold (auric) chloride, CuCl₂, 2AuCl₃+6H₂O

10% is sol in H₂O at 18° Valm. Z anorg 1911, 70 210)

Cupric lithium chloride, CuCl₂, LiCl+2½H₂O

Decomp on air Decomp by dissolving in H₂O Sol in conc LiCl+*Aq* without decomp

Decomp by alcohol (Chassevant, A ch (6) 30 33)

+2H₂O (Meyerhoffer, W A B 100, 2b 621)

Cupric mercuric chloride

Easily sol in H₂O (v Bonsdorff)

Cupric mercuric potassium chloride, CuCl₂, 3HgCl, 6KCl+2H₂O

Deliquescent in moist air Sol in boiling H₂O without decomp, and recrystallises if cooled slowly Insol in absolute alcohol (v Bonsdorff, Pogg 33 81)

Cuprous nitrosyl chloride, Cu₂Cl, 2NOCl

Very deliquescent and sol in H₂O with immediate decomp (Sudborough, Chem Soc 59 658)

Cuprous potassium chloride, CuCl, 4KCl

Sol in H₂O (Vitscherlich, A ch 73 384)
For solubility data, see CuCl—KCl under cuprous chloride

Cupric potassium chloride

CuCl, KCl (Meyerhoffer, Z phys Ch 3 336)

Sol in H₂O, only sl sol in conc HCl—*Aq* (Groger, Z anorg 1899 19 330)

CuCl, 2KCl—2H₂O Sol in H₂O and alcohol (Berzelius Pogg 13 478)

The composition of the hydrates formed by this salt at different dilutions is calculated from determinations of the lowering of the fr pt produced by the salt and of the conductivity and sp gr of its aqueous solutions (Jones, Am Ch J 1905 34 322)

For solubility data see CuCl—KCl under cupric chloride

Cupric rubidium chloride, CuCl, 2RbCl

Easily sol in H₂O and HCl—*Aq* (Godefroy, B 8 9)

+2H₂O Sol in H₂O Wvrouboff, J B 1887 538)

Cuprous sodium chloride

Very sol in H₂O

Cupric sodium chloride

Easily sol in conc NaCl+Aq Sol in alcohol of 0.837 sp gr

No double salt exists (Scheinemakers and de Paat, Z phys Ch 1909, 65 586)

Cupric thallic chloride, $\text{CuCl}_2, 2\text{TlCl}_3$

Sol in H_2O (Willm, A ch (4) 5 55)
+6 H_2O Can be cryst from H_2O
(Gewecke, A 1909, 366 225)

Cuprous chloride ammonia, $\text{Cu}_2\text{Cl}_2, \text{NH}_3$

(Lloyd, J phys Chem 1908, 12 399)
 $\text{Cu}_2\text{Cl}_2, 2\text{NH}_3$ Decomp by H_2O or acids,
not by alcohol (Ritthausen, J pr 59 369)
 $\text{Cu}_2\text{Cl}_2, 3\text{NH}_3$ (Lloyd, J phys Chem
1908, 12 399)
 $\text{Cu}_2\text{Cl}_2, 6\text{NH}_3$ (Lloyd, J phys Chem 1908
12 399)

Cupric chloride ammonia, $\text{CuCl}_2, 2\text{NH}_3$

Decomp by H_2O (Kane, A ch 72 273)
 $\text{CuCl}_2, 4\text{NH}_3$ Sol in H_2O (Bouzat, C R
1902, 135 294)

+ H_2O (*Cuprammonium chloride*) Sol
in H_2O and hot $\text{NH}_4\text{OH}+\text{Aq}$
+2 H_2O Sol in small amt of H_2O
 $\text{Cu}(\text{OH})_2$ is pptd by dilution (Bouzat,
A ch 1903, (7) 29 350)
 $\text{CuCl}_2, 5\text{NH}_3$ (Bouzat, A ch 1903, (7) 29
350)

+11 H_2O Sol in H_2O On dilution
 $\text{Cu}(\text{OH})_2$ is pptd Sol in $\text{NH}_4\text{OH}+\text{Aq}$,
solubility decreases as NH_3 concentration
increases (Bouzat, A ch 1903, (7) 29 350)
 $\text{CuCl}_2, 6\text{NH}_3$ (completely sol in H_2O
(Rose, Pogg 20 55)

Sol in H_2O but decomp by great dilution
with pptn of $\text{Cu}(\text{OH})_2$

Sol in liquid NH_3 (Bouzat, A ch
1903 (7) 29 350)

Cuprocupric chloride ammonia, $\text{CuCl} \cdot \text{CuCl} \cdot \text{NH}_3 + \text{H}_2\text{O}$

Decomp by H_2O or alcohol Abundantly
sol in $\text{NH}_4\text{Cl}+\text{Aq}$ but with partial decom-
position (Ritthausen)

Cupric chloride ammonia platinous chloride,

$\text{CuCl} \cdot 4\text{NH}_3, \text{PtCl}_4$
See Platodiamine cupric chloride

Cuprous chloride carbon monoxide,

$\text{CuCl} \cdot 2\text{CO} + \text{H}_2\text{O}$
Very sol in HCl (sp gr 1.19) with evolu-
tion of CO Sol in $\text{NH}_4\text{OH}+\text{Aq}$ (Min-
chot and Friend, A 1908, 359 110)
2 $\text{CuCl} \cdot \text{CO} + 2\text{H}_2\text{O}$ Insol in H_2O (Ber-
thelot, A ch 1896, (3) 46 488)
4 $\text{CuCl} \cdot \text{CO} + 7\text{H}_2\text{O}$ Insol in H_2O ,
but decomp therewith very quickly Sol
in $\text{CuCl}+\text{HCl}$

Cupric chloride hydrazine, $\text{CuCl}_2, 2\text{N}_2\text{H}_4$

Easily decomp (Hofmann and Marburg,
A 1899, 305 222)

Cuprous chloride mercuric sulphide, $\text{Cu}_2\text{Cl}_2, 2\text{HgS}$

Insol in H_2O , sol in conc hot $\text{HCl}+\text{Aq}$,
not decomp by boiling dil $\text{H}_2\text{SO}_4+\text{Aq}$, but
decomp by conc H_2SO_4 (Heumann, B 7
1390)

Cuprous fluoride, Cu_2F_2

Insol in H_2O or HF Sol in conc $\text{HCl}+\text{Aq}$,
from which it is precipitated by H_2O
Insol in alcohol (Berzelius, Pogg 1 28)
Decomp by H_2O into sol CuF_2 Sol in
boiling $\text{HCl}+\text{Aq}$ and in HNO_3+Aq Only
sl attacked by warm H_2SO_4 (Poulenc, C R
116 1447)

Cupric fluoride, CuF_2

Easily takes up H_2O to form $\text{CuF}_2 \cdot 2\text{H}_2\text{O}$
Sol in HCl , HNO_3 , or $\text{HF}+\text{Aq}$ (Poulenc, C
R 116 1448)

Solubility at 25° in $\text{HF}+\text{Aq}$

Normality of $\text{HF}+\text{Aq}$	g atoms Cu in 1000 c c of solution
0.12	0.0307
0.28	0.1164
0.57	0.2494
1.05	0.388
2.25	0.463

Solubility is decreased by presence of Kf
(Jugot, Z inorg 1901, 27 29)

Insol in liquid NH_3 (Gore, Am Ch J
1895, 20 527)

Insol in methyl acetate (Naumann, B
1909 42 3790) ethyl acetate (Naumann
B 1910 43 311)

Insol in acetone (Fidmann, C C 1899
II 1014, Naumann B 1904, 37 4329)
+2 H_2O Sl sol in cold, decomp by ho
 H_2O (Berzelius)

Cupric hydrogen fluoride, $\text{CuF}_2 \cdot 5\text{H}_2\text{O} + \text{H}_2\text{O}$

Deliquescent
Easily sol in H_2O and dil acids
Sol in $\text{NH}_4\text{OH}+\text{Aq}$ with decomp (Bohm
Z inorg 1901, 43, 329)

Cupric potassium fluoride, $\text{CuF}_2 \cdot 2\text{Kf}$

Easily sol in H_2O
 $\text{CuF}_2 \cdot \text{Kf}$ Very sl sol in H_2O sl sol in
dil acids (Helmholt Z inorg 3 115)

Cupric rubidium fluoride, $\text{CuF}_2 \cdot \text{Rbf}$

As the K salt (Helmholt)

Cupric silicon fluoride

See Fluosilicate, cupric

Copper stannic fluoride
See Fluostannate, copper

Copper tantalum fluoride
See Fluotantalate, copper

Copper titanium fluoride
See Fluotitanate, copper

Copper tungstyl fluoride
See Fluoxytungstate, copper

Copper zirconium fluoride
See Fluozirconate, copper

Cupric fluoride ammonia, $\text{CuF}_2 \cdot 4\text{NH}_3 + 5\text{H}_2\text{O}$

Decomp rapidly in the air
Easily sol in H_2O
Decomp by boiling with H_2O with evolution of NH_3
Easily sol in dil acids (Bohm, Z anorg 1905, 43 333)

Cuprous hydride, CuH

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ (Wurtz, C R 18 102)
Sol in warm conc HCl with decomp (Bartlett, Am Ch J 1895, 17 187)

Cupric hydride, CuH_2

Sol in HCl with decomp (Bartlett, Am Ch J 1895, 17 187)

Copper hydrosulphide, $7\text{CuS} \cdot \text{H}_2\text{S}$

(Linder and Picton, Chem Soc 1892, 61 120)
 $9\text{CuS} \cdot \text{H}_2\text{S}$ (Linder and Picton)
 $22\text{CuS} \cdot \text{H}_2\text{S}$ (Linder and Picton)

Cuprous hydroxide, $\text{Cu}_2\text{O} \cdot x\text{H}_2\text{O}$

Sol in acids as cupric salt Insol in NaOH , or $\text{KOH} + \text{Aq}$
Sol in NH_4OH , and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$

Cuprocupric hydroxide, $\text{CuOH} \cdot 3\text{Cu}(\text{OH}) + 3\text{H}_2\text{O}$

Sol in acids (Francke, Dissert 1907)

Cupric hydroxide, $3\text{CuO} \cdot \text{H}_2\text{O}$

Insol in H_2O or dil alkalies Easily sol in warm $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)
Much more difficultly sol than $\text{Cu}_2\text{O} \cdot \text{H}_2\text{O}$ in $\text{KOH} + \text{Aq}$ (Chodnew, J pr 28 220)
True composition is $6\text{CuO} \cdot \text{H}_2\text{O}$
See also Cupric oxide
 $\text{CuO}_2 \cdot \text{H}_2\text{O}$ Insol in H_2O , but decomp into $6\text{CuO} \cdot \text{H}_2\text{O}$ by being boiled therewith
Extremely easily sol in acids
Sol in NH_4OH , and NH_4 salts + Aq

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ at 25°

NH_3 norm	g Cu per l	equiv Cu per l
2 63	3 05	0 096
2 00	2 12	0 067
1 32	1 08	0 034
2 540	6 26	0 197
1 965	6 28	0 166
1 280	4 13	0 120
0 973	3 36	0 106
0 870	3 08	0 097
0 540	2 36	0 074
0 391	2 04	0 064
3 176	8 06	0 253
2 070	5 72	0 180
1 272	4 75	0 149
0 451	2 54	0 080
0 320	2 13	0 067

The non-agreement of the results is due to the presence of different modifications of $\text{CuO}_2 \cdot \text{H}_2\text{O}$

(Bonsdorff, Z anorg 1904 41 182)

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ at 18°

NH_3 mols per l	Cu g atom per l
0 20	0 00054
0 50	0 0035
1 0	0 0109
1 5	0 0204
2 0	0 0514
2 5	0 0442
3 0	0 0548
4 0	0 0754
5 0	0 1041
6 0	0 1254
8 0	0 1799
9 96	0 1757

(Dawson, Z phys Ch 1909 69 111)

Sol in cold NaOH or $\text{KOH} + \text{Aq}$ Prod but CuO is pptd on boiling Ber 18 not pptd (Chodnew J pr 28 220)

Insol in NaOH or $\text{KOH} + \text{Aq}$ unless contain organic matter Berz 1 contradicted by Volckmer A 59 54 Entirely sol in conc $\text{KOH} + \text{Aq}$ but solution is decomp by heating Franck, A 10 (3) 12 510

Sol in $\text{NaOH} + \text{Aq}$ 70% NaOH Los Z anal 9 463

The solubility in NaOH or KOH , prepared either from CuSO_4 or $\text{Cu(NO}_3)_2$, increases with decrease in concentration of base The solubility of $\text{CuO} \cdot \text{H}_2\text{O}$ in NaOH is only very slightly affected by the addition of sodium or potassium carbonate Franck Z anorg 1904, 40 41

Solubility of crystalline CuO_2H_2 in ammoniacal $\text{Ba}(\text{OH})_2$ and NaOH solutions at 18°

Solvent contains per litre	Cu concentration g atoms per l
1 mol NH_3 +0 mol $\text{Ba}(\text{OH})_2$	0 01090
" +0 0025 "	0 00907
" +0 005 "	0 00801
" +0 01 "	0 00633
" +0 02 "	0 00526
2 mols NH_3 +0 mol $\text{Ba}(\text{OH})_2$	0 0314
" +0 01 "	0 0277
4 mols NH_3 +0 mol $\text{Ba}(\text{OH})_2$	0 0784
" +0 01 "	0 0747
1 mol NH_3 +0 mol NaOH	0 0109
" +0 01 "	0 00766
" +0 02 "	0 00655
" +0 03 "	0 00531
" +0 05 "	0 00456
" +0 10 "	0 00410

(Dawson, Chem Soc 1909, 95 377)

Solubility of crystalline CuO_2H_2 in ammoniacal salt solutions at 18°

Solvent contains per litre	Conc. of dissolved Cu g atoms per l
1 mol NH_3	0 0109
0 05 mol NH_3 +0 01 mol $(\text{NH}_4)_2\text{SO}_4$	0 00129
" +0 025 "	0 00511
0 1 mol NH_3 +0 01 mol $(\text{NH}_4)_2\text{SO}_4$	0 00326
" +0 025 "	0 0108
" +0 05 "	0 0233
0 2 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 00054
" +0 01 "	0 00649
" +0 025 "	0 0175
" +0 05 "	0 0384
" +0 10 "	0 0690
0 5 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 0033
" +0 01 "	0 0127
" +0 025 "	0 0284
" +0 05 "	0 0536
" +0 10 "	0 1013
" +0 20 "	0 1844
1 0 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 0109
" +0 01 "	0 0210
" +0 025 "	0 0386
" +0 05 "	0 0660
" +0 10 "	0 1185
" +0 20 "	0 2275
" +0 40 "	0 4135
2 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 0314
" +0 01 "	0 0462
" +0 025 "	0 0605
" +0 05 "	0 0886
" +0 10 "	0 1468
" +0 20 "	0 2591
" +0 40 "	0 4718
3 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 0548
" +0 01 "	0 0672
" +0 025 "	0 0847
" +0 05 "	0 1156

Solubility of crystalline CuO_2H_2 in ammoniacal salt solutions at 18° —*Continued*

Solvent contains per litre	Conc. of dissolved Cu g atoms per l
3 mol NH_3 +0 10 mol $(\text{NH}_4)_2\text{SO}_4$	0 1740
" +0 20 "	0 2861
" +0 40 "	0 5044
4 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 0784
" +0 01 "	0 0922
" +0 025 "	0 1101
" +0 05 "	0 1397
" +0 10 "	0 2002
" +0 20 "	0 3188
" +0 40 "	0 5451
5 mol NH_3 +0 00 mol $(\text{NH}_4)_2\text{SO}_4$	0 1041
" +0 01 "	0 1154
" +0 025 "	0 1320
" +0 05 "	0 1639
" +0 10 "	0 2239
" +0 20 "	0 3415
" +0 40 "	0 5615
1 mol NH_3 +0 00 mol Na_2SO_4	0 0109
" +0 025 "	0 0134
" +0 10 "	0 0162
" +0 20 "	0 0192
" +0 40 "	0 0784
4 mol NH_3 +0 10 mol Na_2SO_4	0 0994
" +0 20 "	0 1161

(Dawson, Chem Soc 1909, 95 373)

Sl sol in alkali carbonates + Aq, especially KHCO_3 and NaHCO_3 (Berzelius)

Sol in cold $\text{Na}_2\text{S}_2\text{O}_3$ + Aq, but pptd on warming (Field, Chem Soc (2) 1 28)

Partially sol when freshly pptd in KC_2O_8 + Aq (Rodgers, 1834)

Sol in $(\text{NH}_4)_2\text{S}_2\text{O}_8$ + Aq (Moreau, Apot Ztg 1901, 16 383)

Sol in MSCN + Aq, more difficultly sol in NH_4SCN + Aq than ZnO_2H (Gronmann, Z anorg 1908, 58 269)

Very sol in hydroxylamine (Jannasch and Cohen, J pr 1905, (2), 72 14)

Insol in acetone (Fudmann, C C 186, II 1014)

Sol in large amt in $\text{NaC}_2\text{H}_3\text{O}_2$ + Aq (Mecer, 1844)

Not pptd in presence of $\text{Na}_2\text{C}_2\text{O}_4$ (Sillman)

Insol in cane sugar + Aq, unless an alkali or alkaline earth is present (Peschier)

Recently pptd CuO_2H_2 is easily sol in cane sugar with NaOH , KOH , or Ca(OH)_2 + Aq, less sol in presence of SrO_2H_2 or BaO_2H (Becquerel)

Not pptd by KOH + Aq in solutions containing tartaric acid, cane sugar, and many other non-volatile organic substances

Sol in Ca , Ba , Sr , K or Na sucrates + Aq, and ppts of double sucrates form when solutions of the first three bases are heated, but no

ppt forms in the last two cases even at 100° (Hunton)

Insol in simple Ca, Ba, or K sucrates + Aq, but immediately sol when an excess of cane sugar + Aq is present (Pelgot)

Moderately sol in amylamine, easily sol in methyl, less in ethylamine (Wurtz)

Sol in sorbine + Aq (Pelouze)

Not pptd in presence of aromatic oxyacids or phenols of the ortho series. Thus in presence of salicylic acid, pyrocatechin, gallic acid, pyrogallie acid, etc., NaOH + Aq does not ppt CuO_2H_2 from Cu solutions, but pptn is not prevented by benzoic acid, resorcin, hydroquinone, etc (Weith, B 9 342)

Sol in solutions of alkali salts of "spaltungsprodukte" of albumen (Kalle and Co, Pat 1901)

Sol in starch emulsion which has become thin liquid in an alternating magnetic field (Rosenthal, C C 1908, I 593)

CuO , $2\text{H}_2\text{O}$ (Rubénovitch, C R 1899, 129 336)

CuO , $3\text{H}_2\text{O}$ (Kosmann, Z anorg 1893, 3 373)

2CuO , $3\text{H}_2\text{O}$ (Cross, Gm — K 5 1, 753)

4CuO , H_2O Insol in NH_4OH + Aq (Mailhe, A ch 1902, (7) 27 393)

Cupric hydroxide ammonia, CuO_2H_2 , 4NH_3

Present in ammoniacal solution of CuO_2H_2 (Dawson, Z phys Ch 1909, 69 110)

Cuprous imide, Cu_2NH

Decomp at 160° forming Cu_3N

Readily hydrolysed by H_2O

Sol in liquid NH_3 solutions of NH_4NO_3 (Franklin, J Am Chem Soc 1912, 34 1502)

Cuprous iodide, Cu_2I_2

Insol in H_2O , or dil acids

Calculated from electrical conductivity of Cu_2I_2 + Aq, 1 l H_2O dissolves about 8 mg Cu_2I_2 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

Sol in conc H_2SO_4 (Vitali, Gm — K 5 1, 947)

Sol with difficulty in conc HCl + Aq. Decomp by conc HNO_3 , or H_2SO_4 . Insol in NaCl , KNO_3 , Na_2SO_3 , KBr , or NH_4Cl + Aq. Sol in NH_4OH , $\text{Na}_2\text{S}_2\text{O}_3$, KCN , or KI + Aq (Renault, C R 59 558)

Appreciably sol in N/10 HCl . Practically insol in N/10 H_2SO_4 (Moser, Z anal 1904, 43 604)

Results of experiments on solubility of Cu_2I_2 in I_2 + Aq in presence of acids and salts are given by Bray and MacKay.

Cu_2I_2 was found to be sl sol in H_2O but a considerable amt dissolves in presence of I_2 , owing to formation of CuI_2 and CuI_3 (J Am Chem Soc 1910, 32 1207)

Solubility of Cu_2I_2 in I_2 + Aq at 20°

g per l		Solid Phase
Cu	I	
0 285	0 585	Cu_2I_2
0 482	1 305	"
0 583	1 922	"
0 678	2 557	"
0 756	3 204	"
0 844	3 954	"
0 898	4 436	"
0 964	5 085	"
1 032	5 685	"
1 090	6 282	"
1 112	6 530	"
1 232	7 653	$\text{Cu}_2\text{I}_2 + \text{I}$
1 040	6 449	I_2
0 898	5 594	"
0 748	4 711	"
0 606	3 856	"
0 448	2 949	"
0 300	2 069	"
0 159	1 230	"
0 925 *	5 461	$\text{Cu}_3\text{I}_2 + \text{I}_2$
1 658 **	11 366	"

* at 0° ** at 40°

(Fedotieff, Z anorg 1911, 69 26)

Solubility

$\text{NH}_4\text{Br} + \text{Aq}$	-
2-N	1 9068
3-N	3 6540
4-N	6 0588

(Kohn and Klein, Z anorg 1912, 77 254)

Sol in FeCl_3 + Aq (Fleischer, C N 1869, 19 206)

Solubility in KBr + Aq at t°

t°	$\text{KBr} + \text{Aq}$	g CuI in 1 l of the solution
19 5	2-N	1 4666
24 0	2-N	1 5576
19 5	3-N	3 4094
23 0	3-N	3 5949
22 0	4-N	7 1263
22 0	4-N	6 9768

The solutions undergo change in the course of a few days, iodine being set free, the solubility of the cuprous iodide is not markedly affected thereby

(Kohn, Z anorg 1909, 63 337)

1 l of a 0.2N solution of KI dissolves 0.000157 g mol CuI (Bodlander, Z anorg 1902, 31 475)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Insol in CS_2 (Arctowski, Z anorg 1894, 6 257)
 Practically insol in methylene iodide (Retgers, Z anorg 1893, 3 347)
 Sol in methyl acetate (Naumann, B 1909, 42 3790)
 Insol in acetone (Naumann, B 1904, 37 4329), (Eidmann, C C 1899, II 1014)
 100 g acetonitrile dissolve 3.52 g Cu_2I_2 at 18° (Naumann and Schier, B 1914, 47 249)
 Min *Marshale* (Gm—K 5 1, 945)

Cupric iodide, CuI_2

Exists only in very dil aqueous solution (Traube, B 17 1064)

Copper periodide, CuI_4

Sol in H_2O (Walker and Dover, Chem Soc 1905, 87 1588)

Copper ammonium iodide ammonia

See Cupriammonium iodide ammonia

Cuprous mercuric iodide, $\text{Cu}_2\text{I}_2, \text{HgI}_2$

$\text{KI} + \text{Aq}$ dissolves out HgI_2

Cuprous mercuric iodide ammonia, $\text{CuI}_2, 2\text{HgI}_2, 4\text{NH}_3$

Decomp by H_2O or acids Sol in a mixture of acetic acid and alcohol

$\text{CuI}_2, \text{HgI}_2, 4\text{NH}_3$ As above (Jorgensen, J pr (2) 2 347)

Cupric nitrogen iodide, $\text{CuI}_2, \text{N}_2\text{H}_4\text{I}_2$

Decomp by H_2O , or $\text{NH}_4\text{OH} + \text{Aq}$ (Guyard, C R 97 526)

Cupric thallic iodide ammonia, $\text{CuI}_2, 2\text{THI}_3, 4\text{NH}_3$

Decomp slowly by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ with decomp Sol in alcohol

Cuprous iodide ammonia, CuI, NH_3

Ppt (Anderline, Gazz ch it 1912, 42 I, 321)

$+4\text{H}_2\text{O}$ Insol in H_2O Very sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Silberad, Chem Soc 1905, 87 67)

$\text{Cu}_2\text{I}_2, 3\text{NH}_3$ (Lloyd, J phys Chem 1908, 12 399)

$\text{Cu}_2\text{I}_2, 4\text{NH}_3$ (Lloyd, J Phys 4 328)

$+ \text{H}_2\text{O}$ (Saglier, C R 104 1440)

$\text{Cu}_2\text{I}_2, 6\text{NH}_3$ (Lloyd)

Cupric iodide ammonia, $\text{CuI}, 4\text{NH}_3 + \text{H}_2\text{O}$

Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ without decomp Not attacked by cold

alcohol or ether (Berthelmont, J Pl 15 445) (Pozzi-Escot, C R 1900, 130 30)

$\text{CuI}_2, 6\text{NH}_3$ Sol in liquid NH_3 (Lloyd, Am Ch J 1908, 39 205)

$3\text{CuI}_2, 10\text{NH}_3$ Decomp by H_2O (Chardas, Am Ch J 1895, 17 302)

Sol in liq NH_3 (Horn, Am Ch J 1908, 39 204)

Cupriammonium iodide ammonia,

$3\text{Cu}(\text{NH}_3)_2\text{I}_2, 4\text{NH}_3$

Decomp by air and by H_2O (Chardas, Am Ch J 1895, 17 302)

Copper periodide ammonia, $2\text{CuI}, \text{I}_4, 1\text{H}_2\text{O}$

Because of its insolubility it cannot be recryst from any solvent (Silberad, Chem Soc 1905, 87 66)

Copper tetraiodide, ammonia, $\text{CuI}_4, 4\text{NH}_3$

(Jorgensen, J pr (2) 2 353)

Copper hexaiodide ammonia, $\text{CuI}_6, 4\text{NH}_3$

Not decomp in H_2O in closed vessels (Jorgensen)

Copper mercuric iodide ammonia,

$\text{CuHgI}_2, 5\text{NH}_3$

$\text{CuHgI}_2, 2\text{NH}_3$ Ppt Decomp by H_2O and by alcohol

$\text{CuHg}_2\text{I}_2, 3\text{NH}_3$ Ppt Decomp by long washing with H_2O

$\text{CuHg}_2\text{I}_2, 4\text{NH}_3$ Ppt Decomp by I_2O Sl attacked by abs alcohol

$\text{CuI}_2, \text{HgI}_2, 4\text{NH}_3$ Ppt (Anderline, Gazz ch it 1912, 42, (1) 321, C C 1912, I 95)

Copper nitride, Cu_3N_2

Decomp by dil or conc acids

Easily decomp by H_2O when finely powdered (Rossel, C R 1895, 121 942)

Copper suboxide, Cu_2O

Not attacked by H_2O Decomp by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ into Cu and CuSO_4 , dil $\text{HCl} + \text{Aq}$

has similar action Not attacked by $\text{NH}_4\text{OH} + \text{Aq}$ or $\text{NH}_4\text{OH} + (\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Pogg 120 1)

Cu_2O Not attacked by dil or conc acids, even aqua regia Slowly sol in Aq (Bailey and Hopkins, Chem Soc 1890, 57 272)

Is a solution of oxide in Cu (Zeit angew Ch 1908, 21 51)

Converted by $\text{Cl} + \text{Aq}$ into cuprous chloride

Cuprous oxide, Cu_2O

Insol in H_2O Decomp by $\text{H}_2\text{SO}_4 + \text{Aq}$ or cold very dil $\text{HNO}_3 + \text{Aq}$

into a cupric salt and Cu Converted by $\text{Cl} + \text{Aq}$ into cuprous chloride

Solubility of Cu_2O in $\text{NH}_4\text{OH} + \text{Aq}$ at 25°

Conc of total Cu		Conc of total NH_3	
G in 1000 g of solution	G mol in 1000 g of solution	G in 1000 g of solution	G mol in 1000 g of solution

Preparation I

0 3593	0 00566	3 91	0 23
0 5024	0 00791	12 07	0 71
0 6869	0 01080	13 77	0 81
0 6964	0 01095	16 15	0 95
1 0144	0 01597	27 03	1 59
1 0462	0 01645	32 64	1 92
1 0557	0 01660	36 89	2 17
1 2243	0 01924	45 73	2 69
1 3229	0 02081	68 68	4 04
1 4882	0 02340	74 12	4 36
1 5105	0 02375	81 26	4 78
1 6313	0 02565	98 52	5 56
1 6981	0 02670	122 40	7 20

Preparation II

0 4229	0 00665	7 82	0 46
0 6678	0 01050	8 16	0 48
0 9890	0 01555	22 61	1 33
1 0494	0 01650	28 39	1 67
1 3528	0 02127	54 15	3 19
1 5047	0 02366	72 08	4 24
1 5963	0 02510	78 20	4 60
1 6555	0 02603	102 05	6 00

(Donnan and Thomas, Chem Soc 1911, 99 1791)

Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)

Sl sol in excess of $\text{KOH} + \text{Aq}$ (Chodnew)

Sol in conc MgCl_2 and $\text{FeCl}_2 + \text{Aq}$ (Hunt, C R 69 1357)

Sl attacked by liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Mn (cuprite) Sol in HCl , HNO_3 , and $\text{NH}_4\text{OH} + \text{Aq}$

Cupric oxide, CuO

Insol in H_2O Easily sol in acids Sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ but dissolves on addition of a few drops of acid or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Insol in dil, but sol in warm conc NaOH , and $\text{KOH} + \text{Aq}$ (Low, Z anal 9 463)

CuO prepared at a low temp is easily sol in dil acids, but when ignited is slowly sol in boiling conc acids, but moderately rapidly in a cold mixture of $\text{NH}_4\text{I} + \text{HCl}$ (Joannis, C R 1886, 102 1161)

Solubility in N-HNO_3 1 l of the solution contains 0 4802 g atoms Cu at 25° (Jaeger, Z anorg 1901, 27, 33)

Solubility of CuO in $\text{HF} + \text{Aq}$ at 25°

	Time	G CuO in 10 cem of the solution
0 25N-HF	1 1/4 hrs	0 0431
	3 3/4 "	0 0619
	25 1/4 "	0 0812
	71 1/2 "	0 0823
	170 1/2 "	0 0907
N-HF (a)	5 1/2 "	0 3018
	21 1/2 "	0 2797
	52 "	0 2747
	201 1/2 "	0 2339
	226 1/2 "	0 2353
N-HF (b)	4 1/4 "	0 3220
	44 1/4 "	0 2930
	117 3/4 "	0 2431
	167 3/4 "	0 2219
2 02N-HF	1 1/2 "	0 3646
	5 "	0 4533
	71 1/2 "	0 3583
	156 1/2 "	0 3311

(Deussen, Z anorg 1905, 44 421)

Solubility of CuO in HF at 25°

$\text{Cu} = \text{g-atoms Cu}$ in 1 l of the solution

HF normality	Cu
0 12	0 0307
0 28	0 1164
0 57	0 2494
1 08	0 388
2 28	0 463

(Jaeger, Z anorg 1901, 27 29)

Solubility of CuO in $\text{HF} + \text{KF}$ at 25°

$\text{Cu} = \text{g-atoms Cu}$ in 1 l of the solution

HF normality	Cu
0 12	0 0356
0 28	0 06437
0 57	0 1442
1 11(1 08)	0 2451
2 17(2 28)	0 2517

(Jaeger, l c)

Sl sol in large excess of $\text{KOH} + \text{Aq}$ (de Coninck, C C 1904, II, 65)

Slowly sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ and less easily in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Rose)

Sol in boiling H_2O solutions of Al , Gl , U , Cr_2 , Fe_2 , or Bi nitrates and chlorides, $\text{Hg}(\text{NO}_3)_2$, $\text{Hg}_2(\text{NO}_3)_2$, SbCl_3 , SnCl_4 , and SnCl_4 , with pptn of oxides of the bases of those salts Unacted upon by boiling H_2O solutions of Mn , Mg , Ni , Co , Zn , Ce , or

Fe nitrates or chlorides, AgNO_3 , $\text{Pb(NO}_3)_2$, $\text{Cd(NO}_3)_2$, and HgCl_2 (Persoz)

Pure CuO is very sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ but the solution is greatly increased by the addition of NH_4 salts (Muthmann, C C 1904 II, 410)

Sol in hot $(\text{NH}_4)_2\text{SO}_4$ or $(\text{NH}_4)_2\text{SO}_3 + \text{Aq}$ (Jumau, Electrochem Ind 1908, 6 258)

15% dissolves in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ in 24 hrs (Schnabel, Z B H Sal 1880, 28 282)

Sl attacked by liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Solubility in N-acetic acid 1 l of the solution contains 0.1677 g-atoms Cu at 25° (Jaeger, Z anorg 1902, 27 33)

Insol in acetone (Naumann, B 1904, 37 4329, Erdmann, C C 1899, II 1014)

Sl sol in benzamide (Dessaigues, A ch 1852, (3), 34 146)

Insol in piperidine (Cahours, C R 1852, 34 481)

Sol in acid amines as asparagin (Piria, A ch 1848, (3), 22 160)

Sol in amines alone or mixed with NH_3 (Lance, Dissert 1905)

Slowly sol in Ca or any other alkali succrate + Aq, but not in cane sugar + Aq (Hunton)

Solubility in (calcium succrate + sugar) + Aq
1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 10.26 g CuO

1 l solution containing 296.5 g sugar and 24.2 g CaO dissolves 5.68 g CuO

1 l solution containing 174.4 g sugar and 14.1 g CaO dissolves 3.47 g CuO (Bodenbender, J B 1865 600)

Polypeptides in aqueous solution dissolve CuO by short boiling (Fischer, B 1906, 39 576)

$+ \frac{1}{2} \text{H}_2\text{O} = 6\text{CuO} + \text{H}_2\text{O}$ Insol in dil, but sol in conc KOH or $\text{NaOH} + \text{Aq}$

Sol in volatile oils

See also Cupric hydroxide

Min *Melaconite* Sol in HCl , or $\text{HNO}_3 + \text{Aq}$

Cuprocupric oxide, $\text{Cu}_5\text{O}_3 = 2\text{Cu}_2\text{O}$, CuO

(Favre and Maumené)

$\text{Cu}_5\text{O}_3 + \text{H}_2\text{O} = \text{Cu}_2\text{O}$, $\text{CuO} + \text{H}_2\text{O}$ When freshly pptd., sol in $\text{HCl} + \text{Aq}$, but insol after drying (Siewert, J B 1866 257)

$\text{Cu}_4\text{O}_3 = \text{Cu}_2\text{O}$, 2CuO (Siewert)

All oxides of Cu except Cu_4O , Cu_2O , CuO , and Cu_2O , are mixtures (Osborne, Sil Am J (3) 32 33, Debray, C R 99 583)

Copper dioxide, $\text{CuO}_2 + \text{H}_2\text{O}$

Insol in H_2O Decomp by acids with formation of cupric salt and H_2O_2 (Weltzien, A 140 207)

Cuprous oxide ammonia (cuprosammonium oxide)

Known only in solution (Wagner, C C 1863 239)

Cupric oxide ammonia (cuprammonium hydroxide), 3CuO , $4\text{NH}_3 + 6\text{H}_2\text{O}$

Insol in H_2O (Kane, A ch 72 283)

CuO , $4\text{NH}_3 + 4\text{H}_2\text{O}$ Very deliquescent
Decomp in the air and by H_2O (Malaguti and Sarreau, A ch (3) 9 438)

Cuprous oxybromide, Cu_2Br_2 , $\text{CuO} + \text{H}_2\text{O}$

(Spring and Lucion, Bull Ac Belg (3) 24 21)

Cupric oxybromide, CuBr_2 , $3\text{CuO} + 3\text{H}_2\text{O}$

Insol in H_2O Easily sol in dil acids or $\text{NH}_4\text{OH} + \text{Aq}$ (Brun, C R 109 66)

Insol in H_2O but decomp by continued boiling Sol in conc acetic acid, sl sol in conc $\text{CuBr}_2 + \text{Aq}$ Insol in dil $\text{KBr} + \text{Aq}$ (Richards, Proc Am Acad 1890, 25 215)

Cupric oxybromide ammonia, 2CuO , CuBr_2 , $2\text{NH}_3 + 3\text{H}_2\text{O}$

(Kohlschutter and Pudschies, B 1904, 37 1159)

Cuprous oxychloride, Cu_2Cl_2 , $\text{CuO} + 3\text{H}_2\text{O}$

(Spring and Lucion, Bull Ac Belg (3) 24 21)

Cupric oxychloride, CuO , $\text{CuCl}_2 + \text{H}_2\text{O}$

Decomp by H_2O . (Rousseau, C R 1890, 110 1263)

2CuO , CuCl_2 Insol in H_2O Sol in $\text{HCl} + \text{Aq}$, from which it is reprecipitated by dilution with H_2O

$+ \text{H}_2\text{O}$ (Kane, A ch 72 277)

$+ 4\text{H}_2\text{O}$ (Gladstone, Chem Soc 8 211)

3CuO , $\text{CuCl}_2 + 2\text{H}_2\text{O}$ (Miller and Kendrick, Trans Roy Soc Can 1901, (2) 8, III 35)

$+ 3\text{H}_2\text{O}$ (Dupont and Jansen, Bull Soc 1893, (3), 9 193)

$+ 3\frac{1}{2}\text{H}_2\text{O}$ Insol in cold H_2O , sl decomp by boiling (Reindel, J pr 106 378)

Insol in boiling H_2O (Habermann, W A B 90 2 268)

$+ 4\text{H}_2\text{O}$ Sol in alkaline solution of KNa tartrate (Groger, Z anorg 1902, 31 327)

(Brunswick green) Insol in H_2O Easily sol in acids

Min *Atacamite* Sol in acids, and $\text{NH}_4\text{OH} + \text{Aq}$

Sol in cold sat citric acid + Aq (Bolton, B 1880, 13 732)

4CuO , $\text{CuCl}_2 + 6\text{H}_2\text{O}$ (Kane, Gm — K 5 1, 919)

$+ 8\text{H}_2\text{O}$ Min *Tallungite* (Church, Gm — K 5 1, 919)

5Cu(OH) , $\text{Cu Cl}_2\text{Cl(OH)}$ Insol in H_2O

Decomp by hot H_2O (Kuhling, B 1901, 34 2852)

7CuO , $2\text{CuCl}_2 + 9\text{H}_2\text{O}$ (Reindel)

6CuO , $\text{CuCl}_2 + 9\text{H}_2\text{O}$ Insol in H_2O Sol in acetic acid (Neumann, Repert, 37 304)

8CuO , $\text{CuCl}_2 + 12\text{H}_2\text{O}$ Min *Footelite* (Kong, Zeit Kryst 1891, 19 601)

Cupric zinc oxychloride, ZnO , 2ZnCl_2 , $5\text{CuO} + 6\text{H}_2\text{O}$

(André, C R 1888, 106 855)

Cupric oxychloride ammonia, 2CuO , CuCl_2 , $2\text{NH}_3 + 3\text{H}_2\text{O}$

(Dehéran, Gm — K 5 1, 932)

Cupric oxyfluoride, CuO , $\text{CuF}_2 + \text{H}_2\text{O}$

Insol in H_2O (Berzelius) (Balbiano, Gazz ch it 14 74)

Cupric oxyfluoride ammonia (cuprammonium oxyfluoride), $\text{Cu}(\text{OH})\text{F}$, 2NH_3

(Balbiano, Gazz ch it 14 74)

3CuO , $\text{CuI}_2 + x\text{H}_2\text{O}$ (Tschirwinski, Gm — K, 5 1, 1584)

Cuprous oxyiodide, Cu_2I_2 , $\text{CuO} + \text{H}_2\text{O}$

(Spring and Lucion, Bull Ac Belg (3) 24 21)

Cupric oxyiodide, 2CuI_2 , $\text{CuO} + 4\text{H}_2\text{O}$

Easily decomp by H_2O (Carnegie, Watts' Dict II, 257)

Copper oxysulphide, $2\text{Cu}_2\text{S}$, CuO

Insol in H_2O (Maumené, A ch (3) 18 311)

5CuS , CuO Ppt (Pelouze)

2CuS , CuO Insol in H_2O

CuS , CuO Insol in H_2O

Above comps do not exist (Pickering, Chem Soc 33 136)

Copper phosphide, Cu_3P_2

Easily sol in HNO_3 or aqua regia, insol in $\text{HCl} + \text{Aq}$ (Rose, Pogg 6 209)

Sol in HNO_3 and $\text{Br} + \text{Aq}$ Decomp by hot conc H_2SO_4 (Rubcnovitch, C R 1899, 128 1399)

Cu_3P Sol in $\text{HNO}_3 + \text{Aq}$ (Granger, A ch 1898, (7), 14 64)

Crystallized Completely sol in hot HNO_3 , aqua regia and $\text{HF} + \text{HNO}_3$ Slowly sol in hot HCl or H_2SO_4 Not attacked by hot or cold HF or acetic acid (Maronneau, C R 1899, 128 939)

Cu_3P_2 Easily sol in HNO_3 Sol in hot conc H_2SO_4 Sol in conc $\text{HCl} + \text{Aq}$ before the phosphide has been heated (Rose, Pogg 4 110)

Cu_2P_2 Easily sol in HNO_3 , or $\text{HCl} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Granger, Bull Soc (3) 9 661)

CuP_2 Decomp by HNO_3 , not readily sol in HCl Easily attacked by Cl_2 or $\text{Br}_2 + \text{Aq}$ (Granger, C R 1895, 120 924)

Cu_4P_2 (Granger, C N 1898, 77 229)

Very sol in HNO_3 and $\text{Br}_2 + \text{Aq}$ Decomp by hot conc H_2SO_4 (Rubénovitch, C R 1899, 129 338)

Cupric zinc phosphide, $10\text{Cu}_3\text{P}_2$, $\text{Zn}_3\text{P}_2(?)$ (Hvoslef, A 100 99)

Copper phosphoselenide, CuSe , P Se

Insol in H_2O or $\text{HCl} + \text{Aq}$, sol in $\text{HNO}_3 + \text{Aq}$ Insol in cold alkalis, but decomp slowly when heated therewith (Hahn, J pr 93 436)

2CuSe , P_2Se_3 Attacked only by fuming HNO_3 (Hahn)

2CuSe , P_2Se_5 Sol only in $\text{HNO}_3 + \text{Aq}$ (Hahn)

Copper phosphosulphide, $2\text{Cu}_3\text{S}$, P_2S

Cu_3S , P_2S (Berzelius)

2Cu S , P_2S_3 (Berzelius)

CuS , P_2S Insol in H_2O and dil $\text{HCl} + \text{Aq}$ Sol in conc $\text{HCl} + \text{Aq}$, from which it is precipitated by H_2O (Berzelius, A 46 252)

8CuS , P_2S_5 (Berzelius)

Cu_4PS_3 Sol in conc HNO_3 and in aqua regia Insol in HCl Not attacked by hot H_2SO_4 or conc $\text{NaOH} + \text{Aq}$ (Ferrand, A ch 1899, (7), 17 407)

Cuprous selenide, Cu_2Se

Ppt Sol in HCl and in H_2SO_4

Decomp by HNO_3 Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Fonzes-Diacon, C R 1900, 131 1207)

Sol in $\text{KCN} + \text{Aq}$ (Heyn and Bauer, Metall 1903, 3 84)

Min *Berzelianite*

Cupric selenide, CuSe

(Little, A 112 211)

Ppt Sol in HCl and in H_2SO_4 Decomp by HNO_3 (Fonzes-Diacon, C R 1900, 131 1207)

Cuprocupric selenide, Cu_3Se_2

Min *Umangite* Sol in HNO_3 (Klockmann, Zeit Kryst 1891 19, 270)

Cuprous lead selenide, $3\text{Cu}_2\text{Se}$, PbSe

Min *Zorgite* Sol in cold conc $\text{HNO}_3 + \text{Aq}$ with separation of Se

Cupric lead selenide, CuSe , PbSe

Sol in cold conc HNO_3 with separation of Se (Karsten)

Cu_3Se , 2PbSe As above

CuSe , 4PbSe As above

Cuprous silver selenide, Cu_2Se , Ag_2Se

Min *Eucarnite* Sol in hot HNO_3 with decomp (Berzelius)

Cuprous silicide, Cu_4Si

Sol in warm dil or conc HNO_3 Only sl sol in HCl , H_2SO_4 and HF Sol in a mixture of HNO_3 and HF Not attacked by solutions of alkalis (Vigouroux, C R 1906, 142 88)

Cu_2S_3 Sol in aqua regia and fused sodium potassium carbonate (de Chalmot, Am Ch J 1896, 18, 95)

Cu_2S_1 Decomp by water and moist air, and by acids and fused alkali (Vigouroux, C R 1896, 122 319)

Cuprous sulphide, Cu_2S

More sol in H_2O than Ag_2S , but much less than PbS (Bodlander, Z phys Ch 1898 27, 64)

1 l H_2O dissolves 3.1×10^{-6} moles Cu_2S at 18° (Weigel, Z phys Ch 1907, 58 294)

Very slowly decomp by dil H_2SO_4 in presence of oxygen (Thompson, Electrochem, Ind 1904 2, 225)

Decomp by conc H_2SO_4 (Pickering, C N 1878, 37, 37)

Cold HNO_3 + Aq dissolves out Cu and leaves CuS, hot HNO_3 dissolves with separation of S. Sl sol in boiling conc HCl + Aq. Insol in $(\text{NH}_4)_2\text{S}$ + Aq.

5N-HCl dissolves Cu_2S very slightly (0.0038 g Cu in $7\frac{1}{2}$ hrs) but it is more sol in presence of Cl, when 0.672 g are dissolved in $7\frac{1}{2}$ hours (Egl, Z anorg 1902, 30 46)

Sol with exclusion of air in NH_4OH + Aq (Malzac, Pat 1904)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Min *Chalcocite* Completely sol in warm HNO_3 with separation of S

Cupric sulphide, CuS

Almost absolutely insol in H_2O , sol in 950,000 pts H_2O . When exposed to the air, dissolves in H_2O as CuSO_4 . Easily sol in boiling HNO_3 with separation of S. Difficultly sol in hot conc HCl + Aq. Insol in dil H_2SO_4 + Aq (1.6) (Hoffmann, A 115 286)

Pptd by H_2S or $(\text{NH}_4)_2\text{S}$ + Aq in presence of 100,000 pts H_2O (Pfaff), 200,000 pts H_2O (Lassaigne), 15,000 pts H_2O and 7500 pts HCl, but with 40,000 pts H_2O and 20,000 pts HCl no colour is visible (Reinsch)

1 l H_2O dissolves 3.51×10^{-6} moles CuS at 18° (Weigel, Z phys Ch 1907, 58 294)

Insol in H_2SO_3 + Aq (Guerout, C R 1872, 75 1276)

Decomp by conc H_2SO_4 (Kliche, J B 1890, 593)

Sol in $(\text{NH}_4)_2\text{CO}_3$ + Aq (Berzelius) Sol in alkali bicarbonates + Aq

In sol in NH_4NO_3 or NH_4Cl + Aq (Bött) Insol in acidified conc alkali chlorides + Aq (Cushman, Am Ch J 1895, 17, 382)

Sol in FeCl_3 + Aq with separation of S (Cumenge and Wimmer, Dingl 1883, 250 123)

Decomp by boiling CuCl_2 + Aq in presence of HCl or NaCl (Raschig, Gm — K 5 1, 819)

Sol in $\text{Fe}_2(\text{SO}_4)_3$ + Aq in presence of large excess of air (Thompson, Electrochem Ind 1904, 2, 228)

Insol in KOH, or K_2S + Aq, especially if boiling, appreciably sol in colourless and even more readily in hot yellow $(\text{NH}_4)_2\text{S}$ + Aq

Sl sol in Na_2S + Aq, more easily in NaSH + Aq (Becker, Sill Am J (3) 33 199)

100 cc sat Na_2S + Aq (sp gr = 1.225) dissolve 0.0032 g CuS (Holland, Ann Chim Anal 1897, 2 243)

Sol in K polysulphides (3-64%) (Prost, Bull Soc Belg Chim 1897 103)

Appreciably sol in alkali polysulphides + Aq (Rossing, Z anal 1902, 41, 1)

Sol in considerable quantity in alkali sulpharsenates, sulphantimonates, and sulphostannates + Aq. Therefore when a mixed ppt of CuS and As_2S_3 , Sb_2S_3 , or SnS is treated with K_2S , a portion of the CuS is dissolved (Wöhler, A 34 236)

Sol in alkali sulphovandates, or sulphotungstates + Aq (Storch, B 16 2015)

Sol in alkali sulphomolybdates + Aq (Debrav, C R 96 1616)

Insol in K thiocarbonate + Aq (Rosenbladt, Z anal 26 15)

Sol in KCN + Aq

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Insol in Na xanthogenate (Ragg, Ch Z 1908, 32 677)

Solubility of CuS in sugar + Aq at t°
g CuS per l of solution

t°	1% sugar	30% sugar	50% sugar
17.5	0.5672	0.5632	0.9076
45	0.3659	0.7220	1.0559
75	1.1345	1.2033	1.2809

(Stolle, Z Ver Zuckerind 1900 50 331)

Min *Covellic*

Collindal Aqueous solution is stable when it contains 5 g CuS in a litre, when it contains 4 or 5 times that amount it is decomposed in an hour

Solutions of salts of the following concentration cause a precipitate in the above solution. Salts of univalent elements—

Salts of univalent elements—

$\text{K}_2\text{Fe}(\text{CN})_6$	1	62
$\text{K}_4\text{Fe}(\text{CN})_6$	1	127
$\text{Na}_2\text{S}_2\text{O}_3$	1	157
Na_2CO_3	1	200
Na_2HPO_4	1	252
Na_2SO_4	1	333
$\text{K}_2\text{Cr}_2\text{O}_7$	1	2083
KI	1	80
KBr	1	133
KClO_3	1	166

Salts of univalent elements—*Continued*

$\text{NaC}_2\text{H}_3\text{O}_2$	1	221
$(\text{NH}_4)_2\text{C}_2\text{O}_4$	1	255
NaCl	1	400
NaHCO_3	1	2500
K_2SO_4	1	117
K_2CrO_4	1	133
$\text{NaC}_7\text{H}_5\text{O}_2$	1	166
$\text{K}_2\text{S}_2\text{O}_6$	1	222
KCl	1	333
KNO_3	1	500

Salts of bivalent metals—

BaS_2O_6	1	2242
$\text{Cd}(\text{NO}_3)_2$	1	3483
MgSO_4	1	6830
$\text{Ba}(\text{NO}_3)_2$	1	2677
BaCl_2	1	3921
$\text{Pb}(\text{ClO}_3)_2$	1	6988
CdSO_4	1	3442
MnSO_4	1	5518

Salts of trivalent metals—

Ammonia alum	1	31,896
Chrome alum	1	58,889
$\text{Al}_2(\text{SO}_4)_3$	1	90,909

Acids—

Succinic	1	100
Oxalic	1	162
HCl	1	733
H_2SO_4	1	208
Citric	1	20
Acetic	Not at all	
Tartaric	“ “	

(Spring and de Bock, Bull Soc (2) 58 165)

Copper polysulphide, Cu_2S_8 *Amorphous* Ppt Decomp by boiling alcohol (Rossing, Z anorg 1900, 25 413) Cu_4S_5 *Amorphous* Ppt can be boiled with H_2O without decomposition (Rossing, Z anorg 1900, 25 4, 11) Cu_5S_6 Ppt, insol in alkali sulphides, decomp by conc HNO_3 (Bodroux, C R 1900, 130 1398)

Could not be obtained (Rossing, Z anorg 1900, 25 414)

 Cu_2S Ppt Decomp by H_2O Sol in alkali and barium polysulphides + Aq Decomp by colorless alkali sulphides + Aq (Rossing, Z anorg 1900, 25 407)Cuprous iron (ferric) sulphide, Cu_2S , Fe_2S_3 Decomp by conc HCl + Aq Sol in boiling HNO_3 + Aq of 1.2 sp gr (Schneider, J pr (2) 38 569)Min (*halcopyrite*) Insol in HCl + Aq When heated in a sealed tube with H_2S + Aq, a portion of it dissolves with difficulty and subsequent deposition of S (Senarmont, A ch (3) 32 168)Cuprocupric iron (ferric) sulphide, Cu_2S , CuS , FeS Min *Bornite* Sol in HCl + Aq with a residue of SCupric iron (ferric) sulphide, CuS , Fe_2S_3 Min *Cubanite*Copper iron potassium sulphide, $\text{K}_2\text{FeCu}_2\text{S}_4$ Sl attacked by cold dil HCl + Aq Decomp by warming (Schneider, Pogg 138 318)Copper iron sodium sulphide, $\text{Na}_2\text{FeCu}_2\text{S}_4$ Sl attacked by cold dil, easily decomp by hot HCl + Aq (Schneider, Pogg 138 318)Cuprous lead sulphide, $9\text{Cu}_2\text{S}$, 2PbS $3\text{Cu}_2\text{S}$, 2PbS $2\text{Cu}_2\text{S}$, 2PbS Min *Cuprophumbite*

Copper phosphorus sulphide

See Copper phosphosulphide

Cupric platinum sulphide

See Sulphoplatinate, cupric

Cuprous potassium sulphide, 4Cu S , K_2S

(Ditte, C R 98 1429)

Cuprocupric potassium sulphide, $3\text{Cu}_2\text{S}$, 2CuS , K_2S Not decomp by very dil HCl + Aq, but easily by conc HCl + Aq on warming (Schneider, Pogg 138 311)Copper potassium polysulphide, KCuS_4 Sl sol in cold H_2O Decomp by hot H_2O Decomp by conc and dil HCl , H_2SO_4 and HNO_3 Sl sol in alcohol (Biltz and Herms, B 1907, 40 977) 2CuS_8 , K S Decomp by H_2O , NH_4OH , or NH_4SH + Aq (Priwoznik, B 5 1291) $\text{K}_2\text{Cu}_2\text{S}_{10}$ Easily sol in H_2O 1 g is sol in less than 5 cc H_2O Rapidly decomp by dil acids, slowly by conc acids Sl sol in alcohol (Biltz and Herms, B 1907, 40 983)Cupric rubidium polysulphide, RbCuS_4

As K salt (Biltz and Herms, B 1907, 40 978)

 $\text{Rb}_2\text{Cu}_2\text{S}_{10}$ Easily sol in H_2O Decomp by acids Sl sol in alcohol (Biltz and Herms, B 1907, 40 985)Cuprous silver sulphide, Cu_2S , Ag_2S Min *Stromeyerite* Sol in HNO_3 + Aq with separation of S Cu_2S , $3\text{Ag}_2\text{S}$ Min *Jalpaite* As aboveCuprous sodium sulphide, Na_2S , Cu_2S (Bodlander, Z Elektrochem 1905, 11 181)
 Na_2S , $2\text{Cu}_2\text{S}$ (Bodlander, Z Elektrochem 1905, 11 181)

Cuprocupric sodium sulphide, Cu_2S , CuS , Na_2S

Scarcely decomp by cold dil $\text{HCl} + \text{Aq}$, conc $\text{HCl} + \text{Aq}$ decomp easily on warming, without, however, dissolving all the Cu_2S . Completely decomp by warm $\text{HNO}_3 + \text{Aq}$ (Schneider, Pogg 138 315)

Copper zinc sulphide, CuS , 3ZnS **Copper sulphophosphide**

See Copper phosphosulphide

Cupric telluride, CuTe

Cu_2Te_3 Insol in H_2O (Parkmann, Sill Am J (2) 3 335)

Cu_2Te (Brauner, M 1889 423)

Croceocobaltic bromide,

$\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{Br}$

Very sl sol in cold, easily in hot H_2O (Gibbs, Proc Am Acad 10 1)

— chloraurate, $2\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{Cl}$, AuCl_3

Difficultly sol in H_2O

— chloride, $\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{Cl}$

Very sl sol in cold easily in hot H_2O , but more sol than the sulphate (Gibbs)

— chloroplatinate, $2\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{Cl}$, PtCl_4

Can be recrystallised without decomp with difficulty (Gibbs and Genth, Sill Am J (2) 24 91)

— chromate, $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]_2\text{CrO}_4$

Sl sol in H_2O (Gibbs)

— dichromate, $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]_2\text{Cr}_2\text{O}_7$

Sl sol in H_2O (Gibbs)

— periodide, $\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{I}$, I_2

Difficultly sol in cold H_2O and alcohol. Decomp by hot H_2O (Gibbs)

— nitrate, $\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2\text{NO}_3$

Sl sol in cold, easily sol in hot H_2O or dil acids. Much more sol than the sulphate (Gibbs)

Sol in about 400 pts cold H_2O (Jorgensen, Z anorg 5 163)

— nitrite cobaltic nitrite, $3\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2$, $\text{Co}(\text{NO}_2)_3$

Somewhat sol in H_2O (Jorgensen, Z anorg 5 178)

— nitrite diamine cobaltic nitrite, $\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2$, $(\text{NO}_2)_2(\text{NH}_3)_2\text{Co}(\text{NO}_2)_2$

Nearly insol in cold, very sl sol in boiling H_2O (Jorgensen)

Croceocobaltic phosphomolybdate,
 $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]_2\text{O}$, 24MoO_3 , P_2O_5

Sl sol in cold, easily in hot H_2O (Gibbs, Am Ch J 3 317)

— sulphate, $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]_2\text{SO}_4$

Very sl sol in cold or hot H_2O more easily in hot dil $\text{H}_2\text{SO}_4 + \text{Aq}$

Cuprammonium compounds

See Copper compounds, ammonia

Cuprotetrammonium tetraiodide

See Cupric tetraiodide ammonia

Cupric acid

Known only in solution (Kruger, Pogg 62 445)

Calcium cuprate

Decomp by H_2O with evolution of oxygen (Kruger and Crum, A 55 213)

Cyanhydric acid, HCN

Miscible with H_2O , alcohol, and ether with absorption of heat

Sp gr of $\text{HCN} + \text{Aq}$

% HCN	Sp gr	% HCN	Sp gr
1 60	0 9979	4 0	0 9940
1 68	0 9978	4 6	0 9930
1 77	0 9975	5 0	0 9923
2 0	0 9974	5 3	0 9914
2 1	0 9973	5 8	0 9900
2 3	0 9970	6 4	0 9890
2 5	0 9967	7 3	0 9870
2 7	0 9964	8 0	0 9840
3 0	0 9958	9 1	0 9815
3 2	0 9952	10 6	0 9768
3 6	0 9945	16 0	0 9570

(Ure, Quar J Sci 13 321)

2HCN mixed with $3\text{H}_2\text{O}$ causes a diminution of temp of 9.75° (Bussy and Buignet, A ch (4) 3 231)

Miscible with volatile oils and other organic compounds

Cyanhydric iodhydric acid, HI , HCN

Easily sol in H_2O or alcohol, with rapid decomp. Sl sol in ether (Gal, A 138 38)

Cyanides

The alkali cyanides are easily sol in H_2O , those of the alkali-earths are less sol, while all others are insol with the exception of $\text{Hg}(\text{CN})_2$. All cyanides are sol in $\text{KCN} + \text{Aq}$

Ammonium cyanide, NH_4CN

Unstable, easily sol in H_2O and alcohol

Ammonium cobaltic mercuric cyanide

See Cobaltcyanide, ammonium mercuric

Ammonium cuprous cyanide, NH_4CN , $\text{Cu}_2(\text{CN})_2$

Ppt Decomp by acids

+ H_2O Sol in H_2O , less sol in alcohol

Decomp by acids and alkalis (Treadwell and Girsfeld, Z anorg 1904, 39 90)

$2\text{NH}_4\text{CN}$, $\text{Cu}_2(\text{CN})_2$ Sl sol in H_2O , but decomp by long boiling therewith Sol in $\text{HCN} + \text{Aq}$ (Dufau, A 88 278)

Ammonium cuprous cyanide ammonia, NH_4CN , $2\text{Cu}_2(\text{CN})_2$, NH_3

Easily decomp (Treadwell and Girsfeld, Z anorg 1904, 39 90)

+ $2\text{H}_2\text{O}$ Insol in cold, decomp by boiling H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Fleurent, C R 1893, 116 191)

NH_4CN , $\text{Cu}_2(\text{CN})_2$, 3NH_3 Insol in cold, sl sol in boiling H_2O without decomp Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Fleurent, C R 1891, 113 1046)

NH_4CN , $2\text{Cu}_2(\text{CN})_2$, $2\text{NH}_3 + 2\text{H}_2\text{O}$ (Fleurent, B 25 498R)

Ammonium gold (aurous) cyanide NH_4CN , AuCN

Easily sol in cold or warm H_2O or in alcohol Insol in ether

Ammonium gold (auric) mercuric cyanide, basic, $3\text{NH}_4\text{CN}$, $2\text{Au}_2\text{O}$, $\text{Hg}(\text{CN})_2$, HgO (Schmidt, Ch Z 1896, 20 633)**Ammonium mercuric silver cyanide, basic, NH_4CN , $2\text{Ag}_2\text{O}$, 3AgCN , $4\text{Hg}(\text{OH})\text{CN} + \frac{1}{2}\text{H}_2\text{O}$**

(Schmidt, Z anorg 1895, 9 431)

Ammonium nickel cyanide, $2\text{NH}_4\text{CN}$, $\text{Ni}(\text{CN})_2$

Easily decomposed

Ammonium tungsten cyanide

See Tungstocyanide, ammonium

Ammonium zinc cyanide, $2\text{NH}_4\text{CN}$, $\text{Zn}(\text{CN})_2$

Sol in H_2O

Ammonium cyanide mercuric nitrate silver cyanide basic, $2\text{Hg}(\text{OH})\text{NO}_3$, $3\text{NH}_4\text{CN}$, 4AgCN

(Schmidt, Z anorg 1895, 9 431)

Arsenic tricyanide, $\text{As}(\text{CN})_3$

Decomp by H_2O Not attacked by cold conc H_2SO_4 Decomp on heating (Guenez, C R 1892, 114 1188)

Barium cyanide, $\text{Ba}(\text{CN})_2$

Rather sl sol in H_2O , more easily in $\text{KCN} + \text{Aq}$ (Schulz, J pr 68 257)

10 pts H_2O dissolve 8 pts, and 10 pts 70% alcohol dissolve 18 pts $\text{Ba}(\text{CN})_2$ at 14° (Joannis, A ch (5) 26 489)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ $2\text{H}_2\text{O}$ Very deliquescent

$\text{Ba}(\text{CN})_2$, BaO (Drechsel, J pr (2) 21 84)

Barium cadmium cyanide, $\text{Ba}(\text{CN})_2$, $\text{Cd}(\text{CN})_2 + \text{H}_2\text{O}$

Easily sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$

Sl sol in alcohol (Loebe, Dissert, 1902)

$2\text{Ba}(\text{CN})_2$, $3\text{Cd}(\text{CN})_2 + 10\text{H}_2\text{O}$ Sol in H_2O (Weselsky, B 2 590)

Barium cobaltous cobaltic cyanide

See Cobaltocobaltcyanide, barium

Barium cuprous cyanide, $\text{Ba}(\text{CN})_2$, $\text{Cu}_2(\text{CN})_2$

Sol in H_2O without decomp (Traube, Z anorg 1894, 8 21)

+ H_2O (Weselsky, B 2 590)

Could not be obtained (Grossmann, Z anorg 1905, 43 101)

+ $4\text{H}_2\text{O}$ Decomp by H_2O (Grossmann, Z anorg 1905, 43 101)

$2\text{Ba}(\text{CN})_2$, $\text{Cu}_2(\text{CN})_2 + 6\text{H}_2\text{O}$ Decomp by H_2O (Grossmann, Z anorg 1905, 43 105)

Barium gold (aurous) cyanide, $\text{Ba}(\text{CN})_2$, $2\text{AuCN} + 2\text{H}_2\text{O}$

Sl sol in cold but easily sol in hot H_2O

Sl sol in alcohol (Lindbom, Lund Univ Arsk 12 No 6)

Barium iridium cyanide

See Iridicyanide, barium

Barium manganous cyanide, $\text{Ba}(\text{CN})_2$, $2\text{Mn}(\text{CN})_2$

Ppt (Descamps)

See also Manganocyanide and Manganicyanide, barium

Barium mercuric cyanide, $(\text{Ba}(\text{CN})_2)$, $\text{Hg}(\text{CN})_2 + 3\text{H}_2\text{O}$

Very hygroscopic Very sol in H_2O (Grossmann, B 1904, 37 4112)

Barium mercuric cyanide iodide, $\text{Ba}(\text{CN})_2$, $\text{HgI}_2 + 6\text{H}_2\text{O}$

(Vurt, C R 1895, 121 499)

Barium palladium cyanide, $\text{Ba}(\text{CN})_2$, $\text{Pd}(\text{CN})_2 + 4\text{H}_2\text{O}$

See Palladocyanide, barium

Barium nickel cyanide, $\text{Ba}(\text{CN})_2$, $\text{Ni}(\text{CN})_2 + 3\text{H}_2\text{O}$

Sol in H_2O , decomp by acids with pptn of $\text{Ni}(\text{CN})_2$ (Weselsky, B 2 590)

Barium silver cyanide, Ba(CN)_2 , $2\text{AgCN} + \text{H}_2\text{O}$

Sol in H_2O (Weselsky, B 2 589)

Barium zinc cyanide, Ba(CN)_2 , $\text{Zn(CN)}_2 + 2\text{H}_2\text{O}$

Sol in H_2O *

Cadmium cyanide, basic, CdO_2H_2 , $2\text{Cd(CN)}_2 + 4\text{H}_2\text{O}$

Sl sol in H_2O , insol in alcohol (Loebe, Dissert, 1902)

Cadmium cyanide, Cd(CN)_2

Sl sol in H_2O 100 pts H_2O dissolve 17 pts Cd(CN)_2 at 15° (Joannis)

Easily sol in acids, sol in $\text{KCN} + \text{Aq}$ Sol in warm $\text{NH}_4\text{OH} + \text{Aq}$, but insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Wittstein)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Cadmium calcium cyanide, Cd(CN)_2 , $4\text{Ca(CN)}_2 + 20\text{H}_2\text{O}$

Sol in H_2O and in alcohol (Loebe, Dissert, 1902)

Cadmium chromic cyanide

See Chromicyanide, cadmium

Cadmium cobaltic cyanide

See Cobalticyanide, cadmium

Cadmium cuprous cyanide, 2Cd(CN)_2 , $\text{Cu}_2(\text{CN})_2$

Permanent Insol in H_2O Sl sol in cold, easily in warm $\text{HCl} + \text{Aq}$ without decomp, except by long boiling Insol in NH_4OH , or NH_4 salts + Aq (Schuler)

Cadmium cupric cyanide, Cd(CN)_2 , Cu(CN)

Very unstable

Cadmium gold (aurous) cyanide, Cd(CN) , 2AuCN

Nearly insol in cold H_2O Sl sol in boiling H_2O Insol in alcohol (Landbom)

Cadmium mercuric cyanide, 2Cd(CN)_2 , 3Hg(CN)_2

Permanent Readily sol in cold H_2O (Schuler)

Cadmium mercuric cyanide mercuric iodide, Cd(CN)_2 , Hg(CN)_2 , $\text{HgI}_2 + 8\text{H}_2\text{O}$

Very sol in H_2O (Varet, Bull Soc (3) 5 8)

+ $7\text{H}_2\text{O}$ Sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1890, 111, 679)

Cadmium mercuric cyanide mercuric iodide, Cd(CN)_2 , Hg(CN)_2 , $\text{HgI}_2 + 8\text{H}_2\text{O}$

Very sol in H_2O (Varet, Bull Soc (3) 5 8)

+ $7\text{H}_2\text{O}$ Sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1890, 111 679)

Cadmium mercuric cyanide mercuric iodide ammonia, Cd(CN)_2 , Hg(CN)_2 , HgI_2 , 4NH_3

Very easily decomp (Varet, Bull Soc (3) 6 22)

Cadmium molybdenum cyanide

See Molybdocyanide, cadmium

Cadmium potassium cyanide, Cd(CN)_2 , 2KCN

Sol in 3 pts cold, and 1 pt boiling H_2O Insol in absolute alcohol (Rammelsberg)

Cadmium sodium cyanide, $\text{Na}_2\text{Cd}_2(\text{CN})_6$, $+3\text{H}_2\text{O}$

Sol in H_2O and in alcohol (Loebe, Dissert, 1902)

Cadmium strontium cyanide, Cd(CN)_2 , $2\text{Sr(CN)}_2 + 3\text{H}_2\text{O}$

Sol in H_2O and in alcohol (Loebe, Dissert 1902)

Cadmium tungsten cyanide, $\text{Cd}_2\text{W(CN)}_8 + 8\text{H}_2\text{O}$

Nearly insol in H_2O

Sl sol in dil HCl Sol in conc $\text{NH}_4\text{OH} + \text{Aq}$

Insol in organic solvents (Olsson, Z anorg 1914, 88 68)

Cadmium cyanide dihydrazine, Cd(CN)_2 , $(\text{N}_2\text{H}_4)_2$

Easily sol in dil acids (Franzen, Z anorg 1911, 70 152)

Cæsium cuprous cyanide, CsCN , $\text{CuCN} + 1\frac{1}{2}\text{H}_2\text{O}$

H_2O separates CuCN (Grossmann, Z anorg 1905, 43 98)

2CsCN , $\text{CuCN} + \text{H}_2\text{O}$ Sol in H_2O (Grossmann, Z anorg 1905, 43 95)

2CsCN , 3CuCN Insol in, and not decomp by H_2O (Grossmann, Z anorg 1905, 43 98)

Cæsium tungsten cyanide

See Tungstocyanide, cæsium

Calcium cyanide, Ca(CN)_2

Sol in H_2O , but the solution is very unstable (Schulz)

Ca(CN)_2 , $3\text{CaO} + 15\text{H}_2\text{O}$ Decomp by H_2O (Joannis, A ch (5) 26 496)

Calcium cuprous cyanide, Ca(CN)_2 , $\text{CuCN} + 4\text{H}_2\text{O}$

Easily decomp by H_2O (Grossmann, Z anorg 1905, 43 106)

Ca(CN)_2 , $3\text{CuCN} + 8\text{H}_2\text{O}$ Immediately

decomp by H_2O (Grossmann, Z anorg 1905, **43** 99)

Calcium gold (aurous) cyanide, $\text{Ca}(\text{CN})_2$, $2\text{AuCN} + 3\text{H}_2\text{O}$

Easily sol in hot or cold H_2O or in alcohol (Lindbom)

Calcium manganous cyanide, $\text{Ca}(\text{CN})_2$, $2\text{Mn}(\text{CN})_2$

Ppt (Descamps)

See also Manganocyanide, calcium

Calcium mercuric cyanide, $\text{Ca}(\text{CN})_2$, $2\text{Hg}(\text{CN})_2 + 8\text{H}_2\text{O}$

Very deliquescent (Grossmann, B 1904, **37** 4143)

$2\text{Ca}(\text{CN})_2$, $3\text{Hg}(\text{CN})_2 + 6\text{H}_2\text{O}$ Very sol in H_2O (Grossmann, B 1904, **37** 4143)

Calcium mercuric cyanide iodide, $\text{Ca}(\text{CN})_2$, HgI_2 , $\text{Hg}(\text{CN})_2 + 7\text{H}_2\text{O}$

(Varet, C R 1895, **121** 499)

Calcium nickel cyanide, $\text{Ca}(\text{CN})_2$, $\text{Ni}(\text{CN})_2 + \tau\text{H}_2\text{O}$

Sol in H_2O

Calcium tungsten cyanide

See Tungstocyanide, calcium

Calcium zinc cyanide, $(\text{Ca}(\text{CN})_2, \text{Zn}(\text{CN})_2 + 3\frac{1}{2}\text{H}_2\text{O})$

Sol in H_2O und in alcohol (Loebe, Dissert 1902)

Cerous cyanide (?)

Ppt Very easily decomp (Behringer, A **42** 139)

Chromic cyanide, with MCN

See Chromiocyanide, M

Chromous potassium cyanide

See Chromocyanide, potassium

Cobaltous cyanide, $(\text{Co}(\text{CN})_2 + \text{H O})$

Insol in H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, and $\text{KCN} + \text{Aq}$, also in $(\text{NH}_4)_2\text{CO}_3$, or NH_4Cl in NH_4NO_3 , or NH_4Cl

Cobaltous cyanide with 4MCN

See Cobaltocyanide, M

Cobaltic cyanide with 3MCN

See Cobaltocyanide, M

Cobalt gold (aurous) cyanide, $\text{Co}(\text{CN})_2$, 2AuCN

Insol in H_2O or cold $\text{HCl} + \text{Aq}$

Cobalt hydrazine cyanide, $(\text{N}_2\text{H}_4)_4\text{Co}(\text{CN})_6$
Deliquescent (Franzen, Z anorg 1911, **70** 155)

Cobaltous cyanide ammonia, $\text{Co}(\text{CN})_2$, 2NH_3

Unstable (Peters, B 1908, **41** 3178)

Cuprous cyanide, $\text{Cu}_2(\text{CN})_2$

Insol in H_2O and dil acids Sol in NH_4OH , $(\text{NH}_4)_2\text{SO}_4$, or NH_4 succinate + Aq , and in hot NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ Sol in conc $\text{HCl} + \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$

Easily sol in conc NH_4SCN or $\text{KSCN} + \text{Aq}$ Sl sol in $\text{NaSCN} + \text{Aq}$ (Grossmann, Z anorg 1903, **37** 408)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 827)

Very sl sol in pyridine (Schroeder, Dissert 1902)

Mol weight determined in pyridine (Werner, Z anorg 1897, **15** 20)

Cupric cyanide, $\text{Cu}(\text{CN})_2$

Easily decomp Insol in H_2O

Sol in pyridine (Schroeder, Dissert 1901)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Cuprocupric cyanide, $\text{Cu}(\text{CN})_2$, $\text{Cu}_2(\text{CN})_2 + 5\text{H}_2\text{O}$

Insol in H_2O , but decomp by boiling Sol in cold conc $\text{HCl} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, and in hot NH_4 salts + Aq Easily sol in $\text{KCN} + \text{Aq}$

+ H_2O Ppt (Dufau)

+ $\text{Cu}(\text{CN})_2$, $2\text{Cu}_2(\text{CN})_2 + \text{H O}$ Ppt

Cuprous hydrazine cyanide, $\text{Cu}_2(\text{CN})_2$, $\text{N}_2\text{H}_4\text{CN}$

Insol in alcohol and H_2O (Ferratini, C C 1912, I 1281)

Cupric iridium cyanide

See Iridiocyanide, cupric

Cuprous lithium cyanide, $\text{Cu}_2(\text{CN})_2$, $\text{LiCN} + \text{H O}$

Gradually decomp by H_2O (Grossmann, Z anorg 1905, **43** 97)

Cuprous magnesium cyanide, $\text{Cu}(\text{CN})_2$, $\text{Mg}(\text{CN})_2 + 11\text{H}_2\text{O}$

Decomp by H O (Grossmann, Z anorg 1905, **43** 103)

Cuprous mercuric cyanide bromide, $\text{Cu}(\text{CN})_2$, $2\text{Hg}(\text{CN})_2$, HgBr_2

Sol in H_2O (Varet, C R 1890, **110** 148)

Cupric molybdenum cyanide ammonia

See Molybdocyanide ammonia, cupric

Cuprous potassium cyanide, $\text{Cu}(\text{CN})_2, 2\text{KCN}$

Sl sol in H_2O , with partial decomp Decomp by acids, but not by alkalis

Decomp by boiling H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Fleurent, C R 1893, 116 191)

Sol without decomp in conc KSCN (Grossmann, Z anorg 1903, 37 407)

Sol without decomp in $\text{KCN} + \text{Aq}$ (Treadwell and Girsewald, Z anorg 1904, 38 94)

$\text{Cu}_2(\text{CN})_2, \text{KCN} + \text{H}_2\text{O}$ Almost insol in cold H_2O 100 cc H_2O dissolve 0.0594 g at 15° Decomp by much hot H_2O with separation of $\text{Cu}_2(\text{CN})_2$ Sol in $\text{KCN} + \text{Aq}$ or in $\text{NH}_4\text{OH} + \text{Aq}$ (Treadwell and Girsewald, Z anorg 1904, 38 93)

$3\text{Cu}_2(\text{CN})_2, 4\text{KCN}$ Sol in H_2O

$\text{Cu}_2(\text{CN})_2, 6\text{KCN}$ Sol in H_2O

Cuprous potassium cyanide ammonia,

$\text{Cu}_2(\text{CN})_2, \text{KCN}, \text{NH}_3$

(Treadwell and Girsewald, Z anorg 1904, 38 94)

Cuprous potassium cyanide potassium sulphocyanide, $\text{Cu}_2(\text{CN})_2, 4\text{KCN}, 2\text{KSCN}, \text{H}_2\text{O}$

Easily sol in cold H_2O (Itzig, B 1902, 35 108)

Cupric potassium cyanide, $\text{Cu}(\text{CN})_2, 2\text{KCN}$

Sol in $\frac{3}{4}$ pt H_2O at 15° and $\frac{1}{3}$ pt at 100° (Bugnet, J Pharm 1859, (3), 35 168)

Cuprocupric potassium cyanide $\text{Cu}_2(\text{CN})_2, \text{Cu}(\text{CN})_2, 2\text{KCN}$

(Straus, Z anorg 1895, 9 15)

Cuprous rubidium cyanide, $\text{Cu}(\text{CN})_2, 2\text{RbCN}$

Sl sol in H_2O Pure H_2O separates CuCN (Grossmann, Z anorg 1905, 43 100)

$3\text{Cu}(\text{CN})_2, 4\text{RbCN}$ Sl sol in H_2O Pure H_2O separates CuCN (Grossmann, Z anorg 1905, 43 98)

Cuprous silver cyanide, $\text{Cu}(\text{CN})_2, 2\text{AgCN}$

Ppt

$\text{Cu}(\text{CN})_2, 6\text{AgCN}$ Sol in excess of $\text{Cu}(\text{CN})_2, \text{KCN} + \text{Aq}$ (Rummelsberg)

Cuprous sodium cyanide, $\text{Cu}(\text{CN})_2, 2\text{NaCN}$

(Treadwell, Z anorg 1894 8 21)

$+ \text{H}_2\text{O}$ Decomp by H_2O Sol in excess of $\text{NaCN} + \text{Aq}$ (Grossmann, Z anorg 1905 43 96)

$\text{Cu}_2(\text{CN})_2, \text{NaCN} + 2\text{H}_2\text{O}$ Decomp by H_2O (Grossmann, Z anorg 1905, 43 96)

$\text{Cu}_2(\text{CN})_2, 4\text{NaCN} + 6\text{H}_2\text{O}$ Very sol in H_2O without decomp (Grossmann, Z anorg 1905, 43 96)

$\text{Cu}(\text{CN})_2, 6\text{NaCN} + 6\text{H}_2\text{O}$ Very sol in

H_2O without decomp (Grossmann, Z anorg 1905, 43 96)

Cuprous strontium cyanide, $\text{Cu}_2(\text{CN})_2, \text{Sr}(\text{CN})_2 + 8\text{H}_2\text{O}$

H_2O separates $\text{Cu}_2(\text{CN})_2$ (Grossmann, Z anorg 1905, 43 103)

Cuprous cyanide ammonia, $\text{Cu}_2(\text{CN})_2, 2\text{NH}_3$

Nearly insol in cold H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ in absence of oxygen Insol in alcohol and ether Decomp by hot H_2O and acids (Treadwell and Girsewald, Z anorg 1904, 39 87)

Cuprocupric cyanide ammonia, $\text{Cu}_2(\text{CN})_2, \text{Cu}(\text{CN})_2, 2\text{NH}_3$

(Malmberg, Arch Pharm 1898, 236 256) $+ \text{H}_2\text{O}$ Sl sol in cold, decomp by boiling H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Dufau, A 88 278)

$\text{Cu}(\text{CN})_2, \text{Cu}_2(\text{CN})_2, 3\text{NH}_3$ (Mills, Z Ch 1867 545)

Sl decomp by boiling H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ and can be recryst therefrom Insol in alcohol and ether Decomp by alkalis and acids (Treadwell and Girsewald, Z anorg 1904, 39 96)

$\text{Cu}(\text{CN})_2, \text{Cu}_2(\text{CN})_2, 4\text{NH}_3$ Insol in cold decomp by hot H_2O Sol in NH_4OH , or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Treadwell and Girsewald, Z anorg 1904, 39 92)

$2\text{Cu}_2(\text{CN})_2, \text{Cu}(\text{CN})_2, 2\text{NH}_3$ Insol in H_2O , alcohol and ether Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by boiling acids and alkalis (Treadwell and Girsewald, Z anorg 1904, 39 92)

$+ \text{H}_2\text{O}$ (Monthier, J Pharm 11 257)

$\text{Cu}(\text{CN})_2, 2\text{Cu}(\text{CN})_2, 4\text{NH}_3$ (Hallenkamp, A 97 215)

$\text{Cu}(\text{CN})_2, 2\text{Cu}_2(\text{CN})_2, 6\text{NH}_3$ (Schiff and Becchi, A 134 33)

$2\text{Cu}(\text{CN})_2, \text{Cu}(\text{CN})_2, 2\text{NH}_3 + 3\text{H}_2\text{O}$

(Fleurent C R 114 1060)

$2\text{Cu}(\text{CN})_2, \text{Cu}(\text{CN})_2, 4\text{NH}_3 + \text{H}_2\text{O}$ Correct formula for $\text{Cu}(\text{CN})_2, \text{Cu}(\text{CN})_2, 4\text{NH}_3$ (Bouveault, Bull Soc (3) 4 641)

Cuprous cyanide ammonium sulphocyanide $\text{Cu}(\text{CN})_2, 3\text{NH}_4\text{SCN}$

Decomp by H_2O (Grossmann, Z anorg 1903, 37 409)

Cupric cyanide hydrazine, $\text{Cu}(\text{CN})_2(\text{NH}_4)_2$

Insol in H_2O and cold dil acids

Sol in warm dil acids (Frunzen, Z anorg 1911, 70 154)

Cuprous cyanide mercuric iodide, $\text{Cu}_2(\text{CN})_2, \text{HgI}_2$

Sol in H_2O (Varet, Bull Soc (3) 4 484)

Cuprous cyanide potassium sulphocyanide, $\text{Cu}_2(\text{CN})_2, 3\text{KSCN}$

Decomp by H_2O (Grossmann, Z anorg 1903, 37 409)

Gold (aurous) cyanide, AuCN

Insol in H_2O , alcohol, or ether Not attacked by dil, or conc acids, even boiling aqua regia

Sol in $\text{NH}_4\text{OH} + \text{Aq}$, also in soluble cyanides $+ \text{Aq}$

Slowly decomp by boiling $\text{KOH} + \text{Aq}$, also by $(\text{NH}_4)_2\text{S} + \text{Aq}$

Sol in $\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$ (Bentel, Z anorg 1912, 78 152)

Gold (auric) cyanide with MCN

See Auricyanide, M

Gold (auroauric) mercuric cyanide auric mercuric chloride, $4\text{AuCN}, \text{Au}(\text{CN})_3, 5\text{Hg}(\text{CN})_2, 7\text{AuCl}_3, 5\text{HgCl}_2$

(Schmidt, Ch Z 1896, 20 633)

Gold (aurous) potassium cyanide, AuCN, KCN

Sol in 7 pts cold, and less than 0.5 pt boiling H_2O Sl sol in cold, and somewhat more sol in boiling alcohol Insol in ether (Himly, A 42 160)

Decomp by warm acids, even tartaric, and acetic acids

Gold (aurous) sodium cyanide, AuCN, NaCN

Sl sol in cold, more easily in hot H_2O Sl sol in alcohol (Lindbom)

Gold (aurous) strontium cyanide, $2\text{AuCN}, \text{Sr}(\text{CN})_2 + 3\text{H}_2\text{O}$

As the Na salt

Gold (aurous) zinc cyanide, $2\text{AuCN}, \text{Zn}(\text{CN})_2$

Nearly insol in hot or cold H_2O

Insol in cold $\text{HCl} + \text{Aq}$

Gold (auric) cyanide auric mercuric chloride, $\text{Au}(\text{CN})_3, \text{AuCl}_3, 2\text{HgCl}_2$

(Schmidt, Ch Z 1896, 20 633)

Gold (auroauric) cyanide aurous mercuric chloride, $12\text{AuCN}, 3\text{Au}(\text{CN})_3, 4\text{AuCl}_3, 2\text{HgCl}_2$

(Schmidt, Ch Z 1896, 20 633)

Gold (auroauric) cyanide mercuric chloride $15\text{AuCN}, 2\text{Au}(\text{CN})_3, 5\text{HgCl}_2$

(Schmidt, Ch Z 1896, 20 633)

Iridium cyanide, $\text{Ir}(\text{CN})_3$

Insol in H_2O Sol in $\text{HCN} + \text{Aq}$

Iridium cyanide with MCN

See Iridicyanide, M

Lanthanum cyanide, $\text{La}(\text{CN})_3$

Ppt (Frenichs and Smith, B 11 910, 1151)

Lead cyanide, $\text{Pb}(\text{CN})_2$

Sl sol in cold, more in hot H_2O Sol in $\text{HNO}_3 + \text{Aq}$, and $\text{KCN} + \text{Aq}$ Partially sol in $\text{NH}_4\text{OH} + \text{Aq}$, and NH_4 salts $+ \text{Aq}$ Not pptd in presence of Na citrate

Above compound is $2\text{PbO}, \text{Pb}(\text{CN})_2 + \text{H}_2\text{O}$ (Joannis, A ch (5) 26 204)

$2\text{PbO}, \text{Pb}(\text{CN})_2 + \text{H}_2\text{O}$ Insol in H_2O

Lead tungsten cyanide

See Tungstocyanide, lead

Lead zinc cyanide, $\text{Pb}(\text{CN})_2, 2\text{Zn}(\text{CN})_2$

Ppt (Rammelsberg)

Lead cyanide chloride, $2\text{Pb}(\text{CN})_2, \text{PbCl}_2$

Insol in H_2O (Grissom and Thorp, Am Ch J 10 229)

Lithium mercuric cyanide mercuric iodide, $2\text{Li}(\text{CN})_3, \text{Hg}(\text{CN})_2, \text{HgI}_2 + 7\text{H}_2\text{O}$

Deliquescent, sol in H_2O (Varet, C R 111 526)

Magnesium cyanide, $\text{Mg}(\text{CN})_2$

Known only in aqueous solution which decomposes on evaporation (Schulz)

Magnesium mercuric cyanide, $2\text{Mg}(\text{CN})_2, 3\text{Hg}(\text{CN})_2 + 5\text{H}_2\text{O}$

(Grossmann, B 1904, 37 4143)

Magnesium mercuric cyanide mercuric bromide, $\text{Mg}(\text{CN})_2, \text{Hg}(\text{CN})_2, \text{HgBr} + 8\text{H}_2\text{O}$

Very sol in H_2O (Varet, Bull Soc (3) 7 170)

Magnesium mercuric cyanide mercuric iodide, $\text{Mg}(\text{CN})_2, \text{Hg}(\text{CN})_2, \text{HgI}_2 + 8\text{H}_2\text{O}$

Sol in H_2O (Varet, Bull Soc (3) 7 170)

Magnesium platinum cyanide

See Platinocyanide, magnesium

Magnesium tungsten cyanide

See Tungstocyanide, magnesium

Manganous and manganic cyanides

See Manganocyanhydric, and Manganocyanhydric acids

Manganous strontium cyanide, $2\text{Mn}(\text{CN})_2, \text{Sr}(\text{CN})_2$

Ppt (Descamps)

See also Manganocyanide, strontium

Manganous tungsten cyanide

See Tungstocyanide, manganous

Manganic cyanide, with MCN

See Manganicyanide, M

Manganous cyanide with MCN

See Manganocyanide, M

Mercuric cyanide, basic, $\text{Hg}(\text{CN})_2$, HgO

Sl sol in cold, moderately sol in hot H_2O
Sol with decomp in KOH , KCN , or $\text{KCl} + \text{Aq}$ (Johnston)

Decomp by H_2O over 80° (Holdermann, Arch Pharm 1906, 244 135)

Cold H_2O dissolves about 1%, boiling H_2O about 5% (Borelli, Gazz ch it 1908, 38 (1), 361)

1.1% dissolves in H_2O at ord temp (Richard, J Chm Phys (6) 18 555)

At 0° 1/100 mol dissolve in 1 l H_2O
At 25° 1/32 " " " " "
At 90° 1/10 " " " " "

(Borelli, Gazz ch it 1908, 38 (1), 361)

1000 cc cold H_2O dissolve 1.35g (Holdermann, Arch Pharm 1906, 244 135)

Less sol in cold H_2O than $\text{Hg}(\text{CN})_2$ (Pieverling, J B 1899, 783)

Somewhat sol in dil alcohol

Practically insol in alcohol, ether, C_6H_6 and all organic solvents (Borelli, Gazz ch it 1908, 38, (1), 361)

Sol in 110 pt alcohol of 90° Bé (Richard, J Chm Phys (6), 18 555)

$3\text{Hg}(\text{CN})_2$, HgO (Joannis, A ch (5) 26 469)

Moderately sol in H_2O (Barthe, J Pharm 1896, (6), 3 186)

Very sol in hot, less sol in cold H_2O (Holdermann, Arch Pharm 1904, 242 32)

Easily sol in HCl (Joannis A ch 1882, (5) 26 511)

$\text{Hg}(\text{CN})_2$, 3HgO More sol in H_2O than $\text{Hg}(\text{CN})_2$, HgO

Mercuric cyanide, $\text{Hg}(\text{CN})_2$

Moderately sol in H_2O

100 pts $\text{Hg}(\text{CN})_2 + \text{Aq}$ sat at 101.1° contain 35 pts $\text{Hg}(\text{CN})_2$, or 100 pts H_2O dissolve 53.85 pts $\text{Hg}(\text{CN})_2$ at 101.1° (Griffiths)

Sol in 8 pts H_2O at 15° (Abl)

Sol in 11 pts cold, and 2.5 pts boiling H_2O (Wittstein)

8 g are sol in 100 g H_2O at -0.45° (Guthrie, Phil Mag 1878, (5) 6 40)

100 g H_2O dissolve 9.3 g at 13.5° (Gimofeyev, Dissert 1894)

100 cc sat solution contain 9.3 g at 20° (Konowalow, J russ Soc 1898, (4) 30 367)

Solubility in H_2O at $25^\circ = 0.44$ mol l (Sherrill, Z phys Ch 1903, 43 735)

1 l H_2O dissolves 0.3956 mol (Hofmann and Wagner, Z Elektrochem 1909, 15 444)

100 g H_2O dissolve 12.5 g at 15° (Marsh and Struthers, Chem Soc 1905, 87 1879)

100 g H_2O dissolve 11.27 g at 25° Sp gr of solution = 1.0813 (Herz and Anders, Z anorg 1907, 62 164)

$\text{Hg}(\text{CN})_2 + \text{Aq}$ containing 7.23% $\text{Hg}(\text{CN})_2$ has sp gr $20^\circ/20^\circ = 1.0572$

$\text{Hg}(\text{CN})_2 + \text{Aq}$ containing 9.07% $\text{Hg}(\text{CN})_2$ has sp gr $20^\circ/20^\circ = 1.0743$

(Le Blanc and Rohland, Z phys Ch 1896, 19 282)

Sp gr at $16^\circ/4^\circ$ of $\text{Hg}(\text{CN})_2 + \text{Aq}$ containing 7.8921% $\text{Hg}(\text{CN})_2 = 1.06376$, containing 5.4037% = 1.04246, containing 7.5009% = 1.06049 (Schonrock, Z phys Ch 1893, 11 770)

Not decomp by acids except hot conc H_2SO_4

Sol without decomp in $\text{HNO}_3 + \text{Aq}$ (Berzelius)

1 l $\text{NH}_4\text{OH} + \text{Aq}$ (5.2% NH_3) dissolves 204.3 g at about 25° (Konowalow)

Solubility in bases

1 l H_2O containing 0.3286 mols KOH dissolves 0.5179 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.2350 mols NaOH dissolves 0.4840 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.4775 mols NaOH dissolves 0.5977 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.9475 mols NaOH dissolves 0.79603 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.970 mols LiOH dissolves 0.6543 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.480 mols LiOH dissolves 0.5500 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.243 mols LiOH dissolves 0.4840 mols $\text{Hg}(\text{CN})_2$

(Hofmann and Wagner, Z Elektrochem 1909, 15 444)

Solubility in $\text{KCN} + \text{Aq}$ at 25°

Concentration of KCN Mols per litre	Solubility of $\text{Hg}(\text{CN})_2$ Mols per litre
0.0493	0.4855
0.0985	0.5350
0.1970	0.627

(Sherrill, Z phys Ch 1903, 43 719)

Solubility in $\text{Na}_2\text{CO}_3 + \text{Aq}$

1 l H_2O containing 0.4923 mols Na_2CO_3 dissolves 0.4956 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.2443 mols Na_2CO_3 dissolves 0.4464 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.1250 mols Na_2CO_3 dissolves 0.4147 mols $\text{Hg}(\text{CN})_2$

1 l H_2O containing 0.0000 mols Na_2CO_3 dissolves 0.3952 mols $\text{Hg}(\text{CN})_2$

(Hofmann and Wagner, Z Elektrochem, 1909, 15 444)

Solubility in $\text{KNO}_3 + \text{Aq}$ at 25°

1 l H_2O containing 0.9574 mols KNO_3
dissolves 0.5383 mols $\text{Hg}(\text{CN})_2$
1 l H_2O containing 0.4614 mols KNO_3
dissolves 0.4619 mols $\text{Hg}(\text{CN})_2$
1 l H_2O containing 0.0000 mols KNO_3 dis-
solves 0.3956 mols $\text{Hg}(\text{CN})_2$
(Hofmann and Wagner, Z Elektrochem 1909,
15 444)

Insol in liquid CO_2 (Buchner, Z phys
Ch 1906, 54 674)

Very easily sol in liquid NH_3 (Franklin,
Am Ch J 1898, 20 829)

Solubility of $\text{Hg}(\text{CN})_2$ in ethyl alcohol at t°

t°	% HgCl_2
0	8.3
10	8.8
20	9.25
30	9.8
40	10.3

(Timofeev, Dissert 1894)

Solubility of $\text{Hg}(\text{CN})_2$ in methyl alcohol at t°
 $\text{Hg}(\text{CN})_2 = g$ $\text{Hg}(\text{CN})_2$ in 100 g of the
solution

t°	$\text{Hg}(\text{CN})_2$
0.0	26.10
14.7	29.17
23.4	32.01
27.4	31.77
31.7	32.53
38.1	33.29
44.5	34.05

(Dukelski, Z anorg 1907, 53 337)

100 pts methyl alcohol dissolve 44.2 pts
 $\text{Hg}(\text{CN})_2$ at 19.5° , 100 pts ethyl alcohol
dissolve 2.09 pts at 19.5° (de Bruyn, Z
phys Ch 1892, 10 784)

Sol in 2.5 pts methyl alcohol at 14° , in
20 pts ethyl alcohol at 15° (Marsh, Chem
Soc 1905, 87 1878)

Solubility of $\text{Hg}(\text{CN})_2$ in methyl alcohol +
Aq at 25°

$P = g$ alcohol in 100 g alcohol + Aq
 $\text{Hg}(\text{CN})_2 = \text{millimols}$ $\text{Hg}(\text{CN})_2$ in 10 cc of
the solution

P	$\text{Hg}(\text{CN})_2$	Sp gr
0	4.34	1.0813
10.60	4.37	1.0642
30.77	4.94	1.0484
37.21	5.40	1.0430
47.06	6.49	1.0426
64.00	8.13	1.0441
78.05	9.75	1.0484
100	13.60	1.0762

(Herz and Anders, Z anorg 1907, 52 165)

Solubility of $\text{Hg}(\text{CN})_2$ in ethyl alcohol + Aq
at 25°

$P = g$ alcohol in 100 g alcohol + Aq
 $\text{Hg}(\text{CN})_2 = \text{millimols}$ $\text{Hg}(\text{CN})_2$ in 10 cc of
the solution

P	$\text{Hg}(\text{CN})_2$	Sp gr
0	4.34	1.0813
20.18	3.47	1.0339
40.69	3.58	1.0006
70.01	3.80	0.9419
100	3.25	0.8552

(Herz and Anders, l c)

Solubility of $\text{Hg}(\text{CN})_2$ in mixtures of methyl
and ethyl alcohol at 25°

$P = \%$ methyl alcohol in the solvent
 $\text{Hg}(\text{CN})_2 = g$ $\text{Hg}(\text{CN})_2$ in 10 ccm. of the
solution

 $S_{25^\circ/4^\circ} = \text{Sp gr of the sat solution}$

P	$\text{Hg}(\text{CN})_2$	$S_{25^\circ/4^\circ}$
0	0.819	0.8552
4.37	0.902	0.8618
10.4	1.01	0.8707
41.02	1.67	0.9267
80.69	2.82	1.024
84.77	2.96	1.034
91.25	3.09	1.052
100	3.43	1.076

(Herz and Kuhn, Z anorg 1903, 58 166)

100 g propyl alcohol dissolve 3.79 g
 $\text{Hg}(\text{CN})_2$ at 13.5° (Timofeev, Dissert
1894)

Solubility in mixtures of propyl and methyl
alcohol at 25°

$P = \%$ propyl alcohol in the solvent
 $G = g$ $\text{Hg}(\text{CN})_2$ in 10 ccm. of the solution
 $S = \text{Sp gr}$ of the sat solution

P	C	$S_{25^\circ/4^\circ}$
0	3.43	1.0760
11.11	2.952	1.0327
23.8	2.448	0.9891
65.2	1.048	0.8800
91.8	0.504	0.8376
93.97	0.423	0.8335
96.6	0.398	0.8322
100	0.344	0.8283

(Herz and Kuhn, Z anorg 1908, 60 158)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g $\text{Hg}(\text{CN})_2$ in 10 cc of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	0 819	0 8552
8 1	0 790	0 8549
17 85	0 730	0 8527
56 6	0 521	0 8386
88 6	0 387	0 8311
91 2	0 384	0 8306
95 2	0 364	0 8293
100	0 344	0 8283

(Herz and Kuhn, l c)

Sp gr at 16°/4° of $\text{Hg}(\text{CN})_2$ + alcohol, containing 8 2206 % $\text{Hg}(\text{CN})_2$ = 0 85273, containing 5 8652% = 0 8348 +

Sp gr of 16°/4° of $\text{Hg}(\text{CN})_2$ + pyridine containing 29 6018% $\text{Hg}(\text{CN})_2$ = 1 28155, containing 23 2275% = 1 20198

(Schonrock, Z phys Ch 1893, 11 771)

1 l ether dissolves 0 01 mol at 25° (Sherrill, Z phys Ch 1903, 43 735)

Easily sol in acetone (Krug and M'Elroy, J Anal Ch 6 84)

100 g glycerol dissolve 27 g $\text{Hg}(\text{CN})_2$ at 15 5° (Ossendowski, Pharm J 1907, 79 575)

Nearly insol in C_6H_6 (Sherrill, Z phys Ch 1903, 43 735)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

100 g boiling methyl acetate dissolve 3 2 g (Steiner, Dissert, 1906)

Solubility of $\text{Hg}(\text{CN})_2$ in ethyl acetate + Aq at 25°

P = g ethyl acetate in 100 g ethyl acetate + Aq
 $\text{Hg}(\text{CN})_2$ = millimols $\text{Hg}(\text{CN})_2$ in 10 cc of the solution

P	$\text{Hg}(\text{CN})_2$	Sp gr
0	4 34	1 0810
4 39	4 295	1 0797
96 76	1 056	1 9374
100	0 714	0 09097

(Herz and Anders, Z anorg 1907, 52 165)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Solubility in organic solvents at 18-20°

100 g tetrachlormethane dissolve 0 001 g $\text{Hg}(\text{CN})_2$

100 g bromoform dissolve 0 005 g $\text{Hg}(\text{CN})_2$

100 g ethyl bromide dissolve 0 013 g $\text{Hg}(\text{CN})_2$

100 g ethylene dibromide dissolve 0 001 g $\text{Hg}(\text{CN})_2$

(Sule, Z anorg 1900, 25 401)

100 g acetonitrile dissolve 9 58 g $\text{Hg}(\text{CN})_2$ at 18° (Naumann and Schier, B 1914 47 249)

Solubility in benzonitrile at 18° = 1 04 g in 100 g (Naumann, B 1914, 47 1370)

Sl sol in ethyl amine (Shinn, J I ys Chem 1907, 11 538)

Very sol in liquid methyl amine (G bs, J Am Chem Soc 1906, 28 1419)

Sol in paratoluidine (Werner, Z anorg 1897, 15 7)

Mol weight determined in pyridine and benzonitrile (Werner, Z anorg 1897, 15 20 and 32)

100 g pyridine dissolve 64 8 g $\text{Hg}(\text{CN})_2$ at 18° (Schroeder, Z anorg 1905, 44 1)

Solubility in pyridine

Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification	Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification
7 1	9	22 9	45
8 7	11	23 7	46
10 1	12 3	25 3	53
10 4	12 2	26 0	54
11 3	13	26 6	56
12 9	13 5	27 5	68
13 8	14 5	27 7	70
15 8	16 5	29 0	86
15 9	20 5	32 0	111
17 3	22 5	33 8	122
18 4	28 5	34 4	125
19 3	32	38 3	141
20 6	38		
22 3	42		

(Staronka, Anz Ak Wiss Krakau, 1910 372)

Solubility in quinoline

Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification	Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification
4 2	45°	13 2	13
6 0	54	17 4	16
8 2	89(61)	22 5	18
9 2	99(61)	27 1	19

(Staronka, l c)

Solubility in aniline

Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification	Mols per 100 $\text{Hg}(\text{CN})_2$	Temp of Solidification
3 7		14 2	77° ?
4 9	26° (?)	18 2	83 ?
5 7	30 5(?)	19 7	84 ?
7 7	35 ?	23 4	88 ?
9 2	38 5(?)		

(Staronka, l c)

Mercuric nickel cyanide ammonia, $2\text{Hg}(\text{CN})_2 \cdot 4\text{Ni}(\text{CN})_2 \cdot 5\text{NH}_3 + 2\text{H}_2\text{O}$

(Papiermeister, Dissert 1898)
 $5\text{Hg}(\text{CN})_2 \cdot 18\text{Ni}(\text{CN})_2 \cdot 8\text{NH}_3 + 15\text{H}_2\text{O}$
(Papiermeister, Dissert 1898)

Mercuric potassium cyanide, $\text{Hg}(\text{CN})_2, 2\text{KCN}$

Sol in 4 4 pts cold H_2O , sl sol in alcohol, decomp by acids

100 g H_2O dissolve 22.7 g (Fronmüller, B 1878, 11 92)

Abundantly sol in liquid NH_3 (Franklin, Z phys Ch 1909, 69 295)

Mercuric silver cyanide, basic, $\text{Hg}(\text{CN})_2, \text{HgO}, 7\text{AgCN}$

Ppt (Bloxam, B 16 2669)

Mercuric silver cyanide mercuric sulphate, $\text{Hg}(\text{CN})_2, 2\text{AgCN}, \text{HgSO}_4 + \text{H}_2\text{O}$ **Mercuric sodium cyanide, $\text{Hg}(\text{CN})_2, \text{NaCN} + 1\frac{1}{2}\text{H}_2\text{O}$**

Sol in H_2O (Grossmann, B 1904, 37 4141)

Mercuric strontium cyanide, $\text{Hg}(\text{CN})_2, \text{Sr}(\text{CN})_2 + 5\text{H}_2\text{O}$

Very hygroscopic. Sol in H_2O (Grossmann, B 1904, 37 4142)

Mercuric strontium cyanide iodide, $\text{Sr}(\text{CN})_2, \text{HgI}_2, \text{Hg}(\text{CN})_2 + 7\text{H}_2\text{O}$

(Varet, C R 1895, 121 499)

Mercuric thallium cyanide, $\text{Hg}(\text{CN})_2, 2\text{TlCN}$

Easily sol in H_2O 100 pts H_2O dissolve 7.9 pts at 1° , and 10.3 pts at 10° (Fronmüller, B 11 92)

Mercuric zinc cyanide, $4\text{Zn}(\text{CN})_2, \text{Hg}(\text{CN})_2$

Insol in H_2O (Dunstan, Chem Soc 6 666)

Mercuric zinc cyanide mercuric bromide ammonia, $\text{Hg}(\text{CN})_2, \text{Zn}(\text{CN})_2, \text{HgBr}_2, 4\text{NH}_3$

Decomp by H_2O Sl sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1889, 109 810)

Mercuric cyanide ammonia, $\text{Hg}(\text{CN})_2, \text{NH}_3$

Very sol in H_2O $\text{NH}_4\text{OH} + \text{Aq}$ and alcohol (Varet, C R 1889, 109 903)

Sl sol in H_2O (Schmidt, B 1894, 27 232)

$\text{SiH}_4(\text{CN})_2 + 2\text{NH}_3 + 1\frac{1}{2}\text{H}_2\text{O}$ easily decomp (Varet Bull Soc (5) 6 221)

Mercuric cyanide bromide, $\text{Hg}(\text{CN})_2, \text{HgBr}_2$

Very sl sol even in boiling H_2O (Prussia, Gazz ch it 1898, 28, (2), 114)

Mercuric cyanide barium bromide, $2\text{Hg}(\text{CN})_2, \text{BaBr}_2 + 6\text{H}_2\text{O}$

Easily sol especially in hot H_2O and alcohol (Varet, C R 1895, 121 398)

Mercuric cyanide cadmium bromide, $\text{Hg}(\text{CN})_2, \text{CdBr}_2 + 3\text{H}_2\text{O}$

Sol in H_2O and $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 5 8)

$2\text{Hg}(\text{CN})_2, \text{CdBr}_2 + 4.5\text{H}_2\text{O}$ Sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1890, 111 680)

Mercuric cyanide cadmium bromide ammonia $2\text{Hg}(\text{CN})_2, \text{CdBr}_2, 4\text{NH}_3 + 2\text{H}_2\text{O}$

Decomp by H_2O

Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1891, 112 535)

Mercuric cyanide calcium bromide, $2\text{Hg}(\text{CN})_2, \text{CaBr}_2 + 5\text{H}_2\text{O}$

Sol in 1 pt cold, and 0.25 pt boiling H_2O , also in 2 pts cold, and 1 pt boiling 90% alcohol (Custer)

$+ 7\text{H}_2\text{O}$ (Varet, C R 1895, 121 399)

Mercuric cyanide cupric bromide ammonia, $2\text{Hg}(\text{CN})_2, \text{CuBr}_2, 4\text{NH}_3$

Decomp by H_2O , sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 6 221)

Mercuric cyanide lithium bromide, $2\text{Hg}(\text{CN})_2, 2\text{LiBr} + 7\text{H}_2\text{O}$

Deliquescent (Varet, C R 111 526)

Mercuric cyanide magnesium bromide

See Magnesium mercuric cyanide mercuric bromide

$\text{Hg}(\text{CN})_2, 2\text{KBr}$ Very sol in H_2O (Harth, Z anorg 1897, 14 351)

Mercuric cyanide potassium bromide, $\text{Hg}(\text{CN})_2, \text{KBr} + 2\text{H}_2\text{O}$

Sol in 13.34 pts H_2O at 18° , and less than 1 pt boiling H_2O (Brett)

Sol without decomp in hot dil H_2SO_4 , HNO_3 , or $\text{HCl} + \text{Aq}$ (Brett)

Contains $1\frac{1}{2}\text{H}_2\text{O}$ (Berthelot, A ch (5) 29 226)

Mercuric cyanide sodium bromide, $\text{Hg}(\text{CN})_2, \text{NaBr} + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O and alcohol

Mercuric cyanide strontium bromide, $2\text{Hg}(\text{CN})_2, \text{SrBr}_2 + 6\text{H}_2\text{O}$

Sol in H_2O and in alcohol (Varet, C R 1895, 121 399)

Mercuric cyanide zinc bromide, $\text{HgBr}_2, \text{Hg}(\text{CN})_2, \text{Zn}(\text{CN})_2 + 8\text{H}_2\text{O}$

Sol in H_2O and $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 5 8)

Mercuric cyanide zinc bromide ammonia, $\text{HgBr}_2, \text{Hg}(\text{CN})_2, \text{Zn}(\text{CN})_2, 4\text{NH}_3$

As the corresponding chloride (Varet)

Mercuric cyanide chloride, $\text{Hg}(\text{CN})_2$, HgCl_2 Sol in H_2O Decomp by alcohol, which dissolves out HgCl_2 Mercuric cyanide ammonium chloride, $\text{Hg}(\text{CN})_2$, NH_4Cl Sol in H_2O and alcohol (Poggiale) $\text{Hg}(\text{CN})_2$, $4\text{NH}_4\text{Cl}$ Mercuric cyanide barium chloride, $2\text{Hg}(\text{CN})_2$, $\text{BaCl}_2 + 4\text{H}_2\text{O}$ Efflorescent Easily sol in H_2O and alcohol + $6\text{H}_2\text{O}$ (Dexter) Mercuric cyanide barium chloride ammonia, $2\text{Hg}(\text{CN})_2$, BaCl_2, 4NH_3 Decomp by H_2O Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 6 221) Mercuric cyanide cadmium chloride, $\text{Hg}(\text{CN})_2$, $\text{CdCl}_2 + 2\text{H}_2\text{O}$ Sol in H_2O and $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 5 8) Mercuric cyanide calcium chloride, $2\text{Hg}(\text{CN})_2$, $\text{CaCl}_2 + 6\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Varet, C R 1895, 121 349) Mercuric cyanide cerium chloride, $3\text{Hg}(\text{CN})_2$, $\text{CeCl}_3 + 8\text{H}_2\text{O}$ Very sol in H_2O (Ahlén, Bull Soc (2) 27 365) Mercuric cyanide cobaltous chloride, $\text{Hg}(\text{CN})_2$, $2\text{CoCl}_2 + 4\text{H}_2\text{O}$ Sol in H_2O (Poggiale) $2\text{Hg}(\text{CN})_2$, $\text{CoCl}_2 + 7\text{H}_2\text{O}$ (Dexter) Mercuric cyanide cupric chloride, $\text{Hg}(\text{CN})_2$, $\text{CuCl}_2 + 6\text{H}_2\text{O}$ Efflorescent Sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1888, 107 1002) $2\text{Hg}(\text{CN})_2$, $\text{CuCl}_2 + 6\text{H}_2\text{O}$ Efflorescent Very sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, C R 1888, 107 1002) Mercuric cyanide cupric chloride ammonia, $2\text{Hg}(\text{CN})_2$, CuCl_2, 4NH_3 Decomp by H_2O Sl sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 6 221) Mercuric cyanide didymium chloride, $3\text{Hg}(\text{CN})_2$, $\text{DyCl}_3 + 8\text{H}_2\text{O}$ Very sol in H_2O (Ahlen) Mercuric cyanide erbium chloride, $3\text{Hg}(\text{CN})_2$, $\text{ErCl}_3 + 8\text{H}_2\text{O}$ Easily sol in H_2O (Ahlen) Mercuric cyanide hydrazine chloride, $\text{Hg}(\text{CN})_2$, N_2H_4, HCl Very sol in H_2O	Nearly insol in alcohol and ether (Ferrati, Gazz ch it 1912, 42 (1), 154) Mercuric cyanide ferric chloride, $2\text{Hg}(\text{CN})_2$, $\text{FeCl}_3 + 3\frac{1}{2}\text{H}_2\text{O}$ (Dexter) Mercuric cyanide lanthanum chloride, $3\text{Hg}(\text{CN})_2$, $\text{LaCl}_3 + 8\text{H}_2\text{O}$ Very sol in H_2O (Ahlén) Mercuric cyanide magnesium chloride, $2\text{Hg}(\text{CN})_2$, $\text{MgCl}_2 + 2\text{H}_2\text{O}$ Easily sol in H_2O and dil alcohol (Poggiale) Mercuric cyanide manganous chloride, $\text{Hg}(\text{CN})_2$, $\text{MnCl}_2 + 3\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Poggiale) Mercuric cyanide nickel chloride, $\text{Hg}(\text{CN})_2$, $\text{NiCl}_2 + 6\text{H}_2\text{O}$ Deliquescent Sol in H_2O (Poggiale) $2\text{Hg}(\text{CN})_2$, $\text{NiCl}_2 + 7\text{H}_2\text{O}$ (Dexter) Mercuric cyanide chloride nickel chloroxychloride, $11\text{Hg}(\text{CN})_2$, 8HgCl_2, 2NiCl_2, $8\text{Ni}(\text{OH})\text{Cl} + 76\text{H}_2\text{O}$ (Papiermeister, Dissert 1898) Mercuric cyanide potassium chloride, $\text{Hg}(\text{CN})_2$, $\text{KCl} + \text{H}_2\text{O}$ Sol in 675 pts H_2O at 18° (Bret) Sol in alcohol Mercuric cyanide sodium chloride, $\text{Hg}(\text{CN})_2$, NaCl Easily sol especially in hot H_2O, insol in alcohol (Poggiale) Mercuric cyanide strontium chloride, $2\text{Hg}(\text{CN})_2$, $\text{SrCl}_2 + 6\text{H}_2\text{O}$ Easily sol in H_2O and dil alcohol (Varet, C R 1895, 121 349) Mercuric cyanide yttrium chloride, $3\text{Hg}(\text{CN})_2$, $\text{YCl}_3 + 8\text{H}_2\text{O}$ Easily sol in H_2O (Ahlen, Bull Soc (2) 27 365) Mercuric cyanide zinc chloride, $2\text{Hg}(\text{CN})_2$, $\text{ZnCl}_2 + 6\text{H}_2\text{O}$ Efflorescent Sol in H_2O (Kane) HgCl_2, $\text{Hg}(\text{CN})_2$, $\text{Zn}(\text{CN})_2 + 7\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Varet, Bull Soc (3) 5 8) Mercuric cyanide zinc chloride ammonia, HgCl_2, $\text{Hg}(\text{CN})_2$, ZnCl_2, 4NH_3 Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet, Bull Soc (3) 6 221) $\text{Hg}(\text{CN})_2$, $\text{Zn}(\text{CN})_2$, HgCl_2, 6NH_3 (Varet, C R 106 1080)
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Mercuric cyanide potassium chromate
See Chromate mercuric cyanide, potassium

Mercuric cyanide potassium ferrocyanide,
 $3\text{Hg}(\text{CN})_2, \text{K}_4\text{Fe}(\text{CN})_6 + 4\text{H}_2\text{O}$
Readily sol in H_2O

Mercuric cyanide hydrazine, $\text{Hg}(\text{CN})_2, \text{N}_2\text{H}_4$
Very sol in H_2O with partial decomp (Hofmann and Marburg, A 1899, 305 215)
 $\text{Hg}(\text{CN})_2, \text{N}_2\text{H}_4$ Ppt (Franzen, Z anorg 1911, 70 154)

Mercuric cyanide potassium hydroxide,
 $\text{Hg}(\text{CN})_2, \text{KOH}$
(Hofmann and Wagner, B 1908, 41 321)
 $+1\frac{1}{2}\text{H}_2\text{O}$ (Hofmann and Wagner, B 1908, 41 1630)
 $2\text{Hg}(\text{CN})_2, \text{KOH} + \text{H}_2\text{O}$ Very sol in H_2O (Hofmann and Wagner, B 1908, 41 320)

Mercuric cyanide sodium hydroxide,
 $\text{Hg}(\text{CN})_2, \text{NaOH} + 1\frac{1}{2}\text{H}_2\text{O}$ or H_2O
(Hofmann and Wagner, B 1908, 41 1631)

Mercuric cyanide barium iodide, $2\text{Hg}(\text{CN})_2, \text{BaI}_2 + 4\text{H}_2\text{O}$
Slowly deliquescent Sol in 16.5 pts cold, and 0.4 pt boiling H_2O Sol in 22.5 pts cold, and 1.6 pts hot 90% alcohol Solution is decomp on boiling (Custer)

Mercuric cyanide cadmium iodide, $\text{Hg}(\text{CN})_2, \text{Cd}(\text{CN})_2, \text{HgI}_2 + 8\text{H}_2\text{O}$
See Cadmium mercuric cyanide mercuric iodide

Mercuric cyanide caesium iodide, $\text{Hg}(\text{CN})_2, \text{CsI}$
Recryst from H_2O without decomp
Decomp by acids (Mathewson and Wells, Am Ch J 1903, 30 433)

Mercuric cyanide calcium iodide, $2\text{Hg}(\text{CN})_2, \text{CaI}_2 + 6\text{H}_2\text{O}$
Sl efflorescent More sol in H_2O than corresponding Sr comp (Custer)

Mercuric cyanide lithium iodide, $\text{Hg}(\text{CN})_2, 2\text{Li}(\text{CN})_2, \text{HgI}_2 + 7\text{H}_2\text{O}$
See Cyanide, lithium mercuric mercuric iodide

Mercuric cyanide magnesium iodide,
 $\text{Hg}(\text{CN})_2, \text{Mg}(\text{CN})_2, \text{HgI}_2 + 8\text{H}_2\text{O}$
See Cyanide, magnesium mercuric mercuric iodide

Mercuric cyanide potassium iodide, $\text{Hg}(\text{CN})_2, \text{KI}$
Sol in 16 pts cold, and less hot H_2O Sol in 96 pts cold alcohol of 34° Baumé (Caillet) Sl sol in ether Decomp by acids
 $3\text{Hg}(\text{CN})_2, 2\text{KI} + \frac{1}{2}\text{H}_2\text{O}$ (Berthelot)

Mercuric cyanide sodium iodide, $\text{Hg}(\text{CN})_2, \text{NaI} + 2\text{H}_2\text{O}$
Sol in $4\frac{1}{2}$ pts H_2O at 18° , and $\frac{9}{7}$ pt boiling H_2O
Sol in 2 pts boiling, and $6\frac{1}{2}$ pts cold 90% alcohol (Custer)

Mercuric cyanide strontium iodide,
 $2\text{Hg}(\text{CN})_2, \text{SrI}_2 + 6\text{H}_2\text{O}$
Sol in 7 pts H_2O at 18° , and $\frac{1}{2}$ pt at b-pt
Sol in 4 pts 90% alcohol at 18° , and $\frac{1}{2}$ pt at b-pt (Custer)

Mercuric cyanide zinc iodide, $2\text{Hg}(\text{CN})_2, \text{ZnI}_2 + 6\text{H}_2\text{O}$
Efflorescent, sol in H_2O

Mercuric cyanide iodide potassium cyanide,
 $\text{HgI}_2, \text{Hg}(\text{CN})_2, 2\text{KCN}$
Easily decomp by dil acids (Rupp Apoth Ztg, 23 374)

Mercuric cyanide cadmium nitrate,
 $2\text{Hg}(\text{CN})_2, \text{Cd}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$
Decomp by H_2O , not by alcohol (Nylander, J B 1859 271)

Mercuric cyanide cobalt nitrate, $2\text{Hg}(\text{CN})_2, \text{Co}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$
Decomp by H_2O , not by alcohol (Nylander)

Mercuric cyanide copper nitrate, $\text{Hg}(\text{CN})_2, \text{Cu}(\text{NO}_3)_2 + 5\text{H}_2\text{O}$
Decomp by H_2O , not by alcohol (Nylander)

Mercuric cyanide ferrous nitrate, $2\text{Hg}(\text{CN})_2, \text{Fe}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$
Decomp by H_2O , not by alcohol (Nylander)

Mercuric cyanide manganous nitrate,
 $\text{Hg}(\text{CN})_2, \text{Mn}(\text{NO}_3)_2 + 5\text{H}_2\text{O}$
Decomp by H_2O , not by alcohol (Nylander)
 $2\text{Hg}(\text{CN})_2, \text{Mn}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$ As above

Mercuric cyanide nickel nitrate, $2\text{Hg}(\text{CN})_2, \text{Ni}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$
Decomp by H_2O not by alcohol (Nylander)

Mercuric cyanide silver nitrate, $2\text{Hg}(\text{CN})_2, \text{AgNO}_3 + 2\text{H}_2\text{O}$
Sl sol in cold, more readily in hot H_2O
Sol with decomp in $\text{HNO}_3 + \text{Aq}$
As sol in alcohol as in H_2O

Mercuric cyanide zinc nitrate, $2\text{Hg}(\text{CN})_2, \text{Zn}(\text{NO}_3)_2 + 7\text{H}_2\text{O}$
Sol in H_2O with decomp Not decomp by alcohol (Nylander, J B 1859 271)

Mercuric cyanide nitrate silver cyanide, basic,
 $\text{Hg}(\text{N}_2\text{O}_2)\text{CN}$, 10AgCN , $\text{Hg}(\text{OH})\text{NO}_2$
 (Schmidt, Z anorg 1895, 9 431)

Mercuric cyanide potassium selenocyanide,
 $\text{Hg}(\text{CN})_2$, KSeCN

Sl sol in cold, much more easily sol in hot H_2O or alcohol. Traces dissolve in ether (Cameron and Davy, C N 44 63)

Mercuric cyanide nickel sulphate,
 $\text{Hg}(\text{CN})_2$, $\text{NiSO}_4 \cdot 9\text{H}_2\text{O}$
 (Papiermeister, Dissert 1898)

Mercuric cyanide ammonium sulphocyanide,
 $\text{Hg}(\text{CN})_2$, NH_4SCN
 Easily sol in hot H_2O (Cleve, Bull Soc (2) 23 71)

Mercuric cyanide barium sulphocyanide,
 $2\text{Hg}(\text{CN})_2$, $\text{Ba}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$
 Permanent Sol in hot H_2O (Cleve)

Mercuric cyanide cadmium sulphocyanide,
 $2\text{Hg}(\text{CN})_2$, $\text{Cd}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$
 Permanent Sol in hot H_2O (Cleve)

Mercuric cyanide calcium sulphocyanide,
 $2\text{Hg}(\text{CN})_2$, $\text{Ca}(\text{SCN})_2 \cdot 8\text{H}_2\text{O}$
 Sol in H_2O (Cleve)

Mercuric cyanide cerium sulphocyanide,
 $3\text{Hg}(\text{CN})_2$, $\text{Ce}(\text{SCN})_3 \cdot 12\text{H}_2\text{O}$
 Easily sol in hot H_2O (Jolin)

Mercuric cyanide didymium sulphocyanide,
 $3\text{Hg}(\text{CN})_2$, $\text{Dy}(\text{SCN})_3 \cdot 6\text{H}_2\text{O}$
 Sl sol in cold, easily in hot H_2O (Cleve)

Mercuric cyanide erbium sulphocyanide,
 $3\text{Hg}(\text{CN})_2$, $2\text{Er}(\text{SCN})_3 \cdot 12\text{H}_2\text{O}$
 Sl sol in cold, easily in hot H_2O (Cleve)

Mercuric cyanide lanthanum sulphocyanide,
 $3\text{Hg}(\text{CN})_2$, $1\text{La}(\text{SCN})_3 \cdot 12\text{H}_2\text{O}$
 Very sol in H_2O (Cleve)

Mercuric cyanide magnesium sulphocyanide,
 $2\text{Hg}(\text{CN})_2$, $\text{Mg}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$
 Permanent. Easily sol in hot H_2O (Cleve)

Mercuric cyanide potassium sulphocyanide,
 $\text{Hg}(\text{CN})_2$, KSCN
 Permanent. Easily sol in hot H_2O (Cleve)
 $+2\text{H}_2\text{O}$ (Philp, Z Ch 1867 552)

Mercuric cyanide rubidium sulphocyanide,
 $\text{Hg}(\text{CN})_2$, $\text{Rb}(\text{SCN})$
 Sol in hot H_2O without decomp (Grossmann, B 1904, 37 1259)

Mercuric cyanide samarium sulphocyanide
 $3\text{Hg}(\text{CN})_2$, $\text{Sm}(\text{SCN})_2 \cdot 12\text{H}_2\text{O}$
 Easily sol in H_2O (Cleve)

Mercuric cyanide sodium sulphocyanide
 $\text{Hg}(\text{CN})_2$, $\text{NaSCN} \cdot 2\text{H}_2\text{O}$
 Efflorescent Sol in H_2O (Cleve, Bu Soc (2) 23 71)

Mercuric cyanide strontium sulphocyanide
 $2\text{Hg}(\text{CN})_2$, $\text{Sr}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$
 Efflorescent (Cleve)

Mercuric cyanide yttrium sulphocyanide
 $3\text{Hg}(\text{CN})_2$, $\text{Y}(\text{SCN})_3 \cdot 12\text{H}_2\text{O}$
 Sl sol in warm, much less in cold H_2O (Cleve)

Mercuric cyanide zinc sulphocyanide,
 $2\text{Hg}(\text{CN})_2$, $\text{Zn}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$
 Sl sol in H_2O (Cleve)

Mercuric cyanide zinc sulphocyanide ammonia,
 $2\text{Hg}(\text{CN})_2$, $\text{Zn}(\text{SCN})_2$, 3NH_3
 Not efflorescent. Decomp by H_2O

Mercuric cyanide potassium thiosulphate,
 $\text{Hg}(\text{CN})_2$, $\text{K}_2\text{S}_2\text{O}_3$
 Permanent Sol in H_2O (Kessler)
 $+ \text{H}_2\text{O}$ (Fock and Kluss, B 24 1355)

Molybdenum hydroxyl potassium cyanide,
 $\text{K}_3\text{Mo}(\text{OH})_2(\text{CN})_6$
 (Rosenheim and Koss, Z anorg 1906, 1 155)
 $\text{K}_3\text{Mo}(\text{OH})_2(\text{CN})_6$, Very sol in H_2O (Rosenheim and Koss)

Molybdenum cyanide with MCN
 See Molybdocyanide M

Molybdenyl potassium cyanide,
 $\text{MoO}_2(\text{CN})_2$, 2KCN
 Very sol in H_2O . Aqueous solution is stable in presence of alkalis.
 Insol in alcohol (Pichard, C R 1st 4, 118 805)
 $\text{MoO}(\text{CN})_2$, 2KCN Sol in H_2O Insol in alcohol (Hofmann, Z anorg 1896, 2 287)
 $+ \text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (Hofmann)
 $+ 4\text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (Hofmann)

Nickel cyanide, $\text{Ni}(\text{CN})_4 \cdot 2\text{H}_2\text{O}$
 Insol in H_2O . Insol in conc HCl , HNO_3 , or $\text{HNO}_3 + \text{Aq}$ but decomp by heating the solution with Sol in NH_4OH , warm $(\text{NH}_4)_2\text{CO}_3$, or NH_4 succinate $+ \text{Aq}$, also in $\text{KCN} + \text{Aq}$. Sl sol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Wittstein)
 Insol in methyl acetate (Naumann B 1909, 42 3790)

+3H₂O, +3½H₂O, +3¼H₂O, +4¼H₂O, and +5¼H₂O (Papiermeister, Dissert 1898)

+4H₂O (Hofmann and Hochtlen, B 1903, 36 1149)

Nickel potassium cyanide, Ni(CN)₂, 2KCN + H₂O

Sol in H₂O Decomp by acids with residue of insol Ni(CN)₂

+½H₂O (Rammelsberg)

Nickel sodium cyanide, Ni(CN)₂, 2NaCN + 3H₂O

Sol in H₂O, decomp by acids with residue of Ni(CN)₂

Nickel strontium cyanide, Ni(CN)₂, Sr(CN)₂ + xH₂O

Sol in H₂O (Handl, J B 1859 273)

Nickel cyanide ammonia, Ni(CN)₂, NH₃ + ½H₂O

Scarcely attacked by H₂O or dil acids

Sol in conc H₂SO₄ Sol in (NH₄)₂CO₃ + Aq, conc NH₄OH + Aq (NH₄)₂C₂O₄ + Aq, (NH₄)₂S + Aq, and KCN + Aq Decomp by boiling with NaOH or KOH (Bernoulli and Grether, Ch Z 1901, 25 436)

Nickel cyanide trihydrazine, Ni(CN)₂, (N₂H₄)₃

Ppt (Franzen, Z anorg 1911, 70 155)

Osmium cyanide, Os(CN) (?)

Insol in H₂O, not attacked by acids

See also Osmocyanhydric acid

Osmium potassium cyanide

See Osmocyanide, potassium

Palladous cyanide, Pd(CN)

Insol in H₂O Insol in dil acids Sol in KCN or NH₄OH + Aq, also in conc HCN + Aq

Platinous cyanide, Pt(CN)₂

Insol in H₂O, alkalis, or acids Sol in KCN + Aq When freshly pptd, sol in NH₄OH + Aq

Platinous cyanide with MCN

See Platinocyanide, M

Potassium cyanide, KCN

Deliquescent Very sol in H₂O

100 pts KCN + Aq, sat at b-pt 103.3°, contain 55 pts KCN, i e 100 pts H₂O dissolve 122.2 pts KCN at 103.3° (Griffiths)

KCN + Aq containing 3.25% KCN has sp gr = 1.0154, 6.5% KCN, 1.0316 (Kohlrausch, W Ann 1879 1)

KCN + Aq containing 9.64% KCN has sp gr 20°/20° = 1.0514

KCN + Aq containing 14.42% KCN has sp gr 20°/20° = 1.0768 (Le Blanc and Rohland, Z phy ch 1896, 19 278)

Moderately sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 829)

Almost insol in absolute alcohol

Sol in 80 pts 95% alcohol when boiling, and easily sol in 35% alcohol (Geiger, A 1 50)

100 pts absolute methyl alcohol dissolve 4.91 pts at 19.5°, 100 pts absolute ethyl alcohol dissolve 0.87 pt at 19.5° (de Bruyn, Z phys Ch 10 783)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

100 g glycerol dissolve 32 g KCN at 15.5° (Ossendowski, Pharm J 1907, 79 575)

Sol in CS₂ when pure (Loughlin, J B 1875 234)

Wholly insol in CS₂ (Moldenhauer, Z anal 16 199)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Potassium chromium tetroxide pentacyanide, K₃[(CrO₄)₂(CN)₅] + 5H₂O

Very hygroscopic

Sol in H₂O (Riesenfeld, B 1908, 41 3548)

Potassium chromium tetroxide dicyanide ammonia, K₂[CrO₄(CN) NH₃] + 5H₂O

Hygroscopic in the air

Easily sol in H₂O and in NH₄OH + Aq (Riesenfeld, B 1908, 41 3545)

Potassium rhodium cyanide

See Rhodocyanide, potassium

Potassium ruthenium cyanide

See Ruthenocyanide, potassium

Potassium silver cyanide, KCN, AgCN

Sol in 4.7 pts H₂O at 15°, 4 pts at 20°, and in much less at higher temp Sol in 25 pts 85% alcohol (Baup, A ch (3) 53 464)

Potassium silver sodium cyanide, 2KCN, NaCN, 3AgCN

Sol in 4.4 pts H₂O at 15°, and 22 pts 85% alcohol at 17° (Baup)

Potassium tungsten cyanide

See Tungstocyanide, potassium

Potassium uranyl cyanide,

(UO₂)(CN)₂, 2KCN

Ppt Sol in H₂O Sl sol in presence of large excess of KCN (Alox A ch 1901 (7) 24 417)

Potassium vanadium cyanide, K₃V(CN)

Readily sol in H₂O, decomp slowly in neutral aq solution, rapidly in acid aq solution,

insol in alcohol (Locke, Am Ch J 1898, 20 601)

$K_4V(CN)_6 + 3H_2O$ Sol in H_2O

Insol in alcohol and ether (Petersen, Z anorg 1904, 38 345)

Potassium zinc cyanide, $2KCN, Zn(CN)_2$

100 pts H_2O dissolve 11 pts at 20° (Sharwood, Eng Min J 1904, 77 845)

Potassium cyanide molybdenum dioxide, $4KCN, MoO_3 + 5H_2O$

Sol in H_2O Insol in alcohol (Hofmann, Z anorg 1896, 12 287)

$+6H_2O$ "Potassium dioxotetracyanomolybdate"

Very sol in H_2O (Winkler, Dissert 1909)

$+8H_2O$ (Rosenheim, Kohn and Garfunkel, Z anorg 1910, 65 174)

$+10H_2O$ Decomp by conc HCl, HNO_3 and H_2SO_4

Not acted upon by cold dil acids (v der Heide and Hofmann, Z anorg 1896, 12 285)

$5KCN, MoO_3 + 8H_2O$ Sol in H_2O Insol in alcohol (Kalscher, Dissert 1902)

Potassium cyanide molybdenum dioxide hydroxylamine, $4KCN, MoO_3, NH_2OH + H_2O$

Sol in H_2O

Decomp by dil acids (v der Heide and Hofmann, Z anorg 1896, 12 282)

Potassium cyanide molybdenum sulphide, $6KCN, Mo_2S_3 + 5H_2O$

Easily sol in H_2O Decomp by dil acids (Hofmann, Z anorg 1896, 12 289)

Very sol in H_2O Slowly decomp in the cold by dil mineral acids (v der Heide and Hofmann, Z anorg 1896, 12 289)

Potassium cyanide molybdenum sulphocyanide, $2KCN, MoS_2(CN)_2$

(Péchar, C R 1894, 118, 806)

$5KCN, Mo_3S_4(CN)_3 + 7H_2O$ Sol in H_2O Stable toward dil acids and alkalies (Hofmann, Z anorg 1896, 12 289)

Potassium cyanide molybdenum sulphonyl cyanide, $4KCN, Mo_2SO(CN)_2 + 4H_2O$

Sol in H_2O Stable toward dil acids (Hofmann, Z anorg 1896, 12 289)

Potassium cyanide nitrite, $KCN, KNO_2 + \frac{1}{2}H_2O$

Sol in H_2O , decomp slowly by H_2O , explosive (Hofmann, Z anorg 1895, 10 260-261)

Potassium cyanide sulphur dioxide, $KCN, SO_2 + H_2O$

Much more sol in hot than cold H_2O (Étard, C R 88 649)

$KCN, HCN, 2SO_2 + 3H_2O$ Very sl so in cold H_2O , decomp by hot H_2O (Étard)

Rubidium tungsten cyanide

See Tungstocyanide, rubidium

Rhodium cyanide, $Rh(CN)_3$

Ppt Not decomp by acids Sol in $KCN + Aq$ (Martius, A 117 361)

Rhodium cyanide with 3KCN

See Rhodicyanide, potassium

Ruthenium cyanide with 4MCN

See Ruthenocyanide, M

Silver cyanide, $AgCN$

Sl sol in H_2O

$2.2 + 10^{-4}$ g sol in 1 liter of H_2O at 19.96° (Böttger, Z phys ch 1903, 46 603)

1 l solution in H_2O contains 0.000043 $AgCN$ at 17.5° (Abegg and Cox, Z phy Ch 1903, 46 11)

Solubility in H_2O at $25^\circ = 2.22 + 10$ mol per l (Lucas, Z anorg 1904, 41 198)

Insol in dil acids Decomp by conc acids Not sol to any extent in $HCN + A$

Freshly pptd $AgCN$ is not dissolved by cold dil HNO_3 , but is attacked by very d HNO_3 on boiling From dry $AgCN$ is dissolved 5% by boiling 1 hour with 1% $HNO_3 + Aq$ Conc HNO_3 dissolves more (Brunc B 1901, 34 1605)

Sol in $NH_4OH + Aq$ Sol in boiln $KCl, NaCl, CaCl_2, BaCl_2$, or $MgCl_2 + Aq$, b very slowly sol therein at ord temp Sol $Na_2S_2O_3, K_4Fe(CN)_6, (NH_4)_2CO_3, (NH_4)_2SCN, NH_4NO_3$, and NH_4 succinate $+ Aq$, and large amt of hot $NH_4Cl + Aq$ (Wittsten

Sol in $KCN, NaCN, Ba(CN)_2, Ca(CN)_2$ or $Sr(CN)_2 + Aq$ Insol in KOH , or $NaOH + Aq$ Sol in conc boiling $AgNO_3 + A$ (Wohler)

Sol in 431.7 pts 5% $NH_4OH + Aq$ (cgr 0.998) at 12° , in 184.5 pts 10% NH_4OH Aq (sp gr 0.96) at 18° (Longi, Gazz, c it 13 87)

Sl sol in Na citrate $+ Aq$

Sol in $Hg(NO_3)_2 + Aq$

1 l of a 3-N solution of $AgNO_3$ dissolv 3 1.216 g $AgCN$ at 25° (Hellwig, Z anorg 1900, 25 177)

Very sol in $(NH_4)_2S_2O_3 + Aq$ (Rosenheim and Steinhilber, Z anorg 1900, 105)

Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898 20 829)

Sl sol in liquid HF (Franklin, Z anorg 1905, 46 2)

Abundantly sol in quinoline at 60° (Varley, C R 1893, 116 60)

Sl sol in ethyl amine (Shinn, J ph Chem 1907, 11 538)

Insol in methyl acetate (Bezold, Dissert 1906, Naumann, B 1909, 42 3790), etl 1

acetate (Hamers, Dissert 1906, Naumann, B 1910, 43 314)

Silver hydrogen cyanide, AgCN , HCN
(Euler, B 1903, 36 1859)

Silver sodium cyanide, AgCN , NaCN

Sol in 5 pts H_2O at 20° and in much less hot H_2O Sol in 24 pts 85% alcohol at 20° (Baup, A ch (3) 53 468)

Silver thallous cyanide, AgCN , TlCN

Easily sol in H_2O 100 pts H_2O dissolve 4.7 pts at 0° , and 7.4 pts at 16° (Fronmuller, B 11 92)

Silver tungsten cyanide

See Tungstocyanide, silver

Silver cyanide ammonia, AgCN , NH_3

Efflorescent Decomp on air
Very sol in ammonia at -10° (Joannis, C R 1894, 118 1151)

Silver cyanide hydrazine, AgCN , N_2H_4

Decomp in the air
Decomp by H_2O (Franzen, Z anorg 1911, 70 153)

Silver cyanide nitrate, 2AgCN , AgNO_3

Decomp by H_2O

Sodium cyanide, NaCN

Sol in H_2O and 75% alcohol
+ $\frac{1}{2}\text{H}_2\text{O}$, and $2\text{H}_2\text{O}$ Very sol in H_2O , sl sol in alcohol (Joannis, A ch (5) 26 484)

Sodium tungsten cyanide

See Tungstocyanide, sodium

Sodium zinc cyanide, NaCN , $\text{Zn}(\text{CN})_2 + 2\frac{1}{2}\text{H}_2\text{O}$

Much more sol in H_2O than the corresponding K Zn salt (Rammelsberg)
+ $8\text{H}_2\text{O}$ (Loebe, Dissert 1902)

Sodium cyanide molybdenum dioxide, 4NaCN , $\text{MoO}_2 + 6\text{H}_2\text{O}$

(Winkler, Dissert 1909)
+ $14\text{H}_2\text{O}$ Sol in H_2O (Rosenheim, Garfunkel and Kohn, Z anorg 1910, 65 174)

Sodium cyanide molybdenum dioxide hydroxylamine, 4NaCN , MoO_2 , $\text{NH}_2\text{OH} + \text{H}_2\text{O}$

As K comp (Winkler, Dissert 1909)

Strontium cyanide, $\text{Sr}(\text{CN})_2 + 4\text{H}_2\text{O}$

Very unstable, very deliquescent, and sol in H_2O (Joannis, A ch (5) 26 496)

Strontium tungsten cyanide

See Tungstocyanide, strontium

Strontium zinc cyanide, $2\text{Sr}(\text{CN})_2$, $3\text{Zn}(\text{CN})_2 + \text{H}_2\text{O}$

Sol in H_2O and alcohol (Loebe, Dissert 1902)

Thallous cyanide, TlCN

100 pts H_2O dissolve 16.8 pts at 28.5° (Fronmuller, B 6 1178)

Thallothallic cyanide, $\text{Tl}_2(\text{CN})_4 = \text{TlCN}$, $\text{Ti}(\text{CN})_3$

Easily sol in H_2O
100 pts H_2O dissolve 27.3 pts at 30° , 15.3 pts at 12° , 9.7 pts at 0° (Fronmuller, B 11 92)

Thallous tungsten cyanide

See Tungstocyanide, thallous

Thallous zinc cyanide, 2TlCN , $\text{Zn}(\text{CN})_2$

Easily sol in H_2O 100 pts H_2O dissolve 8.7 pts at 0° , 15.2 pts at 14° , and 29.6 pts at 31° (Fronmuller, B 11 92)

Tungsten cyanide with MCN

See Tungstocyanide, M

Zinc cyanide, $\text{Zn}(\text{CN})_2$

Insol in H_2O and alcohol Sol in alkalies
Easily sol in $\text{KCN} + \text{Aq}$ Sol in hot NH_4 salts + Aq (Wittstein)

Easily sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Gore)
Sol in $\text{KOH} + \text{Aq}$ Solution is when less than 1 mol $\text{Zn}(\text{CN})_2$ to 2 KOH is present When proportion ZnO_2H_2 soon separates

Sol in dil $\text{KCN} + \text{Aq}$ (Sharwood, J Am Chem Soc 1903, 25 587)

Sl sol in conc Zn salts + Aq 1 l conc $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ dissolves 4 g, and 1 l conc $\text{ZnSO}_4 + \text{Aq}$ dissolves 2 g $\text{Zn}(\text{CN})_2$
Insol in $\text{HCN} + \text{Aq}$ Easily sol in dil acids (Joannis)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Zinc cyanide ammonia, $\text{Zn}(\text{CN})_2$, 2NH_3

Decomp on air (Varet, C R 105 1070)
+ H_2O Decomp on air Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Varet)

Zinc cyanide dihydrazine, $\text{Zn}(\text{CN})_2$, $2\text{N}_2\text{H}_4$

Decomp by H_2O (Franzen, Z anorg 1911, 70 153)

Cyanogen, CN

H_2O absorbs $4\frac{1}{2}$ vols CN gas at 20° Alcohol absorbs 23 vols, and ether 5 vols at the same temperature (Gay-Lussac)

The solution gradually decomposes, but this is prevented by traces of acids

0.221 mol litre are dissolved in H_2O at 0° (Naumann, Z Electrochem 1910, 16 177)

Oil of turpentine absorbs 5 vols (Gay-Lussac) Absorbed by many essential oils

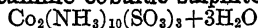
Very sol in $CuCl_2 + Aq$
Absorbed with decomp by $NH_4OH + Aq$ and other alkaline liquids

Absorbed by aniline (Jacquemain, C R 100 1006)

Cyclotriborene, B_3H_3

Insol in H_2O (Ramsay and Hatfield, Proc Chem Soc 1901, 17 152)

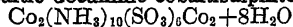
Decamine cobaltic sulphite,



Sol in H_2O (Vortmann and Magdeburg, B 22 2636)

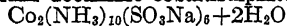
Decamine cobaltisulphurous acid

Cobaltic decamine cobaltisulphite,



Ppt (Vortmann and Magdeburg, B 22 2635)

Sodium decamine cobaltisulphite,



Sol in H_2O (Vortmann and Magdeburg, B 22 2635)

Diamide, N_2H_4

See Hydrazine

Diamine chromium sulphocyanhydric acid, $Cr(NH_3)_{12}(SCN)_3, HSCN + H_2O$

Sol in H_2O (Nordenskiöld, Z anorg 1 130)

Diamine chromium diaquo sulphocyanide, $Cr(NH_3)_2(SCN)_3 + 2H_2O$

Sol in H_2O from which it is pptd by con $HCl + Aq$ (Nordenskiöld, Z anorg 1 137)

Ammonium diamine chromium sulphocyanide, $Cr(NH_3)_3(SCN)_3, NH_4SCN$

(Reinecke's salt) Quite easily sol in H_2O , less in alcohol, and insol in benzene. Slowly decomp by boiling H_2O or dil acids (Nordenskiöld, Z anorg 1 130)

+ H_2O Insol in absolute ether (Christensen, J pr (2) 45 218)

Ammonium diamine chromium sulphocyanide iodide, $Cr(NH_3)_2(SCN)_3, NH_4SCN, I$

Barium ———, $[Cr(NH_3)_3(SCN)_3]_2, Ba(SCN)_2$

Sol in H_2O and alcohol (N)

Cadmium diamine chromium sulphocyanide, $Cd(SCN)_2, [Cr(NH_3)_2(SCN)_3]_2 + H_2O$

Nearly insol in cold, sl sol in hot H_2O
Sl sol in boiling alcohol (Christensen, J pr (2) 45 371)

Cupric ———, $Cu(SCN)_2, [Cr(NH_3)_2(SCN)_3]_2$

Insol in H_2O or dil acids (Reinecke, A 126 116)

Ferric ———, $[Cr(NH_3)_2(SCN)_3]^1 Fe(SCN)_3 (N)$

Luteocobaltic ———, $Co(NH_3)_6(SCN)_3[Cr(NH_3)_2(SCN)_3]_3$

As good as insol in cold H_2O Sl sol in hot H_2O and alcohol (Christensen, J pr (2) 45 370)

Mercuric ———, $[Cr(NH_3)_2(SCN)_3] Hg(SCN)_2$

Insol in H_2O (N)

Insol in H_2O and dil acids (Reinecke)

Potassium ———, $Cr(NH_3)_2(SCN)_3 KSCN$

Properties as the NH_4 salt (N)

$Cr(NH_3)_2(SCN)_3, KSCN, I$ As the NH_4 salt (N)

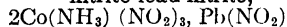
Sodium ———, $NaSCN, Cr(NH_3)_2(SCN)_3$

Sol in H_2O , alcohol, and ether (Reinecke)

Diamine cobaltic nitrite ammonium nitrite, $Co(NH_3)_2(NO_2)_3, NH_4NO_2$

Sol in H_2O (Frdmann)

——— nitrite lead nitrite,



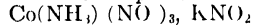
Sol in hot H_2O with partial decomp

——— nitrite mercurous nitrite,



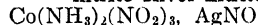
Ppt Not sol in hot H_2O without decomp

——— nitrite potassium nitrite,



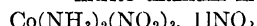
Sol in H_2O (Frdmann, J pr 97 35)

——— nitrite silver nitrite,

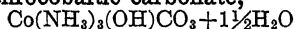


Ppt Crystallises out of hot H_2O (Erdmann)

——— nitrite thallium nitrite,



Crystallises out of hot H_2O without decomp

Dichroco-baltic carbonate,

Sol in H_2O (Vortmann, B 15 1901)

Dichroco-baltic chloride, $\text{Co}(\text{NH}_3)_3\text{Cl}_3 + \text{H}_2\text{O}$

Quite sol in cold H_2O , dil acids, conc H_2SO_4 , or dil alcohol

From solution in conc H_2SO_4 , the salt is precipitated by much $\text{HCl} + \text{Aq}$ Composition is $\text{Co}(\text{NH}_3)_3(\text{OH}_2)\text{Cl}_3$ (Jorgensen, Z anorg 5 189)

— nitrate, $\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3 + 4\text{H}_2\text{O}$

Deliquescent Sol in H_2O More sol in dil $\text{HNO}_3 + \text{Aq}$ than praseocobaltic nitrate (Vortmann, B 15 1897)

Anhydrous Insol in H_2O as such, but converted into above salt thereby (Jorgensen, Z anorg 5 186)

— nitrite, $\text{Co}(\text{NH}_3)_3(\text{NO}_2)_3$

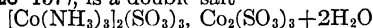
Difficultly sol in cold, but rather easily sol in hot H_2O

— sulphate, $[\text{Co}(\text{NH}_3)_3]_2(\text{SO}_4)_3 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Vortmann, B 15 1900)

— sulphite, $[\text{Co}(\text{NH}_3)_3]_2(\text{SO}_3)_3 + \text{H}_2\text{O}$

Nearly insol in cold, slowly decomp by hot H_2O Decomp by acids or $\text{KOH} + \text{Aq}$ Insol in cold, sol in warm $\text{NH}_4\text{OH} + \text{Aq}$ (Kunzel, J pr (1) 72 209) According to Geuther (A 128 157), is a double salt—

**Didymium, D_1**

Slowly decomp by H_2O Insol in cold conc H_2SO_4 Sol in dil acids

Compound of two elements, neodymium and praseodymium (v Welsbach, W A B 92 317)

Didymium bromide, $\text{D}_1\text{Br}_3 + 6\text{H}_2\text{O}$

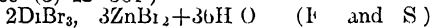
Very deliquescent, und sol in H_2O (Cleve)

Didymium nickel bromide, $2\text{D}_1\text{Br}_3 \cdot 3\text{NiBr} + 18\text{H}_2\text{O}$

Deliquescent Very sol in H_2O (Frerichs and Smith, A 191 342)

Didymium zinc bromide, $\text{D}_1\text{Br}_3 \cdot 3\text{ZnBr}_2 + 12\text{H}_2\text{O}$

Extremely deliquescent (Cleve, Bull Soc (3) 43 361)

**Didymium chloride, D_1Cl_3**

Anhydrous Deliquescent Sol in H_2O and alcohol (Marignac)

+ $6\text{H}_2\text{O}$ Deliquescent Easily sol in H_2O and alcohol (Marignac)

Didymium mercuric chloride, $2\text{D}_1\text{Cl}_3 \cdot 9\text{HgCl}_2 + 24\text{H}_2\text{O}$

More sol in H_2O than the corresponding La salt (Marignac)

$\text{D}_1\text{Cl}_3 \cdot 4\text{HgCl}_2 + 11\text{H}_2\text{O}$ Not deliquescent Easily sol in H_2O

Didymium stannic chloride

See Chlorostannate, didymium

Didymium fluoride, $\text{D}_1\text{F}_3 + \frac{1}{2}\text{H}_2\text{O}$

Precipitate (Cleve)

Didymium hydrogen fluoride, $2\text{D}_1\text{F}_3 \cdot 3\text{HF}$

Precipitate (Smith)

Does not exist (Cleve)

Didymium potassium fluoride, $\text{D}_1\text{F}_3 \cdot \text{KF} + \text{H}_2\text{O}$

Sol in H_2O (Brauner, B 15 114)

+ $\frac{1}{3}\text{H}_2\text{O}$ As above (B)

$2\text{D}_1\text{F}_3 \cdot 3\text{KF} + \text{H}_2\text{O}$ As above (B)

Didymium hydroxide, $\text{D}_1\text{O}_6\text{H}_3$

Insol in KOH , or $\text{NaOH} + \text{Aq}$, but is sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)

See also D_1O_3

Didymium penthydroxide, $\text{D}_1\text{O}_4\text{H}_3 = \text{D}_1\text{O}_5 \cdot 3\text{H}_2\text{O}$

Precipitate (Brauner, B 15 113)

Didymium zinc iodide, $2\text{D}_1\text{I}_3 \cdot 3\text{ZnI}_2 + 24\text{H}_2\text{O}$

Very deliquescent (Frerichs and Smith)

Didymium oxide, D_1O_3

With H_2O slowly forms $\text{D}_1\text{O}_6\text{H}_3$

Sol in conc, or dil mineral acids (Marignac), and in acetic acid (Heimann) Sol in ammonium salts + Aq

Slightly more slowly sol in conc $\text{NH}_4\text{NO}_3 + \text{Aq}$ than La_2O_3 (Damour and Deville)

A solution of NiI_4NO_3 in H_2O that can dissolve 29 mols I_2O_3 dissolves 1 mol D_1O_3 (Brauner, B 15 114)

Insol in acetone (Naumann, B 1904, 37 4329)

Didymium peroxide, D_1O_4

Sol in acids with decomp (Frerichs, B 7 799)

Not obtained by Cleve (B 11 910)

The contradictory statements concerning the composition of D_1 peroxide are owing to the fact that praseodymium is the only one of the constituents of D_1 which easily forms a peroxide (v Welsbach)

Didymium pentoxide, D_1O_5

Sol in dil HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ in the cold without evolution of gas, but gas is evolved if treated with conc acids Insol in $\text{HF} + \text{Aq}$ Sol in cold $\text{NH}_4\text{NO}_3 + \text{Aq} = \text{D}_1\text{O}_3$ (Cleve)

Didymium oxybromide, D_1OBr

(Frerichs and Smith)

Didymium oxychloride, D_1OCl

Anhydrous Insol in H_2O (Smith)
 $+3\text{H}_2\text{O}$ Sol in cold dil $\text{HNO}_3 + \text{Aq}$ (Marignac)
 SI sol in $\text{HCl} + \text{Aq}$ (Hermann)

Didymium oxysulphide, $\text{D}_1\text{O}_2\text{S}$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ without residue (Marignac)

Didymium sulphide, D_1S_2

Insol in H_2O Decomp by dil acids (Marignac, A ch (3) 38 159)
 Insol in acetone (Naumann, B 1904, 37 4329)

Disulphuric acid, $\text{H}_2\text{S}_2\text{O}_7$ *See Disulphuric acid***Dithionic acid (Hyposulphuric acid), $\text{H}_2\text{S}_2\text{O}_6$**

Known only in aqueous solution, which is stable only when dil. Can be evaporated in vacuo until sp gr = 1.347, but decomp upon further evaporation (Welter and Gay-Lussac, A ch 10 312)

DithionatesAll dithionates are sol in H_2O **Aluminum dithionate, $\text{Al}_2(\text{S}_2\text{O}_6)_3 + 18\text{H}_2\text{O}$**

Extremely deliquescent Easily sol in H_2O or absolute alcohol (Kluss, A 246 218)

Aluminum ammonium dithionate,

$\text{Al}_2(\text{S}_2\text{O}_6)_3, (\text{NH}_4)_2\text{S}_2\text{O}_6 + 27\text{H}_2\text{O}$
 SI deliquescent Sol in H_2O (Kluss, A 246 303)

Ammonium dithionate, $(\text{NH}_4)_2\text{S}_2\text{O}_6$

Very sol in H_2O Sol in 0.79 pt H_2O at 16° , with reduction of temp. Not decomp on boiling Insol in absolute alcohol (Heeren, Pogg 7 172)
 Contains $\frac{1}{2}\text{H}_2\text{O}$ Sol in 0.56 pt H_2O at 19° (Kluss, A 246 194)

Ammonium cadmium dithionate,

$2(\text{NH}_4)_2\text{S}_2\text{O}_6, \text{CdS}_2\text{O}_6 + 4\frac{1}{2}\text{H}_2\text{O}$
 Sol in H_2O (Kluss, A 246 298)

Ammonium cobalt dithionate, $9(\text{NH}_4)_2\text{S}_2\text{O}_6,$

$2\text{CoS}_2\text{O}_6 + 16\frac{1}{2}\text{H}_2\text{O}$
 Sol in H_2O (Kluss)

Ammonium cupric dithionate, $(\text{NH}_4)_2\text{S}_2\text{O}_6,$

$2\text{CuS}_2\text{O}_6 + 8\text{H}_2\text{O}$
 Sol in H_2O

Ammonium ferrous dithionate, $3(\text{NH}_4)_2\text{S}_2\text{O}_6,$

$\text{Fe}_2\text{S}_2\text{O}_6 + 6\text{H}_2\text{O}$
 Sol in H_2O (Kluss, A 246 300)
 $9(\text{NH}_4)_2\text{S}_2\text{O}_6, 2\text{Fe}_2\text{S}_2\text{O}_6 + 16\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O (Kluss)

Ammonium manganous dithionate,

$9(\text{NH}_4)_2\text{S}_2\text{O}_6, 2\text{MnS}_2\text{O}_6$
 Sol in H_2O (Kluss, A 246 301)

Ammonium nickel dithionate, $9(\text{NH}_4)_2\text{S}_2\text{O}_6,$

$2\text{NiS}_2\text{O}_6 + 16\frac{1}{2}\text{H}_2\text{O}$
 Sol in H_2O (Kluss)

Ammonium zinc dithionate, $5(\text{NH}_4)_2\text{S}_2\text{O}_6,$

$\text{ZnS}_2\text{O}_6 + 9\text{H}_2\text{O}$
 Easily sol in H_2O (Kluss, A 246 296)
 $9(\text{NH}_4)_2\text{S}_2\text{O}_6, 2\text{ZnS}_2\text{O}_6 + 16\frac{1}{2}\text{H}_2\text{O}$ Easily sol in H_2O (Kluss)

Ammonium dithionate chloride, $(\text{NH}_4)_2\text{S}_2\text{O}_6,$

NH_4Cl
 Sol in H_2O (Fock and Kluss, B 24 3017)

Barium dithionate, $\text{BaS}_2\text{O}_6 + 2\text{H}_2\text{O}$

Not efflorescent Sol in 7.17 pts H_2O at 8° , 4.04 pts at 18° , and 1.1 pts H_2O at 100°
 Insol in alcohol (Gay-Lussac, Heeren)
 Sol in 0.994 pt H_2O at 102° , the boiling-point of the sat solution (Baker, Bull Soc (2) 44 166)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)
 $+4\text{H}_2\text{O}$ Very efflorescent (Heeren)

Barium magnesium dithionate, $\text{BaMg}(\text{S}_2\text{O}_6)_2$

$+4\text{H}_2\text{O}$
 Sol in H_2O (Schiff, A 118 97)

Barium rubidium dithionate, $\text{BaRb}_4(\text{S}_2\text{O}_6)_3$

$+ \text{H}_2\text{O}$
 Sol in H_2O Solubility is diminished by presence of excess of Rb_2SO_4 , but increased by BaS_2O_6 (Bodlander, Chem Ztg 14 1140)

Barium sodium dithionate, $\text{BaNa}_4(\text{S}_2\text{O}_6)_3$

$+4\text{H}_2\text{O}$
 Sol in H_2O Decomp by recrystallisation (Kraut, A 118 95)
 $+6\text{H}_2\text{O}$ (Schiff)

Barium dithionate chloride, $\text{Ba}_2\text{S}_2\text{O}_6, \text{BaCl}_2$

$+4\text{H}_2\text{O}$
 (Fock and Kluss, B 23 3001)

Bismuth dithionate, basic, $\text{Bi}_2\text{O}_3, \text{S}_2\text{O}_6$

$+5\text{H}_2\text{O}$
 Efflorescent Insol in H_2O , but decomp thereby into the following salt Easily sol in dil acids, especially $\text{HCl} + \text{Aq}$ (Kluss, A 246 183)
 $4\text{Bi}_2\text{O}_3, 3\text{S}_2\text{O}_6 + 5\text{H}_2\text{O}$ Insol in H_2O Sol in dil acids (Kluss)

Cadmium dithionate

Deliquescent in moist air, very sol in H_2O (Heeren, Pogg 7 183)

Cadmium dithionate ammonia, $\text{CdS}_2\text{O}_6 \cdot 4\text{NH}_3$

Decomp by alcohol, sol in $\text{NH}_4\text{OH} + \text{Aq}$, but decomp on heating (Rammelsberg, Pogg 58 298)

Cæsium dithionate, $\text{Cs}_2\text{S}_2\text{O}_6$

Easily sol in H_2O (Chabrié, C R 1901, 133 297)

Calcium dithionate, $\text{CaS}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$

Sol in 2 46 pts H_2O at 19° , 0 8 pt at 100° Insol in alcohol (Heeren, Pogg 7 178)
 Insol in acetone (Naumann, B 1904, 37 4329)

Cerous dithionate, $\text{Ce}_2(\text{S}_2\text{O}_6)_3 + 24\text{H}_2\text{O}$

Very sol in H_2O (Jolin)
 +3, and $5\text{H}_2\text{O}$ (Wyruboff)

Chromic dithionate, $\text{Cr}_2(\text{S}_2\text{O}_6)_3 + 18\text{H}_2\text{O}$

Sol in H_2O and alcohol (Kluss, A 246 189)
 $3\text{Cr}_2\text{O}_3 \cdot 4\text{S}_2\text{O}_6 + 24\text{H}_2\text{O}$ Easily sol in H_2O or alcohol Insol in ether (Kluss)

Cobaltous dithionate, $\text{CoS}_2\text{O}_6 \cdot 6\text{H}_2\text{O}$

Not deliquescent Very sol in H_2O (Heeren)
 + $8\text{H}_2\text{O}$ Sol in 0 49 pt H_2O at 19° Sol in absolute alcohol (Kluss, A 246 203)

Cupric dithionate basic, $4\text{CuO} \cdot \text{S}_2\text{O}_6 + 4\text{H}_2\text{O}$

Very sl sol in H_2O (Heeren, Pogg 7 18)
 Insol in H_2O , easily sol in dil acids (Kluss, A 246 208)
 + $3\text{H}_2\text{O}$ Insol in H_2O and $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$, sol in traces in conc $\text{CuS}_2\text{O}_6 + \text{Aq}$ Easily sol in dil acids, even $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{S}_2\text{O}_6 + \text{Aq}$ (Kluss)

Cupric dithionate, $\text{CuS}_2\text{O}_6 + 4\text{H}_2\text{O}$

Not efflorescent Very sol in H_2O Insol in alcohol (Heeren)
 + $5\text{H}_2\text{O}$ (Efflorescent Sol in 0 64 pt H_2O at $18 5^\circ$ (Kluss, A 246 204)

Cupric dithionate ammonia, $\text{CuS}_2\text{O}_6 \cdot 4\text{NH}_3$

Difficultly sol in cold H_2O , moderately sol in H_2O at 40° Decomp by much H_2O or by heating the solution above 60° Decomp by $\text{HCl} + \text{Aq}$ (Heeren)
 Can be recryst from $\text{NH}_4\text{OH} + \text{Aq}$
 Sol in liquid NH_3 (Horn, Am Ch J 1908, 39 213)
 $\text{CuS}_2\text{O}_6 \cdot 9\text{NH}_3$ Decomp at ord temp in the air
 Insol in liquid NH_3 (Horn, Am Ch J 1908, 39 213)

Dydimium dithionate, $\text{Dy}_2(\text{S}_2\text{O}_6)_3 + 24\text{H}_2\text{O}$

Extremely sol in H_2O (Cleve)

Erbium dithionate, $\text{Er}_2(\text{S}_2\text{O}_6)_3 + 18\text{H}_2\text{O}$

Very sol in H_2O or alcohol, insol in ether (Hoglund)

Glucinum dithionate, basic, $5\text{GfO} \cdot 2\text{S}_2\text{O}_6 + 14\text{H}_2\text{O}$

Easily sol in H_2O and absolute alcohol (Kluss, A 246 196)

Iron (ferrous) dithionate, $\text{FeS}_2\text{O}_6 + 5\text{H}_2\text{O}$

Very sol in H_2O Insol in alcohol Decomp in aqueous solution into FeSO_4 by boiling (Heeren, Pogg 7 181)
 + $7\text{H}_2\text{O}$ Sol in 0 59 pt H_2O at $18 5^\circ$ (Kluss, A 246 198)

Iron (ferric) dithionate, basic, $8\text{Fe}_2\text{O}_3 \cdot \text{S}_2\text{O}_6 + 20\text{H}_2\text{O}$

Insol in H_2O or alcohol Very sl sol in $\text{H}_2\text{S}_2\text{O}_6 + \text{Aq}$, easily sol in $\text{HCl} + \text{Aq}$ (Heeren)
 Contains $14\text{H}_2\text{O}$ (Kluss, A 246 200)
 $3\text{Fe}_2\text{O}_3 \cdot \text{S}_2\text{O}_6 + 8\text{H}_2\text{O}$ Insol in H_2O Easily sol in acids (Kluss, A 246 201)

Lanthanum dithionate, $\text{La}_2(\text{S}_2\text{O}_6)_3 + 16\text{H}_2\text{O}$, and $24\text{H}_2\text{O}$

Sol in H_2O (Cleve)

Lead dithionate, basic, $2\text{PbO} \cdot \text{S}_2\text{O}_6 + 2\text{H}_2\text{O}$

Very difficultly sol in H_2O (Heeren, Pogg 7 171)
 $10\text{PbO} \cdot \text{S}_2\text{O}_6 + 2\text{H}_2\text{O}$ Sl sol in H_2O (Heeren)

Lead dithionate, $\text{PbS}_2\text{O}_6 + 4\text{H}_2\text{O}$

Easily sol in H_2O (Heern)
 Sol in 0 869 pt H_2O at $20 5^\circ$ (Baker, C N 36 203)

Lead strontium dithionate, $(\text{Pb}, \text{Sr})\text{S}_2\text{O}_6 + 4\text{H}_2\text{O}$

(Rammelsberg)

Lithium dithionate, $\text{Li}_2\text{S}_2\text{O}_6 + 2\text{H}_2\text{O}$

Sl deliquescent, and easily sol in H_2O Insol in alcohol (Rammelsberg)

Magnesium dithionate, $\text{MgS}_2\text{O}_6 + 6\text{H}_2\text{O}$

Sol in 0 85 pt H_2O at 13° Solution can be boiled without decomp (Heeren, Pogg 7 179)
 Sol in 0 692 pt H_2O at 17° (Baker, C N 36 203)

Manganous dithionate, $\text{MnS}_2\text{O}_6 + 3\text{H}_2\text{O}$

Sol in H_2O (Kraut, A 118 98)
 + $6\text{H}_2\text{O}$ Efflorescent Sol in H_2O (Magnac, J B 1855 380)

Mercurous dithionate, $\text{Hg}_2\text{S}_2\text{O}_6$

Sl sol in cold, decomp by hot H_2O
(Rammelsberg)

Mercuric dithionate, basic, 5HgO , $2\text{S}_2\text{O}_6$

Sl sol in cold, decomp by hot H_2O
Easily sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg,
Pogg 59 472)

Mercuric dithionate, $\text{HgS}_2\text{O}_6 + 6\text{H}_2\text{O}$

Decomp by H_2O or on standing (Kluss,
A 246 216)

Nickel dithionate, $\text{NiS}_2\text{O}_6 + 6\text{H}_2\text{O}$

Sol in H_2O (Topsoe)
Sol in 0.897 pt H_2O at 12° (Baker, C N
36 203)

Nickel dithionate ammonia, NiS_2O_6 , 6NH_3

Can be recryst from warm $\text{NH}_4\text{OH} + \text{Aq}$
Decomp by H_2O (Rammelsberg, Pogg
58 295)

**Nickel dithionate hydrazine, NiS_2O_6 ,
 $3\text{N}_2\text{H}_4$**

Unstable
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg
1908, 60 267)

Potassium dithionate, $\text{K}_2\text{S}_2\text{O}_6$

Not deliquescent Sol in 16.5 pts H_2O at
 16° , and 1.58 pts at 100° Insol in alcohol
(Heeren)

Sol in 2.65 pts H_2O at 16° (Dumas)
Sol in 16.5 pts H_2O at 16° , in 1.58 pts
boiling H_2O
Insol in alcohol (Heeren, Pogg 1826, 7
72)

Praseodymium dithionate, $\text{Pr}_2(\text{S}_2\text{O}_6)_3 + 12\text{H}_2\text{O}$

Deliquescent, very sol in H_2O (von
Schule, Z anorg 1898, 18 361)

Rubidium dithionate, $\text{Rb}_2\text{S}_2\text{O}_6$

Sol in H_2O (Topsoe and Christiansen)

Ruthenium dithionate, RuS_2O_6

Ppt from aq sol by alcohol (Antony,
Gazz ch it 1898, 28 139-142)

Silver dithionate, $\text{Ag}_2\text{S}_2\text{O}_6 + 2\text{H}_2\text{O}$

Sol in 2 pts H_2O at 16° Sol in $\text{NH}_4\text{OH} + \text{Aq}$
(Heeren, Pogg 7 191)

**Silver sodium dithionate, AgS_2O_6 , $\text{Na}_2\text{S}_2\text{O}_6$
 $+ 4\text{H}_2\text{O}$**

Sol in H_2O (Kraut, A 118 96)

Silver dithionate ammonia, AgS_2O_6 , 4NH_3

Sol in H_2O without decomp (Rammels-
berg, Pogg 58 298)

Sodium dithionate, $\text{Na}_2\text{S}_2\text{O}_6 + 2\text{H}_2\text{O}$

Sol in 2.1 pts H_2O at 16° , and in 1.1 pts
boiling H_2O Insol in alcohol

Fuming $\text{HCl} + \text{Aq}$ precipitates the salt
from aqueous solution (Heeren, Pogg 7
76)
 $+ 6\text{H}_2\text{O}$ (Kraut, A 117 97)

Strontium dithionate, $\text{SrS}_2\text{O}_6 + 4\text{H}_2\text{O}$

Sol in 4.5 pts H_2O at 16° , 1.5 pts boiling
 H_2O Insol in alcohol (Heeren, Pogg 7
177)

Thalious dithionate, $\text{Tl}_2\text{S}_2\text{O}_6$

Very easily sol in H_2O (Werther)

**Thalious dithionate sulphate, $3\text{Tl}_2\text{S}_2\text{O}_6$
 Tl_2SO_4**

Sol in H_2O (Wyrouboff, Ann Phys
Beibl 8 802)

Thorium dithionate, $\text{Th}(\text{S}_2\text{O}_6)_2 + 4\text{H}_2\text{O}$ (?)

Very unstable (Kluss, A 246 188)

Tin (stannous) dithionate, SnS_2O_6

Known only in solution
 8SnO , $\text{S}_2\text{O}_6 + 9\text{H}_2\text{O}$ Insol in H_2O Sol
in dil acids, even dithionic acid + Aq (Kluss
A 246 186)

Uranous dithionate, 6UO_2 , $\text{S}_2\text{O}_6 + 10\text{H}_2\text{O}$

Insol in H_2O , sol in warm $\text{HCl} + \text{Aq}$
(Kluss, A 246 191)

7UO_2 , $\text{S}_2\text{O}_6 + 8\text{H}_2\text{O}$ As above
 8UO_2 , $\text{S}_2\text{O}_6 + 21\text{H}_2\text{O}$ As above

Vanadyl dithionate, $(\text{VO})_2\text{S}_2\text{O}_6$

Sol in H_2O (Bevan, C N 38 294)

Yttrium dithionate, $\text{Y}_2(\text{S}_2\text{O}_6)_3 + 18\text{H}_2\text{O}$

Not deliquescent Easily sol in H_2O , but
difficultly sol in alcohol Insol in ether
(Cleve, Bull Soc (2) 21 344)

Zinc dithionate, $\text{ZnS}_2\text{O}_6 + 6\text{H}_2\text{O}$

Very sol in H_2O , decomp on boiling
(Heeren, Pogg 7 183)

Zinc dithionate ammonia, ZnS_2O_6 , 4NH_3

Decomp with H_2O , sol in warm, less sol
in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg
58 297)

$+ \text{H}_2\text{O}$ Ppt (Ephraim, B 1915, 48
640)

Dysprosium, Dy

(Lecoq de Boisbaudran, C R 102 1005)

Dysprosium chloride, $\text{DyCl}_3 + 6\text{H}_2\text{O}$

Deliquescent, sol in H_2O (Urban, C R
1908, 146 129)

Europium**Europium chloride, EuCl_2**

Sol in H_2O Stable in very dil aqueous solution, but decomp when the solution is concentrated at 100° (Urban, C R 1911, 153 1157)

Erbium, Er

Decomposes H_2O (Hoglund)

The so-called element "erbium" can be further decomp into simple substances (Kruss, Z anorg 3 353)

Erbium bromide, $\text{ErBr}_3 + 9\text{H}_2\text{O}$

Very deliquescent

Erbium chloride, $\text{ErCl}_3 + 6\text{H}_2\text{O}$

Deliquescent Sol in H_2O and alcohol (Hoglund)

Erbium mercuric chloride, $\text{ErCl}_3, 5\text{HgCl}_2 + x\text{H}_2\text{O}$

Deliquescent (Cleve)

Erbium fluoride, ErF_3

Insol in H_2O Very sl sol in $\text{HF} + \text{Aq}$ (Hoglund, Bull Soc (2) 18 193)

Erbium hydroxide, $\text{Er}_2\text{O}(\text{OH})_4$

Insol in KOH , or $\text{NaOH} + \text{Aq}$
Easily sol in acids Decomp ammonium salts by boiling therewith

Erbium iodide, ErI_3

Very deliquescent Very sol in H_2O and alcohol Insol in ether (Hoglund)

Erbium oxide, Er_2O_3

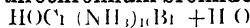
Difficultly but completely sol in warm HNO_3 , H_2SO_4 , or $\text{HCl} + \text{Aq}$ Decomp NH_4 salts by boiling therewith

Erbium peroxide, Er_2O_5

Precipitate (Cleve, Bull Soc (2) 43 53)

Erbium sulphide

Decomp in moist air and with acids

Erythrochromium bromide,

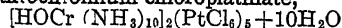
Very easily sol in H_2O Insol in $\text{HBr} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen, J pr (2) 25 598)

— bromide, basic, $\text{HOCr}_2(\text{NH}_3)_{10}(\text{OH})\text{Br}_4 + \text{H}_2\text{O}$

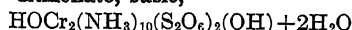
Very sol in H_2O (Jorgensen)

— chloriodide, $\text{HOCr}_2(\text{NH}_3)_{10}\text{ClI}_4 + \text{H}_2\text{O}$

Sol in H_2O and in alcohol (Jorgensen)

Erythrochromium chloroplatinate,

Nearly insol in H_2O (Jorgensen)

— dithionate, basic,

Insol in H_2O Easily sol in very dil HNO_3 , HBr , $\text{HCl} + \text{Aq}$ Sol in conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Jorgensen)

— nitrate, $\text{HOCr}_2(\text{NH}_3)_{10}(\text{NO}_3)_5 + \text{H}_2\text{O}$

Easily sol in H_2O Insol in dil $\text{HNO}_3 + \text{Aq}$ Sol in conc HNO_3 with decomp Very sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ Insol in alcohol (Jorgensen)

— nitrate, basic, $\text{HOCr}_2(\text{NH}_3)_{10}(\text{NO}_3)_4\text{OH} + 3\frac{1}{2}\text{H}_2\text{O}$

Sol in cold H_2O (Jorgensen)

— sulphate, $[\text{HOCr}_2(\text{NH}_3)_{10}]_2(\text{SO}_4)_5$

Nearly insol in H_2O (Jorgensen)

Tetraferriammonium, Fe_3N

See Iron nitride

Ferric acid**Barium ferrate, $\text{BaFeO}_4 + \text{H}_2\text{O}$**

Ppt Can be boiled for some time with H_2O without decomp Decomp by mineral acids Sol in dil acetic acid (Fremy, A ch (3) 12 373)

Insol in H_2O , not readily acted upon by acids when dry (Rosen, J Am Chem Soc 1895, 17 766)

Ppt Easily decomp by acids (Moesel, Arch Pharm 1895, 233 526)

Insol in acetone (Naumann, B 1904, 37 429)

Calcium ferrate, CaFe_2O_4

Sol in H_2O (Rosen, J Am Chem Soc 1895 17 760-69)

Potassium ferrate, K_2FeO_4

Very deliquescent Easily sol in cold H_2O with evolution of much heat Decomp by standing or warming Decomp by acids or alkalis (Fremy, A ch (3) 12 569)

Sol in H_2O , insol in alcohol (Moesel, Arch Pharm 1895, 233 526)

Quickly decomp by potassium carbonate or carbonate, sugar, or albumin without separation of Fe_2O_3 , by alcohol with separation of Fe_2O_3 . Potassium oxalate, acetate, formate, and benzoate, also citrate decomp much more slowly Insol in conc $\text{KOH} + \text{Aq}$ (Wackermader, A 33 41)

Sodium ferrate, Na_2FeO_4

Sol in H_2O and in conc $\text{NaOH} + \text{Aq}$ (Fremy, l c)

Strontium ferrate, SrFeO_4

Sl sol in H_2O by which it is decomp
Decomp by acids
Sol in aqueous solutions of Na and K salts with partial decomp
Insol in sat $\text{SrBr}_2 + \text{Aq}$, alcohol and ether (Eidmann, B 1903, 36, 2290)

Ferricomolybdic acid

Ammonium ferricomolybdate, $3(\text{NH}_4)_2\text{O} \cdot \text{Fe}_2\text{O}_3 \cdot 12\text{MoO}_3 + 19\text{H}_2\text{O}$
Ppt (Hall, J Am Chem Soc 1907, 29 697)

Ferricyanhydric acid,

$\text{H}_3\text{Fe}(\text{CN})_3$, (or $\text{H}_2\text{Fe}_2(\text{CN})_{12}$)
Easily sol in H_2O or alcohol Solution decomposes slowly by standing, more rapidly by heating Insol in ether

Ferricyanides

The alkali, and alkaline-earth ferricyanides are sol in H_2O , the others are insol The ferricyanides of metals, the oxides of which are sol in NH_4OH , or $\text{KOH} + \text{Aq}$, are themselves sol in those reagents

Ammonium ferricyanide, $(\text{NH}_4)_3\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Permanent Readily sol in H_2O (and alcohol?)

Ammonium ferrous ferricyanide, $\text{NH}_4\text{FeFe}(\text{CN})_6 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O and not pptd by alcohol from aqueous solution More stable than the corresponding K salt

Ammonium lead ferricyanide, $\text{NH}_4\text{PbFe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Ammonium potassium ferricyanide, $(\text{NH}_4)_2\text{KFe}(\text{CN})_6$

Sol in H_2O (Schaller, Bull Soc (2) 1 275)

Barium ferricyanide, $\text{Ba}_3[\text{Fe}(\text{CN})_6]_2 + 20\text{H}_2\text{O}$

Easily sol in H_2O , insol in alcohol (Schuler, W A B 77 692)

Barium potassium ferricyanide, $\text{BaKFe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Permanent Easily sol in H_2O , less in alcohol

Barium ferricyanide bromide, $\text{Ba}_3[\text{Fe}(\text{CN})_6] \cdot 2\text{BaBr}_2 + 20\text{H}_2\text{O}$

Easily sol in H_2O Boiling alcohol does not dissolve out BaBr_2 (Rammelsberg, J pr (2) 39 463)

Bismuth ferricyanide, $\text{Bi}_3[\text{Fe}(\text{CN})_6]_3$

Insol in H_2O , but decomp by boil therewith (Muir, Chem Soc 32 40)

Cadmium ferricyanide ammonia, $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2 \cdot 6\text{NH}_3 + 3\text{H}_2\text{O}$

Effloresces to form—
 $\text{Cd}_3[\text{Fe}(\text{CN})_6]_2 \cdot 4\text{NH}_3 + 2\text{H}_2\text{O}$ Insol
 H_2O (Wyrouboff, A hc (5) 10 413)

Calcium ferricyanide, $\text{Ca}_3[\text{Fe}(\text{CN})_6]_2 + 1$ or $12\text{H}_2\text{O}$

Deliquescent Sol in H_2O and dil alcohol

Calcium potassium ferricyanide, $\text{CaKFe}(\text{CN})_6$

Sol in H_2O

Cerous ferricyanide, $\text{CeFe}(\text{CN})_6 + 4\text{H}_2\text{O}$

Sol in H_2O , easily decomp (John)

Chromic ferricyanide (?)

Ppt

Cobaltous ferricyanide, $\text{Co}_3[\text{Fe}(\text{CN})_6]_2$

Insol in H_2O and $\text{HCl} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Cobaltous ferricyanide ammonia, $\text{Co}_3[\text{Fe}(\text{CN})_6]_2 \cdot 4\text{NH}_3 + 6\text{H}_2\text{O}$

Cobaltic ferricyanide ammonia

See Luteo, - purpureo, - etc cobaltic ferricyanide

Cuprous ferricyanide, $(\text{Cu}_2)_3[\text{Fe}(\text{CN})_6]$

Sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in NH_4 salts
 Aq (Wittstein)

Cupric ferricyanide, $\text{Cu}_3[\text{Fe}(\text{CN})_6]_2$

Insol in H_2O or NH_4 salts + Aq Sol in NH_4OH , and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Wittstein)
Insol in $\text{HCl} + \text{Aq}$

Iron (ferrous) ferricyanide, $\text{Fe}_3[\text{Fe}(\text{CN})_6]_2 \cdot x\text{H}_2\text{O}$

(Turnbull's blue) Properties as ferriferrocyanide (Prussian blue), with which it is perhaps identical (Gintl, Z anal 21 110)

Iron (ferrosoferric) ferricyanide,

$\text{Fe}_{13}(\text{CN})_{36} = \text{Fe}^{II}_4\text{Fe}^{III}_9[\text{Fe}(\text{CN})_6]_6$
(Prussian green) Insol in H_2O or conc $\text{HCl} + \text{Aq}$, but slowly decomp by boiling therewith

$\text{Fe}_3(\text{CN})_6 + 4\text{H}_2\text{O} = \text{Fe}^{II}_3\text{Fe}^{III}_3[\text{Fe}(\text{CN})_6]_4 + 12\text{H}_2\text{O}$ Properties as above (Reynolds, Chem Soc 54 767)

Iron (ferrous) potassium ferricyanide,

$\text{KFe}_2(\text{CN})_6 = \text{KFeFe}(\text{CN})_6 + 4$, or $3\text{H}_2\text{O}$
(Soluble Prussian blue) Sol in H_2O , but insol in salts + Aq or alcohol

Salt of the same composition, called "Williamson's blue," is insol in H_2O

Lead ferricyanide, basic, $Pb_3[Fe(CN)_6]_2$,
 $3PbO_2 \cdot H_2 + 11H_2O$
(Schuler)

Lead ferricyanide, $Pb_3[Fe(CN)_6]_2 \cdot 16H_2O$
Sl sol in H_2O , more sol in hot, than cold
 H_2O , but decomp on boiling (Gmelin)
 $+4H_2O$ Easily sol in H_2O , sl sol in
alcohol (Schuler, W A B 77 692)

Lead potassium ferricyanide, $PbKFe(CN)_6$
 $+3H_2O$
Sol in 4 75 pts H_2O at 16° , and the solu-
tion decomp on standing (Schuler)
 $+1\frac{1}{2}H_2O$ Efflorescent Much more sol
in H_2O than the Pb salt Insol in alcohol
(Wyrouboff)

Lead ferricyanide nitrate, $Pb_3[Fe(CN)_6]_2$,
 $Pb(NO_3)_2 \cdot 12H_2O$
Sol in 13 31 pts H_2O at 16° (Schuler)
 $+11H_2O$ (Joannis, A ch (5) 26 528)

Magnesium ferricyanide, $Mg_3[Fe(CN)_6]_2$
Sol in H_2O

Magnesium potassium ferricyanide,
 $MgKFe(CN)_6$
(Reindel, J pr 103 166)

Manganous ferricyanide, $Mn_3[Fe(CN)_6]_2$
Insol in H_2O , acids, NH_4OH , or NH_4 salts
 $+Aq$

Mercurous ferricyanide, $Hg_3Fe(CN)_6$
Ppt (Fernekes, J Am Chem Soc 1906, 28 604)

Mercuric ferricyanide, $Hg_2[Fe(CN)_6]_2$
Very sol in H_2O Solution quickly decomp
(Fernekes, J Am Chem Soc 1906, 28 603)

Nickel ferricyanide ammonia, $Ni_3[Fe(CN)_6]_2$,
 $4NH_3 + H_2O$
Sol in $Ni_4OH + Aq$ (Reynoso, A ch (3)
30 254)

Nickel ferricyanide, $Ni_3[Fe(CN)_6]_2(?)$
Ppt Insol in $HCl + Aq$

Potassium ferricyanide, $K_3Fe(CN)_6$, (or
 $K_4Fe_2(CN)_{12}$)
Permanent Easily sol in H_2O

100 pts H_2O dissolve pts $K_3Fe(CN)_6$ at t°

t°	Pts salt	t	Pts salt	t	Pts salt
4 4	33 0	15 6	40 8	100	77 5
10	36 6	37 8	58 8	104 4	82 6

(Wallace, Chem Soc 7 80)

100 pts H_2O at 13° dissolve 38 pts, and the
solution has sp gr = 1 1630 (Schiff, A 113
350)

1 l sat solution in H_2O at 25° contains
385 5 g $K_3Fe(CN)_6$ (Grube, Z Electrochem
1914, 20 342)

Sp gr of $K_3Fe(CN)_6 + Aq$ at 13°

% salt	Sp gr	% salt	Sp gr	% salt	Sp gr
1	1 0051	11	1 0595	21	1 1202
2	1 0103	12	1 0653	22	1 1266
3	1 0155	13	1 0712	23	1 1331
4	1 0208	14	1 0771	24	1 1396
5	1 0261	15	1 0831	25	1 1462
6	1 0315	16	1 0891	26	1 1529
7	1 0370	17	1 0952	27	1 1596
8	1 0426	18	1 1014	28	1 1664
9	1 0482	19	1 1076	29	1 1732
10	1 0538	20	1 1039	30	1 1802

(Schiff)

Sp gr of $K_3Fe(CN)_6 + Aq$ at 25°

Concentration of $K_3Fe(CN)_6$ $+Aq$	Sp gr
1—normal	1 0574
$\frac{1}{2}$ —"	1 0289
$\frac{1}{4}$ —"	1 0143
$\frac{1}{8}$ —"	1 0092

(Wagner, Z phys Ch 1890, 5 37)

Sat $K_3Fe(CN)_6 + Aq$ boils at 104.4°
(Wallace)

1 l sat solution at 25° of $K_3Fe(CN)_6 +$
 $K_4Fe(CN)_6$ contains 338 1 g $K_3Fe(CN)_6$ and
79 02 g $K_4Fe(CN)_6$ (Grube)

Solubility of $K_3Fe(CN)_6 + K_4Fe(CN)_6$ in
 $KOH + Aq$ at 25°

KOH Normality	g per l	
	$K_3Fe(CN)_6$	$K_4Fe(CN)_6$
0 4687	309	66 64
0 9628	275 3	55 19
1 949	200 8	35 95

(Grube)

Solubility in $KOH + Aq$ at 25°

KOH Normality	g $K_3Fe(CN)_6$ per l
0 4687	342 7
0 9628	302 3
1 949	215 1

(Grube, Z Electrochem, 1914, 20 342)

Insol in liquid NH_3 (Franklin, Am Ch
J 1898, 20 828)

Insol in absolute alcohol, and only sl sol in dil alcohol

Sol in acetone (Naumann, B 1904, **37** 4328)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1910, **43** 314)

Insol in benzonitrile (Naumann, B 1914, **47** 1370)

Potassium sodium ferricyanide,
 $\text{KNa}_2\text{Fe}(\text{CN})_6$

Sol in H_2O

K NaFe(CN)₆ Sol in H_2O

$\text{K}_3\text{Na}_3[\text{Fe}(\text{CN})_6]_2$ Sol in H_2O
+ $3\text{H}_2\text{O}$

Potassium ferricyanide iodide, $\text{K}_3\text{Fe}(\text{CN})_6$,
KI

Very unstable

Silver ferricyanide, $\text{Ag}_3\text{Fe}(\text{CN})_6$

1 l H_2O dissolves 0.00066 g $\text{Ag}_3\text{Fe}(\text{CN})_6$ at 20° (Whitby, Z anorg 1910, **67** 108)

Sol in NH_4OH , and hot $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, but insol in NH_4 salts + Aq

Insol in $\text{Hg}(\text{NO}_3)_2 + \text{Aq}$ (Wackenroder, A **41** 317)

Silver ferricyanide ammonia, $2\text{Ag}_3\text{Fe}(\text{CN})_6$,
 $3\text{NH}_3 + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gintl)

$2\text{Ag}_3\text{Fe}(\text{CN})_6$, 5NH_3 (Carlo, Gazz ch it 1910, **40** (2) 477)

Sodium ferricyanide, $\text{Na}_3\text{Fe}(\text{CN})_6 + \text{H}_2\text{O}$

Deliquescent Sol in 53 pts cold, and 15 pts boiling H_2O Insol in alcohol, but not pptd thereby from aqueous solution (Bette)

Ferrinitrososulphydic acid

See *Ferroheptanitrososulphydic acid*

Ferrocyanhydric acid, $\text{H}_4\text{Fe}(\text{CN})_6$

Sol in H_2O and alcohol

100 pts H_2O dissolve 15 pts acid at 14° (Joannis, A ch (5) **26** 514)

Insol in ether, and much less sol in ethyl alcohol than in alcohol Insol in conc $\text{HCl} + \text{Aq}$

Ferrocyanides

The ferrocyanides of the alkali and alkali-earth metals are sol in H_2O , the others are insol, but sol in alkalis + Aq in case the base is sol therein

Aluminum ferrocyanide, $\text{Al}_4[\text{Fe}(\text{CN})_6]_3 + 17\text{H}_2\text{O}$

Sl sol in H_2O

Sl sol in $\text{HCl} + \text{Aq}$ with partial decomp (Wyruboff, A ch (5) **8** 446)

Ammonium ferrocyanide, $(\text{NH}_4)_4\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Very sol in H_2O , insol in alcohol

+ H_2O (Berzelius)

Ammonium cadmium ferrocyanide ammonia
 $(\text{NH}_4)_2\text{Cd}_2[\text{Fe}(\text{CN})_6]_2, 2\text{NH}_3 + \text{H}_2\text{O}$

Sol in H_2O (Wyruboff, A ch (5) **10** 413)

Ammonium calcium ferrocyanide,
 $(\text{NH}_4)_2\text{CaFe}(\text{CN})_6$

Sl sol in H_2O (Kunheim and Zimmer man, Dingl **252** 478)

100 g sat solution in H_2O contain 0.25% at 16° (Brown, J phys Ch 1898, **2** 51)

Ammonium cuprous ferro cyanide,
 $(\text{NH}_4)_2\text{Cu}_2\text{Fe}(\text{CN})_6$

Insol in H_2O and alcohol

Decomp in the air (Messner, Z anorg 1895, **8** 382)

Ammonium cupric ferrocyanide,
 $(\text{NH}_4)_2\text{CuFe}(\text{CN})_6$

Ppt

+ H_2O Very unstable Insol in H_2O decomp by boiling H_2O (Messner, Z anorg 1895, **8** 384)

Ammonium lithium ferrocyanide,
 $(\text{NH}_4)_2\text{Li}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Sol in H_2O (Wyruboff, A ch (4) **21** 270)

Ammonium magnesium ferrocyanide,
 $(\text{NH}_4)_2\text{MgFe}(\text{CN})_6$

1 l sat solution at 17° contains 2.18 g $(\text{NH}_4)_2\text{MgFe}(\text{CN})_6$ (Robins in Chem Soc 1900 **95**)

Ammonium manganous ferrocyanide,
 $(\text{NH}_4)_2\text{MnFe}(\text{CN})_6$

Ppt (Blum, Z anal **30** 281)

Ammonium potassium ferrocyanide,
 $\text{NH}_4\text{K}_3\text{Fe}(\text{CN})_6 + 5\text{H}_2\text{O}$

Insol in cold, more easily in hot H_2O Insol in alcohol

$(\text{NH}_4)_2\text{KFe}(\text{CN})_6 + 3\text{H}_2\text{O}$ Sol in H_2O

Ammonium potassium ferrocyanide ammonium chloride, $(\text{NH}_4)_4\text{KFe}(\text{CN})_6$
 $2\text{NH}_4\text{Cl}$

Sol in H_2O (Etard, J pr (2) **31** 150)

Ammonium ferrocyanide bromide,
 $(\text{NH}_4)_4\text{Fe}(\text{CN})_6, 2\text{NH}_4\text{Br}$

Permanent Very sol in H_2O

Ammonium ferrocyanide chloride,
 $(\text{NH}_4)_4\text{Fe}(\text{CN})_6, 2\text{NH}_4\text{Cl} + 3\text{H}_2\text{O}$

Permanent Very sol in H_2O , but less so than NH_4Cl (Bunsen)

Antimony ferrocyanide, $\text{Sb}_4[\text{Fe}(\text{CN})_6]_3 + 25\text{H}_2\text{O}$

Ppt (Atterberg)

Barium ferrocyanide, $\text{Ba}_2\text{Fe}(\text{CN})_6 + 6\text{H}_2\text{O}$

Permanent Sl sol in H_2O

Sol in 584 pts cold, and 116 pts boiling H_2O (Duflos, 1832), sol in 1800 pts cold H_2O (Porrett, 1814), sol in 1920 pts cold, and about 100 pts boiling H_2O (Thomson), sol in 2000 pts cold, and 100 pts boiling H_2O (Ure's Diet)

Sol in 1000 pts H_2O at 15° , and 100 pts at 75° (Wyruboff, A ch (4) 16 292)

Sol in HNO_3 , HCl , or conc $\text{H}_2\text{SO}_4 + \text{Aq}$

Barium cupric ferrocyanide, $\text{BaCuFe}(\text{CN})_6$

Insol in H_2O (Messner, Z anorg 1895, 8 389)

Barium potassium ferrocyanide,

$\text{BaK}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Sol in 38 pts cold, and 9.5 pts boiling H_2O (Duflos, 1832), in 36.4 pts H_2O at 14° , and 11.9 pts at b-pt (Mosander)

Not more sol in $\text{NH}_4\text{Cl} + \text{Aq}$ than in H_2O
Sol in dil, insol in conc $\text{HCl} + \text{Aq}$ (Rose)
+ $5\text{H}_2\text{O}$ Sol in 300 pts H_2O at ord temp (Wyruboff)

Bismuth ferrocyanide, $\text{Bi}_2\text{Fe}(\text{CN})_6 + 5\text{H}_2\text{O}$ (?)

Sl sol in pure H_2O (Wyruboff)

$\text{Bi}_4[\text{Fe}(\text{CN})_6]_3$ Ppt (Muir, Chem Soc 31 657)

Bismuth potassium ferrocyanide,

$\text{BiKFe}(\text{CN})_6 + 7\text{H}_2\text{O}$, or $4\text{H}_2\text{O}$

Ppt

Cadmium potassium ferrocyanide,

$\text{CdK}_2\text{Fe}(\text{CN})_6 + \text{H}_2\text{O}$

Insol in H_2O

Formula given by Wyruboff is $\text{Cd}_5\text{K}_6[\text{Fe}(\text{CN})_6]_4 + 11\text{H}_2\text{O}$ (?)

Calcium ferrocyanide, $\text{Ca}_{12}\text{Fe}(\text{CN})_6 + 12\text{H}_2\text{O}$

Very sol in H_2O Sol in 0.66 pt H_2O at 90° and not pptd by cooling, and is apparently less sol in warm than cold H_2O (Wyruboff, A ch (4) 16 280)

Calcium cuprous ferrocyanide,

$\text{CaCu}_2\text{Fe}(\text{CN})_6$ (Messner, Z anorg 1894, 8 387)

Calcium cupric ferrocyanide, $\text{CaCuFe}(\text{CN})_6$

Insol in H_2O (Messner, Z anorg 1895, 8 388)

Calcium potassium ferrocyanide,

$\text{CaK}_2\text{Fe}(\text{CN})_6$

Sl sol in H_2O (Kunheim and Zimmerman, Dingl 252 478)

+ $3\text{H}_2\text{O}$ Sol in 795 pts H_2O at 15° , and 145 pts at b-pt, with decomp in the latter case

Sol in dil, insol in conc $\text{HCl} + \text{Aq}$ Sol in HNO_3 of 1.2 sp gr (Mosander)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$

Calcium sodium ferrocyanide,

$\text{CaNa}_6[\text{Fe}(\text{CN})_6]_2$

Sol in H_2O

Calcium strontium ferrocyanide,

$\text{CaSrFe}(\text{CN})_6 + 10\text{H}_2\text{O}$

Efflorescent Sol in about 3 pts H_2O (Wyruboff, A ch (4) 21 278)

Cerium ferrocyanide, $\text{Ce}_4[\text{Fe}(\text{CN})_6]_3 + 30\text{H}_2\text{O}$

Ppt (Wyruboff)

Cerium potassium ferrocyanide,

$\text{CeKFe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Ppt (John)

+ $4\text{H}_2\text{O}$ (Wyruboff)

Chromic ferrocyanide, $\text{Cr}_2[\text{Fe}(\text{CN})_6]_3 + 20\text{H}_2\text{O}$

Ppt

Cobaltous ferrocyanide, $\text{Co}_2\text{Fe}(\text{CN})_6 + 7\text{H}_2\text{O}$

Wholly insol in H_2O

Sol in H_2SO_4 with decomp Insol in $\text{HCl} + \text{Aq}$ Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$

Cobaltous ferrocyanide ammonia,

$\text{Co}_2\text{Fe}(\text{CN})_6 \cdot 8\text{NH}_3 + 10\text{H}_2\text{O}$

Ppt Decomp on standing (Curda, Z Ch 1869 369)

$\text{Co}_2\text{Fe}(\text{CN})_6 \cdot 12\text{NH}_3 + 9\text{H}_2\text{O}$ As above (Curda)

Cobaltous potassium ferrocyanide,

$\text{CoK}_2\text{Fe}(\text{CN})_6$

Ppt (Wyruboff)

$\text{Co}_6\text{K}_5[\text{Fe}(\text{CN})_6]_4$ (?) Ppt Insol only in presence of an excess of $\text{K}_4\text{Fe}(\text{CN})_6$ (Wyruboff)

Columbium potassium ferrocyanide,

$\text{Cb}_{18}\text{K}[\text{Fe}(\text{CN})_6]_2 + 67\text{H}_2\text{O}$ (?)

Sol in H_2O (Wyruboff)

$\text{Cb}_{12}\text{K}_2\text{Fe}(\text{CN})_6 + 39\text{H}_2\text{O}$ (?) Sol in H_2O (W)

$(\text{CbO})_4\text{K}_9[\text{Fe}(\text{CN})_6]_3 + 10\text{H}_2\text{O}$ (?) Ppt (Atterberg)

Cuprous ferrocyanide, $\text{Cu}_4\text{Fe}(\text{CN})_6$

Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in $\text{NH}_4\text{Cl} + \text{Aq}$

Cupric ferrocyanide, basic, $\text{CuFe}(\text{OH})_4(\text{CN})_4$
Ppt (Bong, Bull Soc 23 231)

Cupric ferrocyanide, $\text{Cu}_2\text{Fe}(\text{CN})_6 + 7\text{H}_2\text{O}$
Insol in H_2O or acids Insol in NH_4
salts + Aq Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in
 $(\text{NH}_4)_2\text{C}_2\text{O}_4 + \text{Aq}$ and in $\text{KCN} + \text{Aq}$
Insol in liquid NH_3 (Gore, Am Ch J
1898, 20 827)
+ $10\text{H}_2\text{O}$ Sol in excess of $\text{K}_4\text{Fe}(\text{CN})_6 +$
Aq, especially if hot (Wyruboff)

Cupric ferrocyanide ammonia (cupram-
monium ferrocyanide), $\text{Cu}_2\text{Fe}(\text{CN})_6$,
 $4\text{NH}_3 + \text{H}_2\text{O}$
Insol in H_2O or alcohol Sol in $\text{NH}_4\text{OH} +$
Aq (Bunsen)
 $\text{Cu}_2\text{Fe}(\text{CN})_6$, $8\text{NH}_3 + \text{H}_2\text{O}$

Cuprous magnesium ferrocyanide,
 $\text{Cu}_2\text{MgFe}(\text{CN})_6$
Very unstable Decomp in air
Insol in H_2O (Messner, Z anorg 1895,
8 385)

Cupric magnesium ferrocyanide,
 $\text{CuMgFe}(\text{CN})_6$
Insol in H_2O Decomp by boiling H_2O
Very unstable (Messner, Z anorg 1895, 8
387)

Cuprous potassium ferrocyanide,
 $\text{Cu}_2\text{K}_2\text{Fe}(\text{CN})_6$
Insol in H_2O Decomp by boiling H_2O
Decomp by acids Insol in alcohol (Mess-
ner, Z anorg 1895, 8 378)
+ $1\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , alcohol, or ether
Decomp by acids Sol in $\text{KCN} + \text{Aq}$
 $\text{K}_4\text{Cu}_2\text{Fe}(\text{CN})_6 + 4\text{H}_2\text{O}$
+ $5\text{H}_2\text{O}$ (Wofor)
+ $6\text{H}_2\text{O}$ (Wyruboff)

Cupric potassium ferrocyanide, $\text{K}_2\text{CuFe}(\text{CN})_6$
+ H_2O
Insol in cold sl decomp by boiling H_2O
 $\text{K}_2\text{Cu}_2[\text{Fe}(\text{CN})_6]_2 + 12\text{H}_2\text{O}$ Ppt

Cuprous sodium ferrocyanide,
 $\text{Cu}_2\text{Na}_2\text{Fe}(\text{CN})_6$
Decomp by boiling H_2O , insol in alcohol,
insol in H_2O , decomp by acids (Messner,
Z anorg 1895, 8 373)

Cupric sodium ferrocyanide,
 $\text{CuNa}_2\text{Fe}(\text{CN})_6$
Insol in cold H_2O Decomp by boiling
 H_2O (Moissan, Z anorg 1895, 8 376)

Cupric strontium ferrocyanide,
 $\text{CuSrFe}(\text{CN})_6$
Insol in H_2O (Messner, Z anorg 1895,
8 389)

Didymium potassium ferrocyanide,
 $\text{DyKFe}(\text{CN})_6 + 4\text{H}_2\text{O}$
Ppt (Cleve)
+ $2\text{H}_2\text{O}$ (Wyruboff)

Erbium potassium ferrocyanide, $\text{ErKFe}(\text{CN})_6$
+ $x\text{H}_2\text{O}$
(Hoglund)

Gallium ferrocyanide
Sol in boiling $\text{HCl} + \text{Aq}$ (de Boisbau an,
C R 99 526)

Glucinum ferrocyanide, $\text{Gl}_2\text{Fe}(\text{CN})_6$, $4\text{Gl}_2\text{H}_2$
+ $7\text{H}_2\text{O}$ (?)
Sol in H_2O (Atterberg)

Iron (ferric) ferrocyanide, $\text{Fe}_7(\text{CN})_{11} =$
 $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3 + x\text{H}_2\text{O}$
(Prussian blue) Insol in H_2O , al-
cohol, ether, or oils Decomp slowly by b-
ling H_2O Insol in dil mineral acids S-
in conc $\text{HCl} + \text{Aq}$, and conc H_2SO_4 with-
out decomp Sol in $\text{H}_2\text{C}_2\text{O}_4$ or NH_4 tartrate
Aq Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by NaOH ,
or $\text{KOH} + \text{Aq}$ Not pptd in presence of tar-
trates or citrates

Iron (ferrous) potassium ferrocyanide
 $\text{FeK}_2\text{Fe}(\text{CN})_6$
Insol in H_2O Decomp on air

Iron (ferric) potassium ferrocyanide
 $\text{FeKFe}(\text{CN})_6$
Is probably ferrous potassium ferrocyanide,
which see

Iron (ferric) ferrocyanide ammonia,
 $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$, $6\text{NH}_3 + 9\text{H}_2\text{O}$
Insol in NH_4 tartrate + Aq

Lanthanum potassium ferrocyanide,
 $\text{LaKFe}(\text{CN})_6 + 4\text{H}_2\text{O}$
Ppt

Lead ferrocyanide, $\text{Pb}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$
Insol in H_2O , acids, or $\text{NH}_4\text{OH} + \text{Aq}$
(Wyruboff, A ch (5) 8 480)
Sl sol in conc H_2SO_4 , from which it is
pptd by H_2O (Berzelius)
Sol in hot NH_4Cl , or NH_4 succinate + Aq,
insol in other NH_4 salts + Aq (Wittmann)
Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Brett)
Not pptd in presence of Na citrate
(Spiller)

Lithium ferrocyanide, $\text{Li}_4\text{Fe}(\text{CN})_6 + 9\text{H}_2\text{O}$
Deliquescent Very sol in H_2O

Lithium potassium ferrocyanide,
 $\text{Li}_2\text{K}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$
Very sol in H_2O Sol in 15 pts H_2O at
ord temp (Wyruboff, A ch (4) 2 274)

Magnesium ferrocyanide, $\text{Mg}_2\text{Fe}(\text{CN})_6 + 6\text{H}_2\text{O}$

Sol in 3 pts cold H_2O (Bette, A 22 148)

Magnesium potassium ferrocyanide, $\text{MgK}_2\text{Fe}(\text{CN})_6$

Sol in 1575 pts H_2O at 15° , and 238 pts at 100° . Solution is decomp by boiling (Storer's Dict.)

1 l sat solution at 17° contains 1.95 g $\text{MgK}_2\text{Fe}(\text{CN})_6$ (Robinson, Chem Soc 1909, 75 1353)

Manganous ferrocyanide, $\text{Mn}_2\text{Fe}(\text{CN})_6 + 7\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ Insol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$

Manganic ferrocyanide, $\text{Mn}_2\text{Fe}(\text{CN})_{12}$

Insol in H_2O Easily decomp in the air Sol in HCl (Straus, Z anorg 1895, 9 8)

Manganous potassium ferrocyanide, $\text{MnK}_2\text{Fe}(\text{CN})_6$

Ppt (Berzelius)
 $5\text{Mn}_2\text{Fe}(\text{CN})_6 + 4\text{K}_4\text{Fe}(\text{CN})_6 + 4\text{H}_2\text{O} (?)$
 Ppt Sol in dil $\text{HCl} + \text{Aq}$ (Wyruboff)

Mercuric potassium ferrocyanide, $\text{K}_2\text{HgFe}(\text{CN})_6$

Insol in H_2O Appreciably sol in $\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$ (Fernekes, J Am Chem Soc 1906 28 87)

Molybdenum ferrocyanide, $\text{Mo}_4\text{Fe}(\text{CN})_6 + 20\text{H}_2\text{O} (?)$

Very sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Wyruboff)
 $\text{Mo}_2\text{Fe}(\text{CN})_6 + 8\text{H}_2\text{O} (?)$ (W)
 $+ 14\text{H}_2\text{O} (?)$ Very sol in H_2O , insol in alcohol (W)

Molybdenum potassium ferrocyanide,

$\text{K}_4\text{Mo}_8[\text{Fe}(\text{CN})_6]_2 + 40\text{H}_2\text{O} (?)$
 (Wyruboff)
 $\text{K}_2(\text{MoO}_4)_3[\text{Fe}(\text{CN})_6]_2, 2\text{MoO}_3 + 20\text{H}_2\text{O} (?)$
 (Atterberg)
 $\text{K}_2\text{Mo}_2[\text{Fe}(\text{CN})_6]_2, 2\text{MoO}_3 + 12\text{H}_2\text{O} (?)$
 (Atterberg)

Nickel ferrocyanide, $\text{Ni}_2\text{Fe}(\text{CN})_6 + 11\text{H}_2\text{O}$, or $14\text{H}_2\text{O}$

Ppt Insol in H_2O or $\text{HCl} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$, insol in NH_4 salts $+ \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$

Nickel ferrocyanide ammonia, $\text{Ni}_2\text{Fe}(\text{CN})_6, 4\text{NH}_3 + \text{H}_2\text{O}$

Completely insol in H_2O and not attacked thereby, sol in $\text{NH}_4\text{OH} + \text{Aq}$ to form—
 $\text{Ni}_2\text{Fe}(\text{CN})_6, 10\text{NH}_3 + 4\text{H}_2\text{O}$ Decomp by hot H_2O (Reynoso, A ch (3) 30 252)

$\text{Ni}_2\text{Fe}(\text{CN})_6, 2\text{NH}_3 + 4$, and $9\text{H}_2\text{O}$ Hygro-

scopic Easily decomp (Gintl, J B 1868 304)

$\text{Ni}_2\text{Fe}(\text{CN})_6, 8\text{NH}_3 + 4\text{H}_2\text{O}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (G)

$\text{Ni}_2\text{Fe}(\text{CN})_6, 12\text{NH}_3 + 9\text{H}_2\text{O}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$, but less so than the above compounds (G)

Nickel potassium ferrocyanide, $\text{NiK}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Ppt (Wyruboff)

Osmium ferrocyanide, $\text{Os}_2\text{Fe}(\text{CN})_6$

Ppt (Martius, A 117 368)

Potassium ferrocyanide, $\text{K}_4\text{Fe}(\text{CN})_6$

Permanent Easily sol in cold, and more easily in hot H_2O

Sol in 4.23 pts H_2O at 15° , or 100 pts H_2O dissolve 23.6 pts salt at 15° (Schiff, A 113 350)

100 pts H_2O dissolve 27.8 pts at 12° , 65.8 pts at 37° , 87.6 pts at 65.5° , and 90.6 pts at 96.3° (Thomson)

Sol in 4 pts cold, and 2 pts boiling H_2O (Wittstein)

100 pts H_2O dissolve 29.2 pts salt at 15° , and solution has sp gr = 1.441 (Michel and Kraft, A ch (3) 41 478)

Solubility of $\text{K}_4\text{Fe}(\text{CN})_6$ in H_2O at t°

-2°	$+7^\circ$	14°	30°	56°
10.8	15.4	17.9	23.0	31.7%
60°	75°	89°	98°	157°
34.0	39.1	41.9	42.6	46.8%

(Étard, A ch 1894, (7) 2 546)

$\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$ sat at 8° has sp gr = 1.13 (Anthon)

Sp gr of $\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$ at 15°

$\% \text{ hydrous salt}$	Sp gr	$\% \text{ hydrous salt}$	Sp gr	$\% \text{ hydrous salt}$	Sp gr
1	1.0058	8	1.0479	15	1.0932
2	1.0116	9	1.0542	16	1.0999
3	1.0175	10	1.0605	17	1.1067
4	1.0234	11	1.0669	18	1.1136
5	1.0295	12	1.0734	19	1.1205
6	1.0356	13	1.0800	20	1.1275
7	1.0417	14	1.0866		

(Schiff, A 113 199)

Sp gr of $\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$ at 25°

Concentration of $\text{K}_4\text{Fe}(\text{CN})_6 + \text{Aq}$	Sp gr
1—normal	1.0617
$1/2$ —“	1.0300
$1/4$ —“	1.0150
$1/8$ —“	1.0074
$1/16$ —“	1.0037

(Wagner, Z phys Ch 1890, 5 37)

Solubility in KOH + Aq at 25°

KOH Normality	g $K_4Fe(CN)_6 \cdot 3H_2O$ per l
0.09984	308.5
0.2496	283.5
0.4963	247.1
0.7036	217.4
0.9415	184.8
1.395	132.1
1.883	86.12

(Grube, Z. Electrochem, 1914, 20, 342)

$K_4Fe(CN)_6 + NaCl + Aq$ sat at 20° contains 26.6 g NaCl and 17.8 g $K_4Fe(CN)_6$ per 100 g H_2O , sat at 93° it contains 27.4 g NaCl and 35.9 g $K_4Fe(CN)_6$ per 100 g H_2O (Conroy, J. Soc. Chem. Ind. 1898, 17, 105)

$K_4Fe(CN)_6 + KCl + Aq$ sat at 21° contains 27.2 g KCl and 4.2 g $K_4Fe(CN)_6$ per 100 g H_2O , sat at 99° it contains 39.6 g KCl and 17.0 g $K_4Fe(CN)_6$ per 100 g H_2O (Conroy)

$K_4Fe(CN)_6 + Na_2CO_3 + Aq$ sat at 22° contains 29.9 g Na_2CO_3 and 26.7 g $K_4Fe(CN)_6$ per 100 g H_2O , sat at 97° it contains 42.0 g Na_2CO_3 and 27.5 g $K_4Fe(CN)_6$ per 100 g H_2O (Conroy)

Insol in liquid NH_3 (Franklin, Am. Ch. J. 1898, 20, 829)

Insol in alcohol even when dilute

Insol in methyl acetate (Naumann, B. 1909, 42, 3790)

Insol in ethyl acetate (Naumann, B. 1904, 37, 3601)

Insol in benzonitrile (Naumann, B. 1914, 47, 1370)

Sol in acetone (Naumann, B. 1904, 37, 4328)

+ $3H_2O$ 1 l sat solution in H_2O contains 319.4 g $K_4Fe(CN)_6 \cdot 3H_2O$ (Grube, Z. Electrochem. Z. 1914, 20, 342)

Two modifications with different solubilities

25.0 g of α modification are contained in 100 g of solution at 20°

24.6 g of β modification are contained in 100 g of solution at 20° (Briggs, Chem. Soc. 1911, 99, 1024)

32.0 g $K_4Fe(CN)_6$ (anhydrous) are dissolved in 100 g H_2O at 25° (Wagner, Z. phys. Ch. 1910, 71, 428)

Potassium samarium ferrocyanide,
 $KSmFe(CN)_6 \cdot 5H_2O$

Precipitate (Clève)

Potassium sodium ferrocyanide,
 $KNa_3Fe(CN)_6 \cdot 12H_2O$

Sol in H_2O

$KNa_2Fe(CN)_6 \cdot 8H_2O$ Easily sol in H_2O

$K_3NaFe(CN)_6 \cdot 3H_2O$ Permanent Easily sol in H_2O , insol in alcohol

Potassium sodium ferrocyanide nitrate,
 $K_2Na_2Fe(CN)_6 \cdot 4KNO_3$

Sol in H_2O (Martius)

Potassium strontium ferrocyanide,
 $K_2SrFe(CN)_6 \cdot 3H_2O$

Easily decomp Sol in H_2O , sl sol in alcohol (Wyrouboff, A. ch. (4) 21, 276)

Potassium stannic ferrocyanide,
 $KSn_3[Fe(CN)_6]_2 \cdot 68H_2O$ (?)

Ppt (Wyrouboff)
 $K_4Sn_{10}[Fe(CN)_6]_{11} \cdot 230H_2O$ (?) (Atterberg)

Potassium titanium ferrocyanide,
 $K_3Ti_3[Fe(CN)_6]_2 \cdot 11H_2O$ (?)

Ppt Sol in $K_4Fe(CN)_6 + Aq$ (Wyrouboff)

$K_4Fe(CN)_6 \cdot 11Ti_3Fe(CN)_6 \cdot 43H_2O$)
Ppt (Wyrouboff)

$K_2(TiO)_3[Fe(CN)_6]_2 \cdot 23H_2O$ (?) (Atterberg)

$K_2(TiO)_{11}[Fe(CN)_6]_8 \cdot 110H_2O$ (?) (Atterberg)

Potassium tungsten ferrocyanide,
 $KW_2Fe(CN)_6 \cdot 7H_2O$ (?)

Sol in H_2O (Wyrouboff)
 $K_2W_5Fe(CN)_6 \cdot 20H_2O$ Sol in H_2O (W)

Potassium uranium ferrocyanide,
 $K_2U_3[Fe(CN)_6]_2 \cdot 6H_2O$ (?)

Ppt (Wyrouboff)
 $K_2(UO_2)_3[Fe(CN)_6]_2 \cdot 6H_2O$ Ppt (Atterberg)

$K_6(UO_2)_5[Fe(CN)_6]_4 \cdot 12H_2O$ Sol in H_2O (Atterberg)

Potassium vanadium ferrocyanide,
 $K_{18}V[Fe(CN)_6]_6 \cdot 39H_2O$ (?)

Ppt Sl sol in H_2O (Wyrouboff)
 $K_6(VO)[Fe(CN)_6]_4 \cdot 60H_2O$ (?) Ppt (Atterberg)

Potassium ytterbium ferrocyanide,
 $KYbFe(CN)_6 \cdot 3H_2O$

Ppt Sol in excess $K_4Fe(CN)_6$ Aq (Clève, Z. anorg. 1902, 32, 140)

Potassium yttrium ferrocyanide,
 $KYFe(CN)_6 \cdot 2H_2O$

Ppt (Wyrouboff, A. ch. (5) 8, 444)

Potassium zinc ferrocyanide,
 $K_4Zn_3[Fe(CN)_6]_4 \cdot 12H_2O$

Absolutely insol in H_2O (Wyrouboff, A. ch. (5) 8, 485)

Potassium ferrocyanide carbonyl,
 $K_3Fe(CN)_5(CO) \cdot 3\frac{1}{2}H_2O$

See Carbonyl ferrocyanide, potassium

Rubidium ferrocyanide, $Rb_4Fe(CN)_6 \cdot H_2O$

Sol in less than 1 pt H_2O at ord temp with great absorption of heat (Wyrouboff, A. ch. (4) 16, 307)

Silver ferrocyanide, $\text{Ag}_4\text{Fe}(\text{CN})_6 + \text{H}_2\text{O}$

Insol in H_2O or dil acids Insol in NH_4OH , or NH_4 salts + Aq Sol in KCN + Aq
Decomp by warm $\text{NH}_4\text{OH} + \text{A-}$ (Weith, Z Ch (2) 5 381)

Silver ferrocyanide ammonia, $\text{Ag}_4\text{Fe}(\text{CN})_6, 2\text{NH}_3 + \text{H}_2\text{O}$

(Wyruboff)
+ $6\text{H}_2\text{O}$ (Gintl)

Sodium ferrocyanide, $\text{Na}_4\text{Fe}(\text{CN})_6 + 12\text{H}_2\text{O}$

Efflorescent Less sol in H_2O than $\text{K}_4\text{Fe}(\text{CN})_6$ Sol in 4.5 pts H_2O at 12° (John)
100 pts H_2O at 15.5° dissolve 22 pts (Ure's Dict)

100 pts H_2O dissolve at

18°	20°	42°	53°	
16 7	17 875	30 2	37 1 pts	$\text{Na}_4\text{Fe}(\text{CN})_6$,
58°	60°	77°	80°	
41 7	42 5	54 8	59 2 pts	$\text{Na}_4\text{Fe}(\text{CN})_6$,
96°	98°	98.5°		
62 1	61 6	6 30 pts	$\text{Na}_4\text{Fe}(\text{CN})_6$	

(Conroy, J Soc Chem Ind 1898, 17 104)

+ $10\text{H}_2\text{O}$

100 pts H_2O dissolve at

18°	20°	42°	
29 45	31 85	58 5 pts	$\text{Na}_4\text{Fe}(\text{CN})_6 + 10\text{H}_2\text{O}$,
53°	58°	60°	
75 9	88 4	90 2 pts	$\text{Na}_4\text{Fe}(\text{CN})_6 + 10\text{H}_2\text{O}$,
77°	80°	96°	
129 5	146 0	157 0 pts	$\text{Na}_4\text{Fe}(\text{CN})_6 + 10\text{H}_2\text{O}$,
98°	98.5°		
156 5	161 0	pts	$\text{Na}_4\text{Fe}(\text{CN})_6 + 10\text{H}_2\text{O}$

(Conroy)

Strontium ferrocyanide, $\text{Sr}_2\text{Fe}(\text{CN})_6 + 15\text{H}_2\text{O}$

Efflorescent Sol in 2 pts cold, and less than 1 pt boiling H_2O (Bette)
Excessively sol in H_2O (Wyruboff, A ch (4) 16 280)
+ $8\text{H}_2\text{O}$ (Wyruboff)

Thallous ferrocyanide, $\text{Tl}_4\text{Fe}(\text{CN})_6 + 2\text{H}_2\text{O}$

100 pts H_2O dissolve 0.37 pt at 18° , and 3.93 pts at 101° (Lamy)
Sol in KCN + Aq (Kuhlmann)

Thorium ferrocyanide, $\text{ThFe}(\text{CN})_6 + 4\text{H}_2\text{O}$

Ppt (Cleve, Bull Soc (2) 24 355)

Tin (stannous) ferrocyanide, $\text{Sn}_2\text{Fe}(\text{CN})_6 + 4\text{H}_2\text{O}$

Insol in H_2O or acids, sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Wyruboff)

Tin (stannic) ferrocyanide, $\text{Sn}_3[\text{Fe}(\text{CN})_6]_2 + 18\frac{1}{2}\text{H}_2\text{O}$ (?)

(Wyruboff)

Titanium ferrocyanide, $\text{Ti}_7[\text{Fe}(\text{CN})_6]_2$ (?)

Ppt (Wyruboff)

Uranium ferrocyanide, $\text{UFe}(\text{CN})_6 + 10\text{H}_2\text{O}$

Ppt (Wyruboff)

Vanadyl ferrocyanide, $(\text{VO})_2\text{Fe}(\text{CN})_6 + 11\text{H}_2\text{O}$

Ppt (Atterberg)

Yttrium ferrocyanide, $\text{Y}_4[\text{Fe}(\text{CN})_6]_3$

Easily sol in H_2O , insol in alcohol (Popp, A 131 179)

Zinc ferrocyanide, $\text{Zn}_2\text{Fe}(\text{CN})_6 + 3\text{H}_2\text{O}$

Insol in H_2O or acids
Insol in $\text{HCl} + \text{Aq}$ (Lea, Sill Am J (2) 31 191)

Sol in NH_4OH , or NH_4 salts + Aq (Wittstan)

Insol in NH_4Cl , or $\text{NH}_4\text{NO} + \text{Aq}$ (Brett)
Sl sol in boiling $\text{K}_4\text{Fe}(\text{CN})_6$, or $\text{K}_3\text{Fe}(\text{CN})_6$ + Aq (Gore)

$\text{Na}_4\text{Fe}(\text{CN})_6 + \text{NaCl} + \text{Aq}$ sat at 21° contains 29.0 g NaCl and 5.8 g $\text{Na}_4\text{Fe}(\text{CN})_6$ per 100 g H_2O , sat at 90° it contains 24.7 g NaCl and 21.3 g $\text{Na}_4\text{Fe}(\text{CN})_6$ per 100 g H_2O

 $\text{Na}_4\text{Fe}(\text{CN})_6$

Very sl sol in
Am Ch J 1898, 20 300,

Insol in alcohol
+ $4\text{H}_2\text{O}$ Absolutely insol in H_2O (Wyruboff, A ch (5) 8 485)
+ $8\text{H}_2\text{O}$ (Weith, A 147 329)
+ $10\text{H}_2\text{O}$ (Pebal, A 233 165)

Ferrotetranitrososulphidic acid,

$\text{H}_2\text{S}_2(\text{NO})_4\text{Fe}$

Insol in H_2O , sl sol in alcohol, more easily in ether, very sol in CS or CHCl_3
Not obtained in a pure state (Pawel, B 15 2600)

Ethyl ferrotetranitrososulphide,

$(\text{C}_2\text{H}_5)_2\text{S}(\text{NO})_4\text{Fe}$

Insol in H_2O , difficultly sol in alcohol, more easily in ether, and very easily in CS, CHCl_3 , $\text{C}_2\text{H}_5\text{I}$, or C_6H_6 (Pawel, B 15 2609)

Ferrous —, $\text{FeS}_2(\text{NO})_4\text{Fe}$

More difficultly sol in H_2O and alcohol than the hepta salt
Sol in ether

Potassium —, $\text{K}_2\text{S}_2(\text{NO})_4\text{Fe} + 4\text{H}_2\text{O}$

Sol in H_2O Easily sol in alcohol, insol in ether (Pawel, B 15 2600)
True composition of "nitrosulphide of

iron and potassium" of Roussin (A ch (3) 52 297) (Pawel, B 13 1949)

Sodium ferrotetranitrososulphide,
 $\text{Na}_2\text{S}_2(\text{NO})_4\text{Fe}_2 + 8\text{H}_2\text{O}$

Sol in H_2O , easily sol in alcohol, insol in ether (Pawel)

True composition of "nitrosulphide of iron and sodium" of Roussin (Pawel)

Thallium —, $\text{Tl}_2\text{S}_2(\text{NO})_4\text{Fe}_2$

Insol in H_2O , alcohol, or ether (Pawel)

Ferroheptanitrososulphydic acid,
 $\text{HS}_2(\text{NO})\text{Fe}_4$

Insol in H_2O , alcohol, and ether Easily sol in CS_2 or CHCl_3 (Pawel, B 15 2604)

May be called Ferrinitrososulphydic acid

Ammonium ferroheptanitrososulphide,
 $\text{NH}_4\text{S}_2(\text{NO})_7\text{Fe}_4 + \text{H}_2\text{O}$

Less easily sol in H_2O than the K compound (Pawel, B 15 2600)

"Binitrosulphide of iron" of Roussin Sol in about 2 pts boiling H_2O , very sl sol in cold H_2O Very sol in alcohols, methyl, ethyl, or amyl, and in $\text{HC}_2\text{H}_3\text{O}_2$ Miscible with ether Insol in CS_2 or CHCl_3

Decomp by conc HCl , HNO_3 , or H_2SO_4
 Not attacked by $\text{H}_2\text{C}_2\text{O}_4$, or $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 +$

sl in NH_4OH , and $\text{KOH} + \text{Aq}$ (Roussin, A ch (3) 52 286)

Sol in H_2O Insol in alcohol (Hofmann, Z anorg 1895, 9 299)

Barium —

Easily sol in H_2O (Pawel)

Cæsium —, $\text{Fe}_4(\text{NO})_7\text{S}_2\text{Cs} + \text{H}_2\text{O}$

Insol in H_2O Difficultly sol in alcohol and ether (Pawel)

Sparingly sol in H_2O (Hofmann, Z anorg 1895, 9 298)

Calcium —

Easily sol in H_2O (Pawel)

Ferrous —, $\text{Fe}[\text{S}_2(\text{NO})_7\text{Fe}_4]_2 + 8\text{H}_2\text{O}$

More easily sol in H_2O than Na salt (Pawel)

Lead —

Difficultly sol in H_2O (Pawel)

Magnesium —

Easily sol in H_2O (Pawel)

Potassium —, $\text{KS}_2(\text{NO})_7\text{Fe}_4$

Sol in H_2O , alcohol, and very sol in ether with slight decomp (Pawel, B 15 2600)

Rubidium ferroheptanitrososulphide,
 $\text{RbS}_2(\text{NO})_7\text{Fe}_4$

Less soluble in H_2O than the NH_4 salt (Pawel)
 $+ \text{H}_2\text{O}$ Ppt (Hofmann, Z anorg 1895 9 298)

Sodium —, $\text{NaS}_2(\text{NO})_7\text{Fe}_4 + 2\text{H}_2\text{O}$

More sol in H_2O than the potassium salt (Pawel)

Thallium —, $\text{TlS}_2(\text{NO})_7\text{Fe}_4 + \text{H}_2\text{O}$

Very difficultly sol in H_2O More easily sol in alcohol (Pawel) (Hofmann, Z anorg 1895, 9 297)

Ferrodinitrosothiosulphonic acid

Ammonium ferrodinitrosothiosulphonate,
 $\text{Fe}(\text{NO})_2\text{S}_2\text{O}_3\text{NH}_4 + \text{H}_2\text{O}$

Can be cryst from warm H_2O without decomp (Hofmann, Z anorg 1895, 8 321)

Cæsium —, $\text{Fe}(\text{NO})_2\text{S}_2\text{O}_3\text{Cs}$

Sparingly sol in H_2O (Hofmann)

Potassium —, $\text{Fe}(\text{NO})_2\text{S}_2\text{O}_3\text{K} + \text{H}_2\text{O}$

Sl sol in H_2O without decomp at 80 Sol in 50% alcohol
 Sol in H_2SO_4 without decomp (Hofmann)

Rubidium —, $\text{Fe}(\text{NO})_2\text{S}_2\text{O}_3\text{Rb} + \text{H}_2\text{O}$

Less sol in H_2O than the corresponding Na salt (Hofmann)

Sodium —, $\text{Fe}(\text{NO})_2\text{S}_2\text{O}_3\text{Na} + 2\text{H}_2\text{O}$

Closely resembles K salt, but is more so in H_2O and alcohol (Hofmann)

Ferrotungstic acid

Sol in H_2O (Laurent, C R 31 693)

Ammonium manganous ferrotungstate,
 $12(\text{NH}_4)_2\text{O}, 6\text{MnO}, 2\text{Fe}_2\text{O}_3, 3\text{H}_2\text{O}, 45\text{WO}_3 + 81\text{H}_2\text{O}$

Sol in H_2O (Laurent)

Barium ferrotungstate, $21\text{BaO}, 2\text{Fe}_2\text{O}_3, 45\text{WO}_3 + 27\text{H}_2\text{O}$

Sol in H_2O (Laurent)

Potassium ferrotungstate, $9\text{K}_2\text{O}, 2\text{Fe}_2\text{O}_3, 12\text{H}_2\text{O}, 45\text{WO}_3 + 54\text{H}_2\text{O}$

Sol in H_2O (Laurent)
 $18\text{K}_2\text{O}, 2\text{Fe}_2\text{O}_3, 3\text{H}_2\text{O}, 45\text{WO}_3 + 54\text{H}_2\text{O}$ (Laurent)

Ferrous acid

Barium ferrite, $\text{BaO}, \text{Fe}_2\text{O}_3$

Ppt (List, B 11 1512)

Calcium ferrite, $4\text{CaO}, \text{Fe}_2\text{O}_3$

Insol in H_2O , or sugar+ H_2O Decomp by the weakest acids, but not by boiling $\text{KOH}+\text{Aq}$ (Pelouze, A ch (3) 33 5)

$\text{CaO}, \text{Fe}_2\text{O}_3$ (List)
 $3\text{CaO}, \text{Fe}_2\text{O}_3$ Much less readily attacked by H_2O and acids than the silicates (Hilpert, B 1909, 42 4581)

$3\text{CaO}, 2\text{Fe}_2\text{O}_3$ As above (Hilpert, B 1909, 42 4581)

Calcium ferrite chloride, $\text{CaO}, \text{Fe}_2\text{O}_3, \text{CaCl}_2$

Not decomp by H_2O (Chatelier, C R 99 276)

Cupric ferrite, $\text{CuO}, \text{Fe}_2\text{O}_3$

Ppt (List)
 $+5\text{H}_2\text{O}$ (List)

Ferrous argentous ferrite, $2\text{FeO}, \text{Ag}_2\text{O}, \text{Fe}_2\text{O}_3$ (?)

Easily decomp by $\text{HCl}+\text{Aq}$ Not completely sol in dil HNO_3+Aq Easily sol in conc HNO_3 Decomp by acetic acid (Rose, Pogg 10 323)

Magnesium ferrite, $\text{MgO}, \text{Fe}_2\text{O}_3$

Insol in H_2O Not attacked by boiling conc HNO_3 (Deville C R 52 1264)

Min *Magnesioferrite* Difficultly sol in $\text{HCl}+\text{Aq}$ (Rammelsberg, Pogg 107 451)
 $+4\text{H}_2\text{O}$ Ppt (List, B 11 1512)
 $6\text{MgO}, \text{Fe}_2\text{O}_3+9\text{H}_2\text{O}$ Ppt
 $+15\text{H}_2\text{O}$ Min *Pyroaurite*

Manganous ferrite, $\text{MnO}, \text{Fe}_2\text{O}_3$

Ppt (List)

Nickel ferrite, $\text{NiO}, \text{Fe}_2\text{O}_3$

Ppt (List)

Potassium ferrite, $3\text{K}_2\text{O}, 4\text{Fe}_2\text{O}_3$

Decomp by $\text{H}_2\text{O}, \text{KOH}+\text{Aq}, \text{NaOH}+\text{Aq}$, etc, but only slowly by $\text{NH}_4\text{Cl}+\text{Aq}$ (Salm-Horstmar, J pr 55 349)

$\text{K}_2\text{Fe}_2\text{O}_4$ Decomp by H_2O (Rousseau and Bernheim, C R 107 240)

Silver (argentous) ferrite, $\text{Ag}_2\text{O}, \text{Fe}_2\text{O}_3$ (?)

Decomp by dil HNO_3+Aq (Rose, Pogg 10 323)

Sodium ferrite, $\text{Na}_2\text{O}, \text{Fe}_2\text{O}_3$

Na_2O is dissolved out by H_2O Easily sol in dil $\text{HCl}+\text{Aq}$ Not easily decomp by $\text{NH}_4\text{Cl}+\text{Aq}$ (Salm-Horstmar)

Zinc ferrite, $\text{ZnO}, \text{Fe}_2\text{O}_3$

Sol in boiling conc $\text{HCl}+\text{Aq}$ (Ebelmen, A ch (3) 33 47)

Min *Franklinite*

Flavocobaltic compounds

See also Xanthocobaltic compounds

Flavocobaltic chloraurate,

$(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4\text{AuCl}_4$

More easily sol than the chloroplatinate Not wholly insol in absolute alcohol (Jorgensen, Z anorg 5 159)

— **chloroplatinate**, $[(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4]_2\text{PtCl}_6$
 As the chloroplatinite (Jorgensen)

— **chloroplatinite**, $[(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4]_2\text{PtCl}_4$
 Somewhat sol in H_2O , and not insol in 50% alcohol (Jorgensen)

— **chromate**, $[(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4]_2\text{Cr}_2\text{O}_7$
 Ppt (Jorgensen)

— **nitrate**, $\text{Co}(\text{NO}_2)_2(\text{NH}_3)_4\text{NO}_3$
 Sol in about 33 pts cold H_2O , insol in HNO_3 (Jorgensen)
 $\text{Co}(\text{NO}_2)_2(\text{NH}_3)_4\text{NO}_3, \text{HNO}_3$ Decomp by H_2O or alcohol (Jorgensen)

— **cobaltic nitrite**, $3(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4, \text{Co}_2(\text{NO}_2)_6+2\text{H}_2\text{O}$
 Sl sol in H_2O (Jorgensen, Z anorg 5 179)

— **diamine cobaltic nitrite**,
 $(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4,$
 $(\text{NO}_2)_2(\text{NH}_3)_2\text{Co}(\text{NO}_2)_2$
 Very sl sol in H_2O (Jorgensen)

— **sulphate**, $[(\text{NO}_2)_2\text{Co}(\text{NH}_3)_4]_2\text{SO}_4$
 Sl sol in H_2O , more easily in $\text{HC}_2\text{H}_3\text{O}_2+\text{Aq}$ (Jorgensen)

Fluoborhydric acid, HBF_4

Decomp by H_2O very rapidly (Landolph, C R 86 603)

Aluminum fluoboride, $2\text{AlF}_3, 3\text{BF}_3$

Sol in H_2O only when acidulated, sol in acids (Berzelius)

Ammonium fluoboride, NH_4BF_4

Easily sol in H_2O Sol in 4 pts H_2O at 16° , and 1.02–1.05 pts boiling H_2O (Stolba, Chem techn Cent Anz 7 459) Sl sol in alcohol

Barium fluoboride, $\text{Ba}(\text{BF}_4)_2+2\text{H}_2\text{O}$

Deliquescent, easily sol in H_2O , decomp by alcohol (Berzelius)

Cæsium fluoboride, CsBF_4

100 pts H_2O dissolve 0.92 pt CsBF_4 at 20° , and 0.04 pt at 100° (Godeffroy, B 9 1367)
 0.02 pts are sol in 100 pts H_2O at 20° (Erdmann, Arch Pharm 1894, 232 21)

Calcium fluoboride, $\text{Ca}(\text{BF}_4)_2$

Decomp by H_2O , with formation of a sol acid salt and an insol basic salt (Berzelius)

Cupric fluoboride, $\text{Cu}(\text{BF}_4)_2$

Deliquescent, and very sol in H_2O (Berzelius)

Lead fluoboride, $\text{Pb}(\text{BF}_4)_2$

Sol in H_2O Decomp by boiling with H_2O or alcohol into an acid soluble, and a basic insoluble salt (Berzelius)

Lithium fluoboride, LiBF_4

Hygroscopic Easily sol in H_2O (Berzelius)

Magnesium fluoboride

Easily sol in H_2O (Berzelius)

Potassium fluoboride, KBF_4

Sol in 223 pts H_2O at 20° (Stolba)

Sol in 70.4 pts cold H_2O (Berzelius)

Sol in 15.94 pts H_2O at 100° (Stolba)

1.43 pts are sol in 100 pts H_2O at 20° (Erdmann, Arch Pharm 1894, 232 21)

Not more sol in $\text{NH}_4\text{OH} + \text{Aq}$ than in H_2O , sol in hot KOH , NaOH , or $\text{M}_2\text{CO}_3 + \text{Aq}$ (Berzelius) More sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose, Pogg 80 276) Insol in 20% $\text{KC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Stromeyer) Insol in cold, sl sol in boiling alcohol

Rubidium fluoboride, RbBF_4

100 pts H_2O dissolve 0.55 pt at 20° , and 1.0 pt at 100° (Godeffroy, B 9 1337)

0.55 pts are sol in 100 pts H_2O at 20° (Erdmann, Arch Pharm 1894, 232 21)

Sodium fluoboride, NaBF_4

Easily sol in H_2O Very sl sol in alcohol (Berzelius)

Yttrium fluoboride

Sol in H_2O with excess of acid (Berzelius)

Zinc fluoboride, $\text{Zn}(\text{BF}_4)_2$

Deliquescent Sol in H_2O (Berzelius)

Fluoboric acid, HBF_4

See Fluoborhydric acid

$\text{H}_4\text{B}_2\text{O}_7$, 3HF and $\text{H}_4\text{B}_2\text{O}_9$, 2HF (?) Fume on air, and are decomp with H_2O (Landolph, B 12 1583)

HBO_2 , 3HF Decomp by H_2O (Berzelius, Pogg 59 644)

Is either a mixture, or a solution of HBO_2 in HF , and is decomp by distillation, and the salts are decomp by recrystallisation (Basarow, C R 78 1698)

Potassium fluoborate, $\text{K}_2\text{B}_2\text{O}_5\text{F}_2$ (?)

Sl deliquescent Scarcely sol in boiling alcohol (Schiff, A Suppl 5 175)

See Boron trioxide potassium fluoride, B_2O_3 , 2KF

Fluochromic acid**Ammonium fluochromate, $\text{NH}_4\text{CrO}_5\text{F}$**

Sol in H_2O (Varenne, C R 91 989)

Potassium fluochromate, KCrO_5F

Efflorescent Sol in H_2O , with gradual decomp (Streng, A 129 225)

Fluocolumbic acid

See also Fluoxycolumbic acid

Ammonium fluocolumbate fluoxycolumbate, $(\text{NH}_4)_2\text{CbF}_3$, 2CbOF_3 , NH_4F **Cadmium fluocolumbate, $\text{Cd}_5\text{H}_5\text{Cb}_3\text{F}_{30} + 28\text{H}_2\text{O}$**

Insol in, and decomp by H_2O (Streng)

Cobalt fluocolumbate, $\text{Co}_5\text{H}_5\text{Cb}_3\text{F}_{30} + 28\text{H}_2\text{O}$

Insol in, and decomp by H_2O (Streng)

Copper fluocolumbate, $\text{Cu}_2\text{HCbF}_{10} + 9\text{H}_2\text{O}$

Insol in, and decomp by H_2O

Ferrous fluocolumbate, $\text{Fe}_3\text{H}_4\text{Cb}_2\text{F}_{20} + 19\text{H}_2\text{O}$

As above

Manganous fluocolumbate, $\text{Mn}_5\text{H}_5\text{Cb}_3\text{F}_{30} + 28\text{H}_2\text{O}$ **Mercuric fluocolumbate, $\text{Hg}_3\text{CbF}_{11} + 8\text{H}_2\text{O}$**

As above

Nickel fluocolumbate, $\text{Ni}_3\text{H}_4\text{Cb}_2\text{F}_{20} + 19\text{H}_2\text{O}$

As above

Potassium fluocolumbate, K_2CbF_7

Decomp by solution in H_2O (Marginal A ch (4) 8 34)

Rubidium fluocolumbate, Rb CbF_7

Sol in H_2O and $\text{HF} + \text{Aq}$ Insol in alcohol (Pennington, J Am Chem Soc 1896, 18 58)

Zinc fluocolumbate, $\text{Zn}_5\text{H}_5\text{Cb}_3\text{F}_{30} + 28\text{H}_2\text{O}$

Insol in cold H_2O , decomp by hot H_3PO_4 (Santesson, Bull Soc (2) 24 52)

Fluodithionic acid**Cesium monofluodithionate,**

$\text{S}_2\text{O}_5(\text{OH})\text{FCs}_2 + \text{H}_2\text{O}$

Easily sol in H_2O with decomp

Sol in HF , very unstable (Weinland Z anorg 1899, 21 66)

Potassium difluodithionate, $\text{S}_2\text{O}_5\text{F}_2\text{K}_2 + 3\text{H}_2\text{O}$

Easily sol in H_2O with decomp

Sol in HF , very unstable (Weinland)

Rubidium difluodithionate, $\text{S}_2\text{O}_5\text{F}_2\text{Rb}_2 + 3\text{H}_2\text{O}$

Easily sol in H_2O with decomp
Sol in HF , very unstable (Weinland)

Fluogermanic acid, H_2GeF_6

Known only in solution (Winkler, J pr (2) 36 177)

Potassium fluogermanate, K_2GeF_6

Sol in 173.98 pts H_2O at 18° (Winkler)
Sol in 184.61 pts H_2O at 18° (Kruss and Nilson, B 20 1896)
Sol in 34.07 pts H_2O at 100° (Winkler)
Sol in 38.76 pts H_2O at 100° (Kruss and Nilson)
Insol in alcohol

Difluoiodic acid

Ammonium difluoiodate, $\text{NH}_4\text{IO}_2\text{F}_2$

Like K salt
Sol in 40% $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 20 30)
Sol in H_2O Easily decomp (Weinland, B 1897, 30 868)

Cæsium difluoiodate, CsIO_2F_2

(Weinland, Z anorg 1899, 20 36)

Cæsium hydrogen difluoiodate,
 $\text{CsIO}_2\text{F}_2, \text{HIO}_2\text{F}_2 + 2\text{H}_2\text{O}$

Efflorescent Sol in H_2O with decomp
(Weinland, Z anorg 1899, 22 257)

Potassium difluoiodate, KIO_2F_2

Sol in H_2O Decomp in moist air
(Weinland, B 1897, 30 867)
Decomp in air Sol in H_2O with decomp
Sol without decomp in 40% $\text{HF} + \text{Aq}$
(Weinland, Z anorg 1899, 20 31)

Rubidium difluoiodate, RbIO_2F_2

Resembles K salt Sol in $\text{HF} + \text{Aq}$
(Weinland, Z anorg 1899, 20 35)

Rubidium hydrogen difluoiodate,
 $\text{RbIO}_2\text{F}_2, \text{HIO}_2\text{F}_2 + 2\text{H}_2\text{O}$

Sol in 40-60% $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 260)

Sodium difluoiodate, NaIO_2F_2

Decomp by H_2O (Weinland, B 1897, 30 868)
Sol in HF (Weinland, Z anorg 1899, 20 37)

Fluomanganic acid, H_2MnF_6

Decomp by H_2O Sol in alcohol and ether
in absence of H_2O (Nickles, C R 65 107)

Ammonium fluomanganate, $(\text{NH}_4)_2\text{MnF}_6$

More sol than the K salt (Nickles, C R 65 107)
True composition is $(\text{NH}_4)_4\text{Mn}_2\text{F}_{10} = 4\text{NH}_4\text{F}, \text{Mn}_2\text{F}_6$ (Christensen, J pr (2) 34 41)

Cobalt fluomanganate, $2\text{CoF}_2, \text{Mn}_2\text{F}_6 + 8\text{H}_2\text{O}$

Sol in H_2O (Christensen)

Nickel fluomanganate, $2\text{NiF}_2, \text{Mn}_2\text{F}_6 + 8\text{H}_2\text{O}$

Sol in H_2O (Christensen)

Potassium fluomanganate, K_2MnF_6

Difficultly sol in H_2O Decomp by much H_2O (Nickles, C R 65 107)

Composition is $\text{K}_4\text{Mn}_2\text{F}_{10} = 4\text{KF}, \text{Mn}_2\text{F}_6$
Also with $2\text{H}_2\text{O}$ (Christensen, J pr (2) 34 41)

Decomp by H_2O Sol in $\text{HCl}, \text{H}_2\text{SO}_4$ and HNO_3 with decomp Can be recryst from 40% $\text{HF} + \text{Aq}$ Insol in acetic acid (Weinland and Lauenstein, Z anorg 1899, 20 41)

Rubidium fluomanganate, $\text{Rb}_2\text{MnF}_6 + 2\text{H}_2\text{O}$

As the K salt (Weinland and Lauenstein, Z anorg 1899, 20 44)

Silver fluomanganate, $\text{Ag}_2\text{Mn}_2\text{F}_8 + 14\text{H}_2\text{O}$
(Christensen, J pr (2) 34 41)

Sodium fluomanganate, $4\text{NaF}, \text{Mn}_2\text{F}_6$

Decomp by much H_2O (Christensen)

Zinc fluomanganate, $2\text{ZnF}_2, \text{Mn}_2\text{F}_6 + 8\text{H}_2\text{O}$

Sol in H_2O (Christensen)

Fluomolybdic acid

See Fluoxyhypomolybdic, and Fluoxymolybdic acids

Fluopalladous acid

Potassium fluopalladite,

Sl sol in H_2O

Sodium fluopalladite

Sl sol in H_2O (Berzelius)

Fluoperboric acid

Ammonium fluoperborate,
 $\text{NH}_4\text{OOB}(\text{F})\text{OOB}(\text{F})\text{OONH}_4$

Ppt Insol in ether (Petrenko, C C 1902, I 1191)

Potassium fluoperborate, $\text{K}_4\text{B}_4\text{F}_{10} + \text{H}_2\text{O}$

Dry salt is rather stable

Easily sol in H_2O Aqueous solution decomp rapidly when warmed, at ordinary

temp the decomp proceeds slowly Insol in alcohol (Melikoff, B 1899, **32** 3350)
 $\text{KOOB(F)OOB(F)OK} + 1\frac{1}{2}\text{H}_2\text{O}$ Ppt
 Insol in ether (Petrenko, C C 1902, I 1191, J Russ, phys chem Soc **34** 37)

Fluoperuranic acid

Potassium fluoperuranate, $\text{K}_4\text{U}_4\text{F}_{15}\text{O}_{15} + 4\text{H}_2\text{O} = 3\text{UO}_4\text{KF}, \text{UO}_3\text{F}_2, \text{KF} + 4\text{H}_2\text{O}$
 Ppt (Lordkipanidse, C C 1900, II 525)

Sodium fluoperuranate, $\text{UO}_4\text{NaF} + 5\text{H}_2\text{O}$
 Ppt (Lordkipanidse, C C 1900, II 525)

Fluophosphamide, $\text{PF}_3(\text{NH}_2)_2$
 Sol in H_2O (Poulenc, A ch (6) **24** 566)

Fluophosphoric acid

Monocæsium monofluophosphate,
 $\text{P}(\text{OH})_2(\text{OCs})\text{F}$
 Like the K salt (Weinland, Z anorg 1899,

- - -osphate,

$\frac{1}{2}\text{F} + \text{Aq}$, decomp in the air
 Z anorg 1899, **21** 44)

Potassium monofluophosphate,
 $\text{KHFPO}_3 + \text{H}_2\text{O}$
 Decomp by H_2O , unstable (Weinland, B 1898, **31** 124-125)

Monorubidium monofluophosphate,
 $\text{P}(\text{OH})_2(\text{ORb})\text{F}$
 Sol in 40% $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, **21** 47)

Rubidium monofluophosphate,
 $\text{RbHFPO}_3 + \text{H}_2\text{O}$
 Decomp by H_2O (Weinland, B 1898, **31** 124)

Fluoplatinic acid

Ammonium fluoplatinate
 Secomp by H_2O to a sol acid, and an insol basic salt Insol in alcohol (Berzelius)

Potassium fluoplatinate
 Deliquescent Insol in alcohol Decomp by H_2O (Berzelius)

Sodium fluoplatinate
 Decomp by H_2O (Berzelius)

Fluor- and Fluoro-
 See Fluor-

Fluorhydric (Hydrofluoric) acid, HF or H_2F_2

Attracts H_2O from air with great avidity. Very sol in H_2O with evolution of much heat. Sat solution has sp gr 1.25 (H Davy)

On boiling the aqueous solution an acid of constant composition is obtained, which boils at 120° , has sp gr 1.15, and contains 35.37% HF (Bineau, A ch (3) **7** 257) The residual acid after boiling contains 36 to 38% HF , and by standing over CaO gives off HF until an acid containing 32.5 to 32.7% HF is formed. Weaker acids increase their strength to 32.2 to 32.4% HF , while an acid containing 32.5% HF remains unchanged (Roscoe, A **116**. 218)

Does not attack gutta-percha Sol in H_2SO_4

Sp gr of $\text{HF} + \text{Aq}$ at 15°

Sp gr	% HF	Sp gr	% HF	Sp gr	% HF
1.01	2.90	1.10	29.00	1.19	55.10
1.02	5.80	1.11	31.90	1.20	58.00
1.03	8.70	1.12	34.80	1.21	60.90
1.04	11.60	1.13	37.70	1.22	63.80
1.05	14.50	1.14	40.60	1.23	66.70
1.06	17.40	1.15	43.50	1.24	69.60
1.07	20.30	1.16	46.40	1.25	72.50
1.08	23.20	1.17	49.30		
1.09	26.10	1.18	52.20		

(Hart, J Anal Ch **3** 372)

Sp gr of $\text{HF} + \text{Aq}$ at ord temp

Deg Baumé	Sp gr	% HF
1	1.0069	2.32
2	1.0139	4.04
3	1.0211	5.76
4	1.0283	7.48
5	1.0356	9.20
6	1.0431	10.92
7	1.0505	12.48
8	1.0583	14.04
9	1.0661	15.59
10	1.074	17.15
11	1.082	18.86
12	1.0901	21.64
13	1.0983	24.42
14	1.1067	27.20
15	1.1152	29.98
16	1.1239	32.78
17	1.1326	35.15
18	1.1415	37.53
19	1.1506	39.91
20	1.1598	42.29
21	1.1691	44.67
22	1.1786	47.04
23	1.1883	49.42
24	1.1981	51.57
25	1.2080	53.72
26	1.2182	55.87
27	1.2285	58.02

Sp gr of HF + Aq at ord temp — *Continued*

Deg Baumé	Sp gr	% HF
28	1 2390	60 17
29	1 2497	62 32
30	1 2605	64 47
31	1 2716	66 61
32	1 2828	68 76
33	1 2943	70 91
34	1 3059	73 06
35	1 3177	75 21
36	1 3298	77 36
37	1 3421	79 51
38	1 3546	81 66
39	1 3674	83 81
40	1 3804	85 96
41	1 3937	88 10
42	1 4072	90 24
43	1 4211	92 39
44	1 4350	94 54
45	1 4493	96 69

(Eckelt, Ch Z 1898, 22 225)

Sp gr of HF + Aq at 0°

% HF	Sp gr	% HF	Sp gr
0 484	1 005	71 73	1 262
1 504	1 009	72 21	1 260
2 48	1 012	78 05	1 260
4 80	1 017	84 27	1 235
7 75	1 035	87 72	1 212
15 85	1 065	88 11	1 210
24 47	1 097	88 82	1 207
28 48	1 110	89 02	1 202
29 83	1 120	89 15	1 200
34 23	1 130	89 82	1 190
38 50	1 145	90 20	1 185
41 00	1 155	90 64	1 175
41 15	1 155	91 04	1 165
41 92	1 157	92 09	1 152
47 52	1 182	92 81	1 135
48 49	1 187	92 91	1 130
50 97	1 200	94 26	1 095
55 09	1 217	95 84	1 065
55 39	1 220	97 50	1 035
57 66	1 230	98 22	1 022
61 66	1 245	100 05	1 0005
65 19	1 255		

(Hill, Roy Soc Proc 1909, 83 A 144)

Sp gr of HF + Aq at 18°

% HF	Sp gr
0 484	1 003
1 504	1 005
2 48	1 009
4 80	1 017
7 75	1 028
15 85	1 058
24 47	1 087
29 83	1 103

(Hill)

Aq solution of sp gr 1 138 at 18° contains 43 2% HF and has a constant bpt of 111° at 750 mm (Deussen, Z anorg 1906, 49 297)

The strongest acid that can be obtained by distillation contains 48 17% HF and boils at 125–125 5° (Gore)

Fluorides

The alkali fluorides, also AgF and SnF₂, are sol in H₂O, the fluorides of Fe, Sr, and Cd are sl sol, the others are insol in H₂O. Most fluorides are sol in acids, especially HF + Aq.

Insol in liq. NH₃ (Franklin, Am Ch J 1898, 20 822)

See under each element

Fluorine, F₂

Decomposes H₂O and all organic solvent with great violence (Moissan, C R 103 202 and 256)

Liquefied at –185° to a yellowish liquid which does not dissolve glass nor ignite cooled Si, B, C, S, P, or Fe (Moissan, C R 1897, 124 1202–1204)

Fluomolybdic acid

Ammonium fluomolybdate, (NH₄)MoF₄ + H₂O

Somewhat more sol in H₂O than the K salt. Hydrolysed by H₂O (Rosenheim, Z anorg 1905, 46 321)

(NH₄)₃Mo₂F₉ + 2H₂O (Rosenheim)

Potassium fluomolybdate, KMoF₄ + H₂O

Nearly insol in H₂O (Rosenheim)

Fluoselenenic acid

Ammonium monofluoselenate,

SeO₃(OH)(F)(NH₄)₂

Not hygroscopic

Easily sol H₂O with decomp

Sol in HF (Weinland, Z anorg 1899, 21 58)

Tripotassium difluodiselenate, Se₂O₇F₂ K₃H + H₂O

Decomp in the air, sol in H₂O with decomp, sol in HF (Weinland)

Tri-rubidium difluodiselenate, Se₂O₇F₂ Rb₃H + H₂O

Decomp in the air, sol in H₂O with decomp, sol in HF (Weinland, Z anorg 1899, 21 57)

Fluosilicic acid, H_2SiF_6

Sp gr of $\text{H}_2\text{SiF}_6 + \text{Aq}$ at 17.5° (H_2O at $17.5^\circ = 1.000$)

% H_2SiF_6	Sp gr	% H_2SiF_6	Sp gr
2	1.0161	20	1.1748
4	1.0324	22	1.1941
6	1.0491	24	1.2136
8	1.0661	26	1.2335
10	1.0834	28	1.2537
12	1.1011	30	1.2742
14	1.1190	32	1.2951
16	1.1373	34	1.3162
18	1.1559		

(Stolba, J pr 90 193)

+ $2\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O (Kessler, C R 90 1285) Solution decomp into HF and SiF_4 on evaporation, when it becomes concentrated

Fluosilicates

Most of the fluosilicates are sol in H_2O , but the alkali salts (especially K) and the Ba salt are only sl sol in H_2O

Aluminum fluosilicate, $\text{Al}_2(\text{SiF}_6)_3$

Easily sol in H_2O After evaporating to dryness, the residue is slowly but completely sol in H_2O (Deville, A ch (3) 61 327)

Insol in acetone (Naumann, B 1904, 37 4328)

Aluminum fluosilicate silicate, $\text{Al}_2\text{SiF}_{10}$, $5\text{Al}_2\text{SiO}_5$

Min *Topaz* Insol in acids

Ammonium fluosilicate, $(\text{NH}_4)_2\text{SiF}_6$

Sol in 538 pts H_2O at 17.5° to form a solution of 1.0961 sp gr, sol in 18 pts hot H_2O , sol in 45.5 pts alcohol of 31% (Stolba, C C 1877 418)

Insol in acetone (Naumann, B 1904, 37 4329, Erdmann, C C 1899, II 1014)

$3\text{NH}_4\text{F} \cdot \text{SiF}_4 = (\text{NH}_4)_2\text{SiF}_6 \cdot \text{NH}_4\text{F}$ Sol in H_2O (Mangnac, Ann Min (5) 15 221)

Barium fluosilicate, BaSiF_6

Sol in 3802 pts cold H_2O (Fresenius, A 59 120)

Sol in 3731 pts H_2O at 17.5° in 3315 pts at 21° , in 1175 pts at 100° (Stolba, J pr 96 22)

Sol in 640-733 pts H_2O containing a little HCl (Fresenius)

488 pts HCl + Aq containing 4.25% HCl dissolve 1 pt at 22° (Stolba)

More sol in $\text{HNO}_3 + \text{Aq}$ than in H_2O (Fresenius)

272 pts $\text{HNO}_3 + \text{Aq}$, containing 8% N O_5 , dissolve 1 pt at 22° (Stolba)

1 pt BaSiF_6 dissolves in 428 pts sat $\text{NH}_4\text{Cl} + \text{Aq}$, in 589 pts sat $\text{NH}_4\text{Cl} + \text{Aq} + 2$ vols H_2O (Mallet, Sill Am J (2) 28 48)

1 pt BaSiF_6 dissolves in 306 pts sat $\text{NH}_4\text{Cl} + \text{Aq}$ at 22° , in 361 pts 15% solution of NH_4Cl , in 563 pts sat boiling $\text{NaCl} + \text{Aq}$, in 349 pts 10% solution of NaCl at boiling temp, in 2185 pts 10% solution of NaCl at 20° , in 1140 pts 5% solution of NaCl at 20° (Stolba)

Nearly absolutely insol in alcohol (Fresenius)

Solubility in a mixture of H_2O , alcohol (96%), HCl + Aq (20%), $\text{H}_2\text{SiF}_6 + \text{Aq}$ (3.7%)
1 pt BaSiF_6 is sol in pts of solutions of given composition

H_2O	Alcohol	HCl + Aq	$\text{H}_2\text{SiF}_6 + \text{Aq}$	BaSiF_6
50	50	0	0	37,219
74 1	25	0 9	0	5,263
70 8	25	4 2	0	2,860
77 95	20	0 9	1 15	39,061
73 0	25	0 9	1 1	70,679
97 09	0	1 25	1 66	3,247
75 0	25	0	0	16,914

(Fresenius, Z anal 29 143)

Cadmium fluosilicate, $\text{CdSiF}_6 + 6\text{H}_2\text{O}$

Extremely sol in H_2O Easily sol in 50% alcohol (Engelskirchen, Dissert 1903)

Cæsium fluosilicate, Cs SiF_6

Sol in 166 pts H_2O at 17° , and much less hot H_2O Insol in alcohol (Preis, J pr 103 410)

Calcium fluosilicate, $\text{CaSiF}_6 + 2\text{H}_2\text{O}$

Sl sol in, and partly decomp by H_2O Sol in HF and HCl + Aq Sol in fluosilicic acid without decomp Easily sol in 60% alcohol (Fleischer)

Cerium fluosilicate

Very difficultly sol in H_2O , acetic, or fluosilicic acids Insol in alcohol (Stolba, C C 1874 130)

Chromium fluosilicate

Deliquescent (Berzelius)

Efflorescent Sol in H_2O (Bullin)

Cobaltous fluosilicate, $\text{CoSiF}_6 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Berzelius)

Cuprous fluosilicate, Cu_2SiF_6

Insol in H_2O (Berzelius, Pogg 1 199)

Cupric fluosilicate, $\text{CuSiF}_6 + 6\text{H}_2\text{O}$

Deliquescent in moist, efflorescent in dry air

Sol in 0.428 pt H_2O at 17° Sp gr of solution sat at $17^\circ = 1.6241$

Sol in 17.5 pts alcohol of 62 vol % at 20° , in 150 pts of 85% at 20° , in 617 pts of 92% at 20° (Stolba, J pr 102 7)

Insol in methyl acetate (Naumann, B 1909, 42 3790)
Contains $6\frac{1}{2}$ H₂O (Stolba)
+ $5\frac{1}{2}$ H₂O (Knop and Wolf)

Cupric fluosilicate phosphate, CuSiF_6 ,
 $\text{Cu}_3(\text{PO}_4)_2$

Insol in H₂O, but easily sol in dil HCl + Aq (Thorpe and Rodger, Chem Soc 55 320)

Glucinum fluosilicate

Known only in solution

Iron (ferrous) fluosilicate, $\text{FeSiF}_6 \cdot 6\text{H}_2\text{O}$
Easily sol in H₂O (Berzelius)

Iron (ferric) fluosilicate, $\text{Fe}_2(\text{SiF}_6)_3$
Sol in H₂O (Berzelius)

Lead fluosilicate, $\text{PbSiF}_6 \cdot 2\text{H}_2\text{O}$

Deliquescent Easily sol in H₂O
Insol in acetone (Naumann, B 1904, 37 4329)
+ 4 H₂O (Marignac)

Lithium fluosilicate, $\text{Li}_2\text{SiF}_6 \cdot 2\text{H}_2\text{O}$

100 pts H₂O at 17° dissolve 73 pts crystalline salt (Marignac)
100 pts cold H₂O dissolve 52.6 pts crystals
Sol in dil alcohol (Stolba, J pr 91 456)
100 pts alcohol of 46 vol % dissolve about 4 pts, and 100 pts alcohol of 79 vol % dissolve about 0.4 pt crystals (Stolba, Z anal 3 311)
Insol in ether or benzene
Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)
Insol in methyl acetate (Naumann, B 1909, 42 3790)
Insol in ethyl acetate (Naumann, B 1904, 37 3601)

Magnesium fluosilicate, $\text{MgSiF}_6 \cdot 6\text{H}_2\text{O}$

Efflorescent Sol in 1534 pts cold H₂O, forming a solution of 1.235 sp gr at 17.5° Separates out SiO₂ on warming, which nearly all redissolves on cooling (Stolba, C C 1877 578)

Magnesium fluosilicate silicate, $\text{Mg}_3\text{Si}_2\text{F}_{18}$,
 $x\text{Mg}_3\text{Si}_2\text{O}_9$

Min *Humite* *Chondrodite* Gelatinises with HCl, or H₂SO₄ + Aq

Manganous fluosilicate, $\text{MnSiF}_6 \cdot 6\text{H}_2\text{O}$

Sol in H₂O (Marignac, J pr 83 202)
100 pts dissolve in 71.4 pts H₂O at 17.5°, and sp gr of solution = 1.44825 Much more sol in hot H₂O, and less sol in alcohol, the stronger the alcohol (Stolba, C C 1883 292)

Mercurous fluosilicate, Hg_2SiF_6

Sl sol in H₂O without decomp (Lemaire, C C 1897, I 1046)
+ 2 H₂O Sl sol in H O More easily sol in acidified H₂O, but precipitated by HCl + Aq (Berzelius)

Mercuric fluosilicate, basic, HgSiF_6 , $\text{HgO} + 3\text{H}_2\text{O}$

Decomp by H₂O, but sol in weakest acids (Berzelius, Pogg 1 200)

Mercuric fluosilicate, $\text{HgSiF}_6 \cdot 6\text{H}_2\text{O}$

Deliquescent, and easily sol in H₂O (Finkener, Pogg 111 246)

Nickel fluosilicate, $\text{NiSiF}_6 \cdot 6\text{H}_2\text{O}$

Easily sol in H₂O (Marignac, Ann Min (5) 15 262)

Potassium fluosilicate, K_2SiF_6

Sol in 833.1 pts H₂O at 17.5°, and 104.8 pts at 100° (Stolba, J pr 103 396) Sol in 3800 pts cold, and more easily sol in hot H₂O (Freseman)

More sol in HCl + Aq than in H O
Sol in 337 pts HCl + Aq of 26.5% at 14°, in 307 pts of 25.7% at 15°, in 340 pts of 14.1% at 14°, in 303 pts of 13.6% at 15°, in 327 pts of 9.6% at 14°, in 313 pts of 9.2% at 15°, in 376 pts of 2.7% at 14°, in 319 pts of 2.4% at 15°, in 409 pts of 1.8% at 14° (Stolba, l c)

Sol in 428 pts sat, and 589 pts dil NH₄Cl + Aq (Mallet)
Much less sol in K₂SO₄, KNO₃, or KCl + Aq, but more sol in NH₄Cl + Aq than in H₂O (Stolba)

Sol in 24,066 pts K₂SO₄ + Aq containing 9.92% K₂SO₄ at 17°, in 17,858 pts containing 6% at 18°, in 19,530 pts containing 5% at 17°, in 10,721 pts containing 1% at 17°

Sol in 125,000 pts KNO₃ + Aq containing 18.4% KNO₃ at 15°, in 43,478 pts containing 8.7% at 15°, in 1735 pts containing 8.8% at 100°, in 35,814 pts containing 4.3% at 15°, in 10,203 pts containing 1.00% at 15°

Sol in 40,070 pts KCl + Aq containing 25% KCl at 17°, in 38,352 pts containing 18.4% at 17°, in 41,254 pts containing 13.4% at 14°, in 24,032 pts containing 6.7% at 12°, in 1200 pts containing 0.65% at 17°, in 1095 pts containing 0.45% at 18°

Sol in 358 pts NH₄Cl + Aq containing 26.3% NH₄Cl at 17°, in 306 pts containing 15% at 15°, in 339 pts containing 10% at 15°, in 436 pts containing 5% at 15° (Stolba, J pr 103 306)

Insol in liquid CO (Buchner, Z phys Ch 1906, 54 674)

Insol in liquid NH₃ (Gore, Am ch J 1898, 20 829)

Completely pptd from aqueous solution by an equal vol of alcohol

Si sol in benzonitrile (Naumann, B 1914, 47 1369)
Insol in methyl acetate (Naumann, B 1909, 42 3790)

Rubidium fluosilicate, Rb_2SiF_6

Sol in 625 pts H_2O at 20° , and 73 05–74 5 pts at 100° More sol in acidified water
 Insol in alcohol (Stolba, J pr 101 1)
 Insol in H_2O (Eggeling, Z anorg 1905, 46 175)
 Less sol in H_2O than K_2SiF_6 (Gossner, Zeit Kryst 1904, 38 149)

Silver fluosilicate, $\text{Ag}_2\text{SiF}_6 + 4\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O (Marignac, Ann Min (5) 15 221)

Sodium fluosilicate, Na_2SiF_6

Much more sol in H_2O than K_2SiF_6 , especially in hot H_2O Addition of acid does not increase solubility (Berzelius)

Sol in 153 3 pts H_2O at 17.5° , and 40 66 pts at 100° Easily forms supersaturated solutions (Stolba, Z anal 11 199)

Much less sol in $\text{NaCl} + \text{Aq}$ than in H_2O (Stolba, J pr 1865 (1) 96 26)

Precipitated completely from aqueous solution by alcohol (Rose)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Strontium fluosilicate, $\text{SrSiF}_6 + 2\text{H}_2\text{O}$

Sol in cold H_2O , but decomp somewhat on heating Sol in 31 06 pts H_2O (Fresenius)

Easily sol in acidified H_2O without decomp Sol in alcohol

Solubility in a mixture of H_2O , alcohol (96%), $\text{HCl} + \text{Aq}$ (20%), $\text{H}_2\text{SiF}_6 + \text{Aq}$ (3 7%)
 1 pt SrSiF_6 is sol in pts of solutions of given composition

H_2O	Alcohol	$\text{HCl} + \text{Aq}$	$\text{H}_2\text{SiF}_6 + \text{Aq}$	SrSiF_6
50	50	0	0	15 29
74 1	25	0	0	82 93
70 8	25	4 2	0	50 9
77 95	20	0 9	1 15	55 0
73	25	0 9	1 1	82 97
75	25	0	0	147 4
95 24	0	2 04	2 72	7 3

(Fresenius, Z anal 29 143)

Thallous fluosilicate, $\text{Tl}_2\text{SiF}_6 + 2\text{H}_2\text{O}$

Very easily sol in H_2O (Kuhlmann)

Thorium fluosilicate, $\text{Th}(\text{OH})_2\text{SiF}_6$ (?)

(Cleve)

Tin (stannic) fluosilicate, $\text{SnF}_4, \text{SiF}_4$

Very easily sol in H_2O (Berzelius)

Uranyl fluosilicate

Very sl sol in acids (Berzelius)

Sol in alcohol (Stolba, Z anal 3 71)

Vanadium fluosilicate

Deliquescent Sol in H_2O (Guyard, Bull Soc (2) 25 352)

Yttrium fluosilicate

Insol in pure, sol in acidified H_2O (Berzelius)

Zinc fluosilicate, $\text{ZnSiF}_6 + 6\text{H}_2\text{O}$

Very easily sol in H_2O (Berzelius)

Zirconium fluosilicate

Sol in H_2O Solution clouds up on boiling (Berzelius)

Fluostannic acid

Ammonium fluostannate, $(\text{NH}_4)_2\text{SnF}_6$

Sol in H_2O (Marignac, Ann Min (5) 15 224)

$4\text{NH}_4\text{F}, \text{SnF}_4$ Sol in H_2O (Marignac)

Barium fluostannate, BaSnF_6

Slowly sol in H_2O

$+3\text{H}_2\text{O}$ Sol in 18 pts H_2O at 18° (Marignac, Ann Min (5) 15 246)

Decomp by warming with H_2SO_4 with evolution of HF (Emich, M 1904, 25 1912)

Calcium fluostannate, $\text{CaSnF}_6 + 2\text{H}_2\text{O}$

Sol in H_2O (Marignac, Ann Min (5) 15 250)

Cadmium fluostannate, $\text{CdSnF}_6 + 6\text{H}_2\text{O}$

Sol in H_2O (Marignac)

Cobaltous fluostannate, $\text{CoSnF}_6 + 6\text{H}_2\text{O}$

(Gossner, Zeit Kryst 1907, 42 482)

Cupric fluostannate, $\text{CuSnF}_6 + 4\text{H}_2\text{O}$

Not deliquescent (Marignac, Ann Min (5) 15 291)

Lithium fluostannate, $\text{Li}_2\text{SnF}_6 + 2\text{H}_2\text{O}$

Sol in H_2O (Marignac, Ann Min (5) 15 242)

Magnesium fluostannate, $\text{MgSnF}_6 + 6\text{H}_2\text{O}$

Not deliquescent Sol in H_2O (Marignac, Ann Min (5) 15 256)

Manganous fluostannate, $\text{MnSnF}_6 + 6\text{H}_2\text{O}$

Slowly efflorescent (Marignac)

Nickel fluostannate, $\text{NiSnF}_6 + 6\text{H}_2\text{O}$

Sol in H_2O (Marignac, Ann Min (5) 15 262)

Potassium fluostannate, $K_2SnF_6 + H_2O$

Two modifications—(a) *Thin plates* Sol in 23 pts H_2O at 100° , and in 15–16 pts at 18° (Marignac)

(b) *Octahedra* Sol in 3 pts H_2O at 100° , and 27 pts at 18° (Marignac)

Sol in hot H_2O Can be crvst from hot H_2O With conc H_2SO_4 , HF is evolved (Emich, M 1904, 25 911)

Potassium hydrogen fluostannate, $3KF, HF, SnF_4$

Sol in H_2O (Marignac)

Silver fluostannate, $Ag_2SnF_6 + 4H_2O$

Sl deliquescent Easily sol in H_2O (Marignac)

Sodium fluostannate, Na_4SnF_6

Sol in 18–19 pts H_2O at 20° (Marignac)

Strontium fluostannate, $SrSnF_6 + 2H_2O$

Sol in 5.5 pts H_2O at 18° (Marignac)

Zinc fluostannate, $ZnSnF_6 + 6H_2O$

Sol in H_2O (Marignac)

Fluosulphonic acid, HSO_3F

See Sulphuryl hydroxyl fluoride

Ammonium fluosulphonate, FSO_3NH_4

Easily sol in H_2O from which it can be cryst

Sol in ethyl alcohol, more sol in methyl alcohol Can be crvst from abs alcohol (Traube, B 1913, 46 2528)

Sodium fluosulphonate, FSO_3Na

Hydrosopic

Sol in alcohol and acetone (Traube)

Fluosulphuric acid**Tricæsium difluodisulphate, $S_2O_7F_2Cs_3H + H_2O$**

As the h salt (Weinland, Z anorg 1899, 21 53)

Tripotassium difluodisulphate, $S_2O_7F_2K_3H + H_2O$

Sol in HF, quite stable in air, sol in H_2O with decomp (Weinland, Z anorg 1899, 21 51)

Trirubidium difluodisulphate, $S_2O_7F_2Rb_3H + H_2O$

Sol in HF (Weinland, Z anorg 1899, 21 53)

Fluotantallic acid**Ammonium fluotantalate, $(NH_4)_2TaF_7$**

Very sol in H_2O (Marignac, A ch (4) 9 272)

$(NH_4)_2TaF_7$ (Balke, J Am Chem Soc 1905, 27 1151)

Cæsium fluotantalate, $CsTaF_6$

Can be recryst from HF+Aq (Balke)

Cs_2TaF_7 Can not be recryst from H_2O as it tends to go into CsF, TaF_5 (Balke, J Am Chem Soc 1905, 27 1151)

$15CsF, TaF_5$ Sl sol in H_2O (Pennington, J Am Chem Soc 1896, 18 59)

Calcium fluotantalate

Difficulty sol in H_2O (Berzelius)

Cupric fluotantalate, $Cu_2TaF_7 + 4H_2O$

Deliquescent Easily sol in H_2O (Marignac, A ch (4) 9 294)

Lead fluotantalate

Difficulty sol in H_2O (Berzelius)

Lithium fluotantalate, $LiTaF_6 + 2H_2O$

Can be recryst from conc HF (Balke, J Am Chem Soc 1905, 27 1143)

Potassium fluotantalate, K_2TaF_7

Sl sol in cold, much more easily in hot H_2O Decomposes, with formation of a white precipitate on boiling (Berzelius)

Much more sol in HF+Aq 1 pt of the salt is sol in 200 pts H_2O containing a trace of HF, and in 150–160 pts of H_2O containing a little more HF (Marignac, A ch (4) 9 267)

Potassium hydrogen fluotantalate, KF, HF, TaF_5 (?)

Sol in H_2O (Berzelius)

Rubidium fluotantalate, Rb_2TaF_7

Sol in HF+Aq (Pennington, J Am Ch Soc 1896, 18 58)

$3RbF, 2TaF_5$ (Balke, J Am Chem Soc 1905, 27 1151)

Sodium fluotantalate, $3NaF, TaI_5$

Easily sol in H_2O

$Na_2TaF_7 + H_2O$ Sol in H_2O (Marignac)

Thalious fluotantalate, 11_2TaF_7

Sol in H_2O On boiling the aqueous solution tantalic acid separates

Decomp by conc H_2SO_4 Difficulty sol in cold, easily sol in hot HF (Lephrium B 1909, 42 4461)

Zinc fluotantalate, $ZnTaF_7 + 7H_2O$

Very deliquescent Sol in H_2O (Marignac, A ch (4) 9 249)

Fluotelluric acid**Ammonium fluotellurate, $NH_4Tel_5 + H_2O$**

Decomp by H_2O (Hogbom, Bull Soc (2) 35 60)

Barium fluotellurate, $\text{Ba}(\text{TeF}_6)_2 + \text{H}_2\text{O}$

As above

Potassium fluotellurate, KTeF_6

As above

$\text{TeO}_3\text{F}_2\text{K}_2 + 3\text{H}_2\text{O}$ Stable in dry air, only sl sol in H_2O with decomp, sol in HF (Weinland, Z anorg 1899, 21 61)

Rubidium difluotellurate, $\text{TeO}_3\text{F}_2\text{Rb}_2 + 3\text{H}_2\text{O}$

Sl sol in H_2O with decomp Sol in HF (Weinland, Z anorg 1899, 21 62)

Fluotitanic acid

Known only in solution as titanium hydrogen fluoride

Ammonium fluotitanate, $(\text{NH}_4)_2\text{TiF}_6$

Sol in H_2O (Marignac)

$3\text{NH}_4\text{F}$, TiF_4 Sol in H_2O (Marignac)

Ammonium fluosequititanate, $6\text{NH}_4\text{F}$, Ti_2F_6

Easily sol in H_2O Sl sol in $\text{NH}_4\text{F} + \text{Aq}$ (Petersen, J pr (2) 40 54)

Insol in $\text{NH}_4\text{F} + \text{Aq}$ (Piccini, C R 97 1064)

$4\text{NH}_4\text{F}$, Ti_2F_6 Properties as the corresponding K salt (Piccini, B 18 257 R)

e, BaTiF_6

H_2O More easily sol in a (Engelskirchen, Dissert

$+\frac{1}{2}\text{H}_2\text{O}$ (Emich, M 1904, 25 907)

Cadmium fluotitanate, $\text{CdTiF}_6 + 6\text{H}_2\text{O}$

Extremely sol in H_2O Easily sol in 50% alcohol (Engelskirchen, Dissert 1903)

Cesium fluotitanate, Cs_2TiF_6

More sol in hot than cold H_2O and much more sol than the Rb comp (Engelskirchen, Dissert 1903)

4CsF , TiF_4 More sol in H_2O than $\text{Cs}_{15}\text{TaF}_{20}$ and is not decomp by pure H_2O (Pennington, J Am Chem Soc 1896, 18 60)

Calcium fluotitanate, $\text{CaTiF}_6 + 3\text{H}_2\text{O}$

Decomp by pure H_2O Sol without decomp in acidified H_2O (Berzelius)

Separates a precipitate with cold H_2O , which dissolves on heating (Marignac, Ann Min (5) 15 250)

Cupric fluotitanate, $\text{CuTiF}_6 + 4\text{H}_2\text{O}$

Sol in pure H_2O with partial decomp, easily and completely sol in acidified H_2O (Berzelius)

Cupric fluotitanate ammonium fluoride,

CuTiF_6 , $\text{NH}_4\text{F} + 4\text{H}_2\text{O}$

Efflorescent Easily sol in H_2O (Marignac, Ann Min (5) 15 267)

Cupric fluotitanate potassium fluoride,

CuTiF_6 , $\text{KF} + 4\text{H}_2\text{O}$

As the above salt (Marignac)

Ferrous fluotitanate, $\text{FeTiF}_6 + 6\text{H}_2\text{O}$

Sol in H_2O (Weber, Pogg 120 287)

Ferric fluotitanate

Decomp by H_2O (Berzelius)

Lead fluotitanate

Easily sol in H_2O (Berzelius)

Lithium fluotitanate, $\text{Li}_2\text{TiF}_6 + 2\text{H}_2\text{O}$

Very sol in H_2O (Engelskirchen, Dissert, 1903)

Magnesium fluotitanate, $\text{MgTiF}_6 + 6\text{H}_2\text{O}$

Easily sol in cold H_2O (Marignac, Ann Min (5) 15 257)

Nickel fluotitanate, $\text{NiTiF}_6 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Weber, Pogg 120 282)

Potassium fluotitanate, K_2TiF_6

Difficultly sol in cold, much more easily in hot H_2O

100 pts H_2O dissolve at

0° 3° 6° 10° 14° 20°

0 556 0 667 0 775 0 909 1 042 1 28 pts K_2TiF_6 (Marignac, A ch (4) 8 65)

Sol in 78 6 pts H_2O at 21° Sol in acids (Piccini, Gazz ch it 1886, 16 104)

Sol in 78 pts H_2O at 20°, 9 4 pts at 100° By addition of small amount of HF, the solubility is increased (Weiss and Kaiser, Z anorg 1910, 65 354)

Sol in HF (Marchetti, Z anorg 1895, 10 66)

+ H_2O Much less sol in H_2O in presence of KBr or KI (Hall, J Am Chem Soc 1904, 26 1246)

Sol in H_2O or HF with decomp (Marchetti, Z anorg 1895, 10 66)

Potassium fluosesquititanate, 4KF , Ti_2F_6

Scarcely sol in H_2O , sol in dil acids (Piccini, B 18 257 R)

Rubidium fluotitanate, Rb_2TiF_6

Very sl sol in cold, somewhat more sol in hot H_2O (Engelskirchen, Dissert 1903)

Silver fluotitanate

Very deliquescent (Marignac)

Sodium fluotitanate, Na_2TiF_6

Much more sol in H_2O than the corresponding potassium salt (Marignac, Ann Min (5) 15 238)

Sodium hydrogen fluotitanate, Na_2TiF_6 , NaHF_2
Sol in H_2O (Marignac)

Strontium fluotitanate, $\text{SrTiF}_6 + 2\text{H}_2\text{O}$
Sol in cold H_2O Solution clouds up on heating (Marignac)

Zinc fluotitanate, $\text{ZnTiF}_6 + 6\text{H}_2\text{O}$
Sol in H_2O (Marignac, A ch (3) 60 304)

Fluovanadic acid

Ammonium fluovanadate, $3\text{NH}_4\text{F}$, VF_3
Moderately sol in H_2O More easily sol in dil acids Nearly insol in alcohol or MF + Aq (Petersen, J pr (2) 40 52)
 $2\text{NH}_4\text{F}$, $\text{VF}_3 + \text{H}_2\text{O}$ Easily sol in H_2O
Sl sol in alcohol (Petersen)
 NH_4F , $\text{VF}_3 + 2\text{H}_2\text{O}$ As above (Petersen)

Cadmium fluovanadate, CdF_2 , $\text{VF}_3 + 7\text{H}_2\text{O}$
Very sl sol in H_2O (Piccini and Giorgis, Gazz ch it 22, 1 89)

Cobalt fluovanadate, CoF_2 , $\text{VF}_3 + 2\text{H}_2\text{O}$
Sol in H_2O without decomp (Petersen, l c)

Nickel fluovanadate, NiF_2 , $\text{VF}_3 + 2\text{H}_2\text{O}$
As the Co salt (Petersen)

Potassium fluovanadate, 2KF , $\text{VF}_3 + \text{H}_2\text{O}$
Sl sol in H_2O , easily sol in acids Insol in $\text{KF} + \text{Aq}$ (Petersen, J pr (2) 40 51)

Potassium fluovanadate fluoxyvanadate, 4KF , VF_3 , VOF_3
Easily sol in H_2O , and still more easily in $\text{HF} + \text{Aq}$ Sl sol in $\text{KF} + \text{Aq}$ (Petersen, J pr (2) 40 274)

Sodium fluovanadate, 5NaF , $2\text{VF}_3 + \text{H}_2\text{O}$
As the potassium salt (Petersen)

Thalious fluovanadate, TlF , $\text{VF}_3 + 2\text{H}_2\text{O}$
Easily sol in H_2O
Sol with decomp in conc H_2SO_4 , dil HNO_3 , or cold dil HCl
Insol in $\text{NaOH} + \text{Aq}$ (Ephraim, B 1909, 42 4460)
 2TlF , $\text{VF}_3 + \text{H}_2\text{O}$ Easily sol in H_2O
Sol in conc H_2SO_4 , dil HNO_3 , or cold dil HCl with decomp
Insol in cold or hot $\text{NaOH} + \text{Aq}$ (Ephraim, B 1909, 42 4461)

Zinc fluovanadate, ZnF_2 , $\text{VF}_3 + 7\text{H}_2\text{O}$
Sl sol in cold H_2O Decomp on heating (Piccini and Giorgis)

Fluoxycolumbic acid

Ammonium fluoxycolumbate, $3\text{NH}_4\text{F}$, CbOF_3
Cubic salt Sol in H_2O (Marignac, A ch (4) 8 38)
 $2\text{NH}_4\text{F}$, CbOF_3 *Lamellar salt* Much more sol in H_2O than 2KF , CbOF_3 (M)
 $5\text{NH}_4\text{F}$, $3\text{CbOF}_3 + \text{H}_2\text{O}$ *Hexagonal salt* (M)
 NH_4F , CbOF_3 *Rectangular salt* (M)

Ammonium fluoxycolumbate columbium fluoride, $3\text{NH}_4\text{F}$, CbOF_3 , CbF_5
(Marignac)

Cupric fluoxycolumbate, CuF_2 , $\text{CbOF}_3 + 4\text{H}_2\text{O}$
Sl deliquescent Sol in H_2O (Marignac, A ch (4) 8 42)

Potassium fluoxycolumbate, 2KF , $\text{CbOF}_3 + \text{H}_2\text{O}$
Sol in 12.5-13 pts H_2O at $17-21^\circ$ Much more sol in hot H_2O , or H_2O containing HF . (Marignac)
 3KF , CbOF_3 Decomp by H_2O into above salt (M)
 5KF , $3\text{CbOF}_3 + \text{H}_2\text{O}$ Sol in H_2O (M)
 4KF , $3\text{CbOF}_3 + \text{H}_2\text{O}$ Sol in H_2O (M)
 3KF , $2\text{Cb}_2\text{O}_5 + 5\text{H}_2\text{O}$ Sl sol in H_2O (Petersen, J pr (2) 40 287)
 KF , $\text{Cb}_2\text{O}_5 + 3\text{H}_2\text{O}$ Sl sol in H_2O (Petersen)
 2KF , $3\text{Cb}_2\text{O}_5\text{F}$ Insol in H_2O Sol in HF (Kruss and Nilson, B 20 1689)
See also Fluoxypercolumbate, potassium

Potassium hydrogen fluoxycolumbate, 3KF , HF , CbOF_3
Sol in H_2O (Marignac)

Sodium fluoxycolumbate, 2NaF , $\text{CbOF}_3 + 2\text{H}_2\text{O}$
Sol in H_2O
 NaF , $\text{CbOF}_3 + \text{H}_2\text{O}$ (Marignac)

Zinc fluoxycolumbate, ZnF_2 , $\text{CbOF}_3 + 6\text{H}_2\text{O}$
Sol in H_2O (Marignac, A ch (4) 8. 41)

Fluoxyhypomolybdic acid

Ammonium fluoxyhypomolybdate, MoOF_3 , $2\text{NH}_4\text{F}$
Decomp by H_2O (Mauro, Gazz ch it 19 179)
 3MoOF_3 , $5\text{NH}_4\text{F} + \text{H}_2\text{O}$ Decomp by H_2O (Mauro)

Cupric fluoxyhypomolybdate, CuF_2 , $\text{MoOF}_3 + 4\text{H}_2\text{O}$
Deliquescent Sol in H_2O (Mauro, Real Ac Linc 1892, 1 194)

Potassium fluoxyhypomolybdate, MoOF_3 , $2\text{KF} + \text{H}_2\text{O}$

Sol in H_2O with decomp
Sol in HF or $\text{HCl} + \text{Aq}$ (Mauro and Panabianco, Gazz ch it 12 80)
 3MoOF_3 , $5\text{KF} + \text{H}_2\text{O}$ Sol in H_2O with decomp (Mauro, Gazz ch it 19 179)

Thallous fluoxyhypomolybdate, 2TlF , MoOF_3

(Mauro, B 1894, 27R 109)

Zinc fluoxyhypomolybdate, ZnF_2 , $\text{MoOF}_3 + 6\text{H}_2\text{O}$

Rapidly deliquescent Sol in H_2O
(Mauro, Real Ac Linc 1892 1 194)

Fluoxyhypovanadic acid

See Fluoxylvanadic acid

Fluoxymanganic acid

Ammonium fluoxymanganate, $(\text{NH}_4)_2\text{MnOF}_4$

Precipitate (Nicklès)

Potassium fluoxymanganate, K_2MnOF_4

Precipitate (Nicklès, C R 65 107)

Sesquifluoxymanganic acid

Potassium sesquifluoxymanganate,

$\text{K}_4\text{Mn}_2\text{OF}_8 = 4\text{KF}$, Mn_2OF_4
Precipitate (Nicklès)

Fluoxymolybdic acid

See also Fluoxyhypomolybdic, and fluoxypermolybdic acids

Ammonium fluoxymolybdate, NH_4F , MoO_2F_2

Sol in H_2O (Mauro, Gazz ch it 20 109)

$+ \text{H}_2\text{O}$ More sol in H_2O than $2\text{NH}_4\text{F}$, MoO_2F_2 (Delafontaine, N Arch Sci ph nat 30 250)

Correct formula is $3\text{NH}_4\text{F}$, MoO_2F_2 (Mauro, Gazz ch it 18 120)

$2\text{NH}_4\text{F}$, MoO_2F_2 Much more sol than 2KF , MoO_2F_2 (Delafontaine)

$3\text{NH}_4\text{F}$, MoO_2F_2 Sol in H_2O (Mauro)

$5\text{NH}_4\text{F}$, $3\text{MoO}_2\text{F}_2 + \text{H}_2\text{O}$ Sol in H_2O (Mauro, Gazz ch it 20 109)

Ammonium fluoxymolybdate molybdate,

MoO_2F_2 , $4\text{NH}_4\text{F}$, $(\text{NH}_4)_2\text{MoO}_4$

Sol in H_2O , but with decomp (Mauro, Gazz ch it 18 120)

Cadmium fluoxymolybdate, CdF_2 , $\text{MoO}_2\text{F}_2 + 6\text{H}_2\text{O}$

Sl efflorescent (Delafontaine, J B 1867 236)

Cobaltous fluoxymolybdate, CoF_2 , $\text{MoO}_2\text{F}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Delafontaine, J B 1867 236)

Cupric fluoxymolybdate, CuF_2 , $\text{MoO}_2\text{F}_2 + 4\text{H}_2\text{O}$

Deliquescent (Mauro, Real Ac Linc 1892, 1 194)

Nickel fluoxymolybdate, NiF_2 , $\text{MoO}_2\text{F}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Delafontaine, J B 1867 236)

Potassium fluoxymolybdate, 2KF , $\text{MoO}_2\text{F}_2 + \text{H}_2\text{O}$

Easily sol in boiling H_2O
Sol in H_2O with decomp Sol in HF (Marchetti, Z anorg 1895 10 68)
 KF , $\text{MoO}_2\text{F}_2 + \text{H}_2\text{O}$ Gradually efflorescent (Delafontaine)

Rubidium fluoxymolybdate, 2RbF , $2\text{MoO}_2\text{F}_2 + 2\text{H}_2\text{O}$

Sol in cold, more sol in hot H_2O (Delafontaine)

Sodium fluoxymolybdate, NaF , $\text{MoO}_2\text{F}_2 + \frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Delafontaine)

Thallous fluoxymolybdate, 2TlF , $\text{MoO}_2\text{F}_2 + \text{H}_2\text{O}$

Sol in hot H_2O (Delafontaine)

Zinc fluoxymolybdate, ZnF_2 , $\text{MoO}_2\text{F}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Delafontaine)

Fluoxypercolumbic acid

Potassium fluoxypercolumbate, 2KF , $\text{CbO}_2\text{F}_2 + \text{H}_2\text{O}$

(Piccini, Z anorg 2 21)
Sol in H_2O with decomp
Sol in HF (Marchetti, Z anorg 1895, 10 67)

Fluoxypermolybdic acid

Ammonium fluoxypermolybdate, MoO_2F_2 , $3\text{NH}_4\text{F}$

Sol in H_2O (Piccini, Z anorg 1 51)

Cæsium fluoxypermolybdate, MoO_2F_2 , $2\text{CsF} + \text{H}_2\text{O}$

(Piccini)

Potassium fluoxypermolybdate, MoO_2F_2 , $2\text{KF} + \text{H}_2\text{O}$

Not very sol in H_2O , more sol in HF + Aq without decomp (Piccini)

Rubidium fluoxypermolybdate, MoO_3F_2 , $2\text{RbF} + \text{H}_2\text{O}$

Somewhat more sol in H_2O than K salt
Easily sol in $\text{HF} + \text{Aq}$ (Piccini)

Fluoxypertantalic acid

Potassium fluoxypertantalate, 2KF , $\text{TaO}_2\text{F}_3 + \text{H}_2\text{O}$

Sol in H_2O (Piccini, Z anorg 2 21)

Fluoxypertitanic acid, TiO_2F_3 , HF

Known only in solution (Piccini, B 18 255 R)

Ammonium fluoxypertitanate, TiO_2F_3 , $2\text{NH}_4\text{F}$

Very unstable (Piccini, Gazz ch it 17 479)

TiO_2F_3 , $3\text{NH}_4\text{F}$ Sol in H_2O

Sol in H_2O_2 (Piccini, Z anorg 1895, 10 439)

$2\text{TiO}_2\text{F}_3$, $3\text{NH}_4\text{F}$ Sol in H_2O (Piccini, B 18 698 R)

Barium fluoxypertitanate, TiO_2F_3 , BaF_2
Precipitate Easily sol in acids (Piccini, B 18 698 R)

$2\text{TiO}_2\text{F}_3$, 3BaF_2 Insol in H_2O , sol in dil acids (Piccini, Gazz ch it 17 479)

Potassium fluoxypertitanate, TiO_2F_3 , 2KF

Sol in H_2O (Piccini, B 21 1391)

Sol in H_2O_2 (Piccini, Z anorg 1895, 10 438)

Fluoxypertungstic acid

Potassium fluoxypertungstate, 2KF , $\text{WO}_3\text{F} + \text{H}_2\text{O}$

(Piccini, Z anorg 2 11)

Fluoxytantallic acid

See also Fluoxypertantallic acid

Ammonium fluoxytantalate, $3\text{NH}_4\text{F}$, TaOF_2

Easily sol in H_2O The solution clouds up by standing or on warming (Joly, C R 81 1266)

Fluoxytitanic acid

See also Fluoxypertitanic acid

Barium fluoxytitanate, TiOF_2 , BaF_2

Insol in H_2O , sol in dil acids (Piccini, Gazz ch it 17 479)

Fluoxytungstic acid

Ammonium fluoxytungstate, $2\text{NH}_4\text{F}$, WO_2F_2

Very sol in H_2O (Marignac, A ch (3) 69 65)

NH_4F , $\text{WO}_2\text{F}_2 + \text{H}_2\text{O}$ Decomp by H_2O
Crystallises unchanged from H_2O containing HF (Marignac)

Ammonium fluoxytungstate tungstate,

$4\text{NH}_4\text{F}$, WO_2F_2 , $(\text{NH}_4)_2\text{WO}_4$

Incompletely sol in H_2O Residue dissolves in $\text{NH}_4\text{OH} + \text{Aq}$ (Marignac)

Cadmium fluoxytungstate

Very sol in H_2O (Marignac)

Cupric fluoxytungstate, CuF_2 , $\text{WO}_2\text{F}_2 + 4\text{H}_2\text{O}$

Very sol in H_2O (Marignac, C R 55 888)

Cupric fluoxytungstate ammonium fluoride, CuF_2 , WO_2F_2 , $\text{NH}_4\text{F} + 4\text{H}_2\text{O}$

Sol in H_2O (Marignac)

Manganese fluoxytungstate

Very sol in H_2O (Marignac)

Nickel fluoxytungstate, NiF_2 , $\text{WO}_2\text{F}_2 + 10\text{H}_2\text{O}$

Deliquescent Very sol in H_2O (Marignac)

Potassium fluoxytungstate, KF , $\text{WO}_2\text{F}_2 + \text{H}_2\text{O}$

Can be recrystallised without decomp only from H_2O containing HF (Marignac, A ch (3) 69 70)

2KF , $\text{WO}_2\text{F}_2 + \text{H}_2\text{O}$ Difficultly sol in cold, more easily in hot H_2O (Berzelius)

Sol in 17 pts H_2O at 15° (Marignac)

Can be recrystallised without decomp from H_2O , or H_2O containing HF (Marignac)

Sol in H_2O with decomp Sol in HF (Murchetti, Z anorg 1895, 10 71)

See also Fluoxypertungstate, potassium

Silver fluoxytungstate

Very easily sol in H_2O (Marignac)

Sodium fluoxytungstate, 2NaF , WO_2F_2

More sol in H_2O than the corresponding K compound (Berzelius)

Thallos fluoxytungstate, TlF , WO_2F_2

Insol in H_2O Decomp by H_2O

(Ephraim and Heymann, B 1909, 42 4463)

2TlF , WO_2F_2 Insol in H_2O but decomp thereby (Ephraim and Heymann, B 1909, 42 4462)

3TlF , $2\text{WO}_2\text{F}_2$ Insol in H_2O Decomp by acids (Ephraim and Heymann, B 1909, 42 4462)

Zinc fluoxytungstate, ZnF_2 , $\text{WO}_2\text{F}_2 + 10\text{H}_2\text{O}$

Very sol in H_2O (Marignac)

Fluoxyuranic acid

Ammonium fluoxyurate, $3\text{NH}_4\text{F}$, UO_2F_2
 Easily sol in H_2O , less in HF Insol in alcohol (Bolton)
 100 g solution sat at 27° contain 10.11 g salt
 100 g solution sat at 81.3° contain 20.71 g salt

(Burger, Dissert 1904)

Barium fluoxyurate, 3BaF_2 , $2\text{UO}_2\text{F}_2 + 2\text{H}_2\text{O}$
 Traces dissolve in hot H_2O Easily sol in dil acids (Bolton)

Potassium fluoxyurate, 3KF , UO_2F_2
 Sol in 8 pts H_2O at 21° Insol in alcohol and ether (Bolton, J pr 99 269)
 Does not exist (Smithells, Chem Soc 43 125)
 4KF , UO_2F_2 Insol in H_2O Easily sol in dil acids (Ditte, C R 91 115)
 5KF , $2\text{UO}_2\text{F}_2$ (Baker, Chem Soc 35 760)
 3KF , $2\text{UO}_2\text{F}_2 + 2\text{H}_2\text{O}$ (Baker)

Sodium fluoxyurate, NaF , UO_2F_2
 $+2\text{H}_2\text{O}$ Not efflorescent
 $+4\text{H}_2\text{O}$ Insol in H_2O and dil acids Sl sol in conc $\text{HCl} + \text{Aq}$ Sol in conc H_2SO_4 , J B 1866 212)
 NaF , UO_2F_2 (Ditte)
 Does not exist (Smithells, Chem Soc 43 125)

Fluoxyvanadic acid

Ammonium fluoxyvanadate, $12\text{NH}_4\text{F}$, V_2O_5 , 2VOF_3

Easily sol in H_2O , and not attacked by cold conc H_2SO_4 (Baker, Chem Soc 33 388)

Formula is $3\text{NH}_4\text{F}$, VO_2F (Petersen, J pr (2) 40 289)
 $3\text{NH}_4\text{F}$, VO_2F Sol in H_2O (Petersen, l c)

Much less sol in H_2O in presence of NH_4F (Piccini and Giorgis, Gazz ch it 27 1 65)
 $+ \text{H}_2\text{O}$ (Piccini and Giorgis, Gazz ch it 1892, 22 55)

$3\text{NH}_4\text{F}$, VOF_2 "Hypovanadate" Quite sol in H_2O Very sl sol in $\text{MF} + \text{Aq}$ Less sol in alcohol than in H_2O (Petersen, J pr (2) 40 195)

$2\text{NH}_4\text{F}$, VOF_2 Sol in H_2O (Petersen)
 $+ \text{H}_2\text{O}$ (Piccini and Giorgis)

$7\text{NH}_4\text{F}$, $4\text{VOF}_2 + 5\text{H}_2\text{O}$ Very sol in H_2O (Petersen)

$3\text{NH}_4\text{F}$, $2\text{VO}_2\text{F}$ Sol in H_2O without decomp Sol in conc $\text{HF} + \text{Aq}$ (Piccini and Giorgis, Gazz ch it 24 1 68)

$3\text{NH}_4\text{F}$, $2\text{VOF}_3 + \text{H}_2\text{O}$ Sol in H_2O with decomp
 V_2O_5 , $2\text{NH}_4\text{F}$ (Ditte, C R 106 270)

V_2O_5 , $8\text{NH}_4\text{F} + 4\text{H}_2\text{O}$ As above
 V_2O_5 , $4\text{NH}_4\text{F} + 4\text{H}_2\text{O}$ As above Sol in H_2O

Ammonium hydrogen fluoxyvanadate, $7\text{NH}_4\text{F}$, HF , $4\text{VO}_2\text{F}$

Verv sol in H_2O (Petersen, J pr (2) 40 284)

Ammonium hydrogen trifluoxyvanadate, 3HF , $9\text{NH}_4\text{F}$, 5VOF_3

Easily sol in H_2O Sl sol in $\text{MF} + \text{Aq}$ (Petersen, J pr (2) 40 280)

$3\text{NH}_4\text{F}$, 3HF , 2VOF_3 Sol in H_2O (Baker, Chem Soc 33 388)

Identical with 3HF , $9\text{NH}_4\text{F}$, 5VOF_3 (Petersen)

Barium fluoxyvanadate, BaF_2 , VO_2F

Ppt (Ephraim, Z anorg 1903, 35 79)

Cadmium fluoxyvanadate, CdF_2 , $\text{VOF}_2 + 7\text{H}_2\text{O}$

"Hypovanadate" As the Co salt (Piccini and Giorgis)

Cobalt fluoxyvanadate, CoF_2 , $\text{VOF}_2 + 7\text{H}_2\text{O}$

"Hypovanadate" Sol in H_2O (Piccini and Giorgis)

Nickel fluoxyvanadate, NiF_2 , $\text{VOF}_2 + 7\text{H}_2\text{O}$

"Hypovanadate" As the Co salt (Piccini and Giorgis)

Potassium fluoxyvanadate, 7KF , 3VOF_2

Very sl sol in H_2O and $\text{MF} + \text{Aq}$ Easily sol in dil acids (Petersen, J pr (2) 40 199)

2KF , VOF_2 As above (Petersen)
 2KF , $2\text{V}_2\text{O}_5 + 8\text{H}_2\text{O}$ Sol in H_2O and H_2SO_4 (Ditte, C R 105 1067)

2KF , $3\text{V}_2\text{O}_5 + 5\text{H}_2\text{O}$ As above
 2KF , $4\text{V}_2\text{O}_5 + 8\text{H}_2\text{O}$ As above
 4KF , V_2O_5 Less sol than 4KF , $3\text{V}_2\text{O}_5 + 2\text{H}_2\text{O}$, and $+3\text{H}_2\text{O}$ Sol in H_2O
 4KF , $3\text{V}_2\text{O}_5 + 4\text{H}_2\text{O}$, and $+6\text{H}_2\text{O}$ Less sol than 2KF , $3\text{V}_2\text{O}_5 + 5\text{H}_2\text{O}$
 8KF , $\text{V}_2\text{O}_5 + 2\text{H}_2\text{O}$, and $+3\text{H}_2\text{O}$ Sol in H_2O

Potassium trifluoxyvanadate, 2KF , VOF_3

Ppt (Petersen, J pr (2) 40 272)
 6KF , V_2O_5 , $2\text{VOF}_3 + 2\text{H}_2\text{O}$ Sol in H_2O Insol in cold conc H_2SO_4 (Baker, Chem Soc 33 300)

Formula is 3KF , $2\text{VO}_2\text{F}$ (Piccini and Giorgis)

See also Fluovanadate fluoxyvanadate, potassium

Potassium fluoxyvanadate, 2KF , VO_2F

Easily sol in H_2O (Petersen, J pr (2) 40 278)

3KF, VO₂F As above (Petersen)
 3KF, 2VO₂F Sol in H₂O, scarcely attacked by H₂SO₄ (Piccini and Giorgis)

Potassium hydrogen fluoxyvanadate, 3KF, HF, 2VOF₃
 Sol in H₂O (Petersen)

Sodium fluoxyvanadate, 8NaF, 3VOF₂+2H₂O

Sol in H₂O (Petersen, J pr (2) 40 200)
 3NaF, VO₂F, VOF₃ (?) Very easily decomp (Piccini and Giorgis)
 2NaF, 2V₂O₅+10H₂O Sol in H₂O (Ditte, C R 106 270)

4NaF, V₂O₅ As above
 4NaF, 3V₂O₅+18H₂O As above
 6NaF, V₂O₅+5H₂O As above
 8NaF, V₂O₅+3H₂O (As above)

Thallous fluoxyvanadate, 2TlF, VOF₂

Somewhat sol in cold H₂O without decomp
 Sol in boiling H₂O with exception of a black residue, which is easily sol in dil H₂SO₄ (Ephraim, B 1909, 42 4460)
 3TlF, 2VO₂F Insol in H₂O Sol in H₂O containing H₂SO₄ (Ephraim and Heymann, B 1909, 42 4459)

Zinc fluoxyvanadate, ZnF₂, ZnO, 2VOF₃+14H₂O

Decomp on air, sol in H₂O (Baker, Chem Soc 33 388)

True composition is represented by the formula ZnF₂, VO₂F+7H₂O (Petersen)
 ZnF₂, VO₂F+7H₂O Very sol in H₂O (Piccini and Giorgis)

ZnF₂, VOF₃+7H₂O "Hypovanadate"
 Sol in cold H₂O, but decomp by boiling, sol in dil HF+Aq (Piccini and Giorgis)

Fluozirconic acid

Ammonium fluozirconate, (NH₄)₂ZrF₆

Sol in H₂O
 3NH₄F, ZrF₄ Sol in H₂O (Marignac)

Cadmium fluozirconate, 2CdF₂, ZrF₄+6H₂O

Sol in H₂O, can be recrystallised therefrom (Marignac, A ch (3) 60 257)
 CdZrF₆+6H₂O Sol in H₂O (Marignac)

Cæsium fluozirconate, CsF, ZrF₄+H₂O

Sol in H₂O without decomp (Wells, Z anorg 1895, 10 434)

2CsF, ZrF₄ Sol in H₂O without decomp (Wells, Z anorg 1895, 10, 434)

2CsF, 3ZrF₄+2H₂O Only sl sol in H₂O (Wells, Z anorg 1895, 10 434)

Cupric fluozirconate, 2CuF₂, ZrF₄+12H₂O

Easily sol in cold H₂O (Marignac, A ch (3) 60 296)

3CuF₂, 2ZrF₄+16H₂O Sol in H₂O (Marignac)

Lithium fluozirconate, 2LiF, ZrF₄

Ppt (Wells, Am J Sci 1897, (4) 3 468)

4LiF, ZrF₄+½H₂O Sol in H₂O with decomp (Wells, Am J Sci 1897, (4) 3 469)

Magnesium fluozirconate, MgZrF₆+5H₂O

Sol in H₂O (Marignac)

Manganous fluozirconate, MnZrF₆+5H₂O

Sol in H₂O (Marignac, J pr 83 202)

Nickel fluozirconate, 2NiF₂, ZrF₄+12H₂O

Sol in H₂O (Marignac, A ch (3) 60 291)

NiZrF₆+6H₂O Sol in H₂O (Marignac)

Nickel potassium fluozirconate, K₂ZrF₆,

NiZrF₆+8H₂O
 Sol in H₂O (Marignac)

Potassium fluozirconate, KF, ZrF₄+H₂O

Much more sol in hot, than cold H₂O (Marignac)

2KF, ZrF₄=K₂ZrF₆ 100 pts H₂O dissolve at 2°, 0.781 pt, at 15°, 1.41 pts, at 19° 1.69 pts, at 100°, 25.0 pts K₂ZrF₆ (Marignac)

Insol in liquid NH₃ (Gore, Am Ch J 1898, 20 829)

3KF, ZrF₄

Sodium fluozirconate, 5NaF, ZrF₄

100 pts H₂O dissolve 0.387 pt at 18°, and 1.67 pts at 100° (Marignac)

2NaF, ZrF₄ (Wells, Am J Sci 1897, (4) 3 469)

5NaF, 2ZrF₄ Sol in H₂O with decomp (Wells)

Tellurium fluozirconate, TeF₄, ZrF₄

Sol in H₂O without decomp (Wells, Am J Sci 1897, (4) 3 470)

+H₂O Sol in H₂O without decomp (Wells)

3TeF₄, ZrF₄ Sol in H₂O without decomp (Wells)

5TeF₄, 3ZrF₄ Sol in H₂O without decomp (Wells)

Zinc fluozirconate, ZnZrF₆+6H₂O

Sol in H₂O (Marignac)

2ZnF₂, ZrF₄+12H₂O Sol in H₂O (Marignac, A ch (3) 60 257)

Fulminating gold

See Auroamidoimide

Fulminating platinum

See Fulminoplatinum

Fulminating silver

See Silver nitride

Fulminoplatinum compounds

See—

Dichlorofulminoplatinum

Trichlorofulminoplatinum

Tetrachlorofulminoplatinum

Chloroxyfulminoplatinum

Fusocobaltic chloride, $\text{Co}(\text{NH}_3)_4(\text{OH})\text{Cl}_2 + \text{H}_2\text{O}$

Sol in H_2O , from which it is precipitated by $\text{NH}_4\text{Cl} + \text{Aq}$, decomp by boiling H_2O , pptd from aqueous solution by alcohol (Fremy, C R 32 501)

— nitrate, $\text{Co}(\text{NH}_3)_4(\text{OH})(\text{NO}_3)_2 + \text{H}_2\text{O}$

Sol in H_2O Properties as the chloride (Fremy)

— sulphate, $\text{Co}(\text{NH}_3)_4(\text{OH})\text{SO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Fremy, C R 32 501)

Insol in H_2O Sol in conc $\text{HCl} + \text{Aq}$, or H_2SO_4 , from which it is precipitated by H_2O (Vortmann, N 6 412)

Fusible white precipitate

See Mercuridiammonium chloride

Gadolinium, Gd

(Marignac, C R 102 92)

Gadolinium bromide, $\text{GdBr}_3 + 6\text{H}_2\text{O}$

Sol in HBr (Benedicks, Z anorg 1900, 22 403)

Gadolinium chloride, $\text{GdCl}_3 + 6\text{H}_2\text{O}$

Somewhat deliquescent Sol in H_2O (Benedicks)

Gadolinium platinum chloride

See Chloroplatinate, gadolinium

Gadolinium fluoride, GdF_3

Insol in H_2O , sl sol in hot HF (Popovici, B 1908, 41 635)

Gadolinium hydroxide, $\text{Gd}(\text{OH})_3$

Ppt (Benedicks, Z anorg 1900, 22 402)

Gadolinium oxide, Gd_2O_3

Sol in acids (de Boisbaudran, C R 111 394)

Somewhat hygroscopic, easily sol in acids (Benedicks)

Gallium, Ga

Not decomp by H_2O , easily sol in cold $\text{HCl} + \text{Aq}$ Slowly sol in warm dil $\text{HNO}_3 + \text{Aq}$ Not attacked by conc HNO_3 free from

N_2O_3 below $40-50^\circ$, and only slowly in presence of N_2O_3 (Dupré, C R 86 720)

Easily sol in cold or warm $\text{KOH} + \text{Aq}$ (de Boisbaudran, A ch (5) 10 100)

Gallium bromide, GaBr_3

Deliquescent, and sol in H_2O

Gallium dichloride, GaCl_2

Deliquescent, and decomp by H_2O (Nilsson and Petersen, C R 107 527)

Gallium chloride, GaCl_3

Deliquescent, and very sol in little H_2O Decomp by much H_2O , with formation of basic salt, which is slowly sol in dil $\text{HCl} + \text{Aq}$

Gallium hydroxide

Sol in acids, sol in KOH or $\text{NaOH} + \text{Aq}$, less easily in $\text{NH}_4\text{OH} + \text{Aq}$, even in presence of ammonium salts

Gallium iodide, GaI_3

Deliquescent, and sol in H_2O (de Boisbaudran and Jungfleisch, C R 86 578)

Gallium suboxide, Ga_2O_3 (?)

Sol in $\text{HNO}_3 + \text{Aq}$ (Dupré)

Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$

Gallium oxide, Ga_2O_3

Sol in acids

Germanium, Ge

Insol in $\text{HCl} + \text{Aq}$ Easily sol in aqua regia Decomp by $\text{HNO}_3 + \text{Aq}$ to oxide Conc H_2SO_4 decomp to sulphate Insol in boiling $\text{KOH} + \text{Aq}$ (Winkler, J pr (2) 34 177, 36 177)

Germanium tetrabromide, GeBr_4

Decomp by H_2O (Winkler)

Germanium dichloride, GeCl_2

Decompl by H_2O (Winkler)

Germanium tetrachloride, GeCl_4

Sinks in H_2O , and is gradually decomp thereby (Winkler, J pr 34 177)

Insol in and not attacked by hot conc H_2SO_4 (Friedrich, W A B 102, 2b 540)

Germanium chloroform, GeHCl_3

Decomp by H_2O Sol in $\text{HCl} + \text{Aq}$ (Winkler)

Germanium tetrafluoride, GeF_4

Deliquescent, and sol in H_2O $+ 3\text{H}_2\text{O}$ Deliquescent Melts in its crystal H_2O when warmed (Winkler)

Germanium potassium fluoride

See Fluogermanate, potassium

Germanium hydride, GeH_4 Sl sol in hot HCl Sol in $\text{NaOCl} + \text{Aq}$
(Voegelen, Z anorg 1902, 30 327)**Germanium tetraiodide, GeI_4** Deliquescent, and sol in H_2O with decomp
(Winkler)**Germanium monoxide, GeO** Not appreciably sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$
Easily sol in $\text{HCl} + \text{Aq}$ Insol in alkalis
(Winkler, J pr (2) 34 177)Somewhat sol in H_2O , insol in $\text{H}_2\text{SO}_4 + \text{Aq}$,
even when hot and conc (van Bemmelen, R
t c 6 205)**Germanium dioxide, GeO_2** Not very difficultly sol in H_2O
Sol in 247 1 pts H_2O at 20° , in 93 3 pts
at 100° (Winkler)
Easily sol in alkali carbonates or hydrates
+ Aq , sl sol in acids**Germanium oxychloride, GeOCl_2** Insol in H_2O , sol in acids (Winkler, J
pr (2) 36 177)**Germanium monosulphide, GeS** Sol in 402 9 pts H_2O Sol in conc hot
 $\text{HCl} + \text{Aq}$ Sol in $\text{KOH} + \text{Aq}$ Sol in
 $(\text{NH}_4)_2\text{S} + \text{Aq}$ when precipitated Insol in
 $(\text{NH}_4)_2\text{S} + \text{Aq}$ if crystalline Also exists in a
colloidal state (Winkler)**Germanium disulphide, GeS_2** Sol in 221 9 pts H_2O Easily sol in
 $\text{KOH} + \text{Aq}$, or $\text{NH}_4\text{OH} + \text{Aq}$ Insol in acids
Exists also in a colloidal state (Winkler)**Glass**

Numerous and extensive researches have been made on the action of H_2O and various solutions on glass. The older work has a certain historical interest, but only a brief statement of some of the more important results can be given here. For a very thorough résumé of the work before the year 1861, Storer's Dictionary, p 555, should be consulted.

All glass is more or less attacked by H_2O , the more easily the greater the amount of alkali present, the finer it is powdered, and the higher the temperature.

Glass as that of a flask is decomposed to a considerable extent by several days boiling with H_2O a portion of the fixed alkali being dissolved but when powdered glass is rubbed with distilled H_2O in a mortar the H_2O remains pure and exhibits no alkalinity (Scheele).

Glass of alembics is partially dissolved by long boiling with H_2O (Lavoisier).

H_2O extracts potash or soda from glass together with

a portion of the silica the decomposition taking place the more easily in proportion as the glass is richer in alkalis more minutely divided or the temperature of the water higher (Bischof Kasin Arch. 1 443).

Powdered crown glass and some varieties of window glass render cold H_2O alkaline when in contact therewith (Dumas).

100 pts finely divided flint glass lose 7 pts potash when boiled one week with H_2O (Griffiths Q J Sci. 20 258).

Retorts of ordinary or flint glass are partially dissolved by H_2O when it is evaporated thereon (Chevreul 1811).

Finely powdered plate glass (Faraday Pogg 18 569) and Thuringian potash glass (Ludwig Arch Pharm. 91 47) reddens moistened turmeric paper.

The alkaline reaction disappears by continued washing but reappears when the glass is freshly rubbed (Griffiths).

Cold H_2O takes up SiO_2 as well as alkali from glass powder (Fuchs).

Powdered lead glass gives up appreciable amounts of PbO to weakly acidified H_2O (Pelouze).

When powdered white glass containing 12 4% Na_2O 15 5% CaO and 72 1% SiO_2 is treated repeatedly with H_2O more than 3% of the glass is dissolved and the undissolved part gives up 1 5% CaO to $\text{HCl} + \text{Aq}$ with effervescence. A glass containing more alkali is 16 3% Na_2O 6 4% CaO 77 3% SiO_2 lost with the same treatment 18 2% and the residue gave up 2% CaO to $\text{HCl} + \text{Aq}$ (Pelouze C R 43 117).

In the above case the fineness of the glass has an influence as well as its composition. When the same sample of glass was boiled 1 hour with H_2O amounts were dissolved in the proportion 1 4 28 according as the glass was in form of a coarse fine or very fine powder. Glass of the composition of the above samples as given by Pelouze lost 10 and 32% respectively.

If powdered glass is boiled with H_2O and CO_2 conducted into the solution it is absorbed if boiled with K_2SO_4 Na_2SO_4 is dissolved (Pelouze).

Glass tubes are converted into a white crystalline mass by heating with H_2O several months to 75 – 150° lead glass and Bohemian glass most easily English crown glass least. A little H_2O attacks glass more than much H_2O .

The action of H_2O is greatly increased by finely pulverising the glass.

H_2O dissolved 10% of a glass containing 12% Na_2O , 15 5% CaO , and 72 5% SiO_2 , and 32% of another glass containing 16 3% Na_2O , 6 4% CaO , and 77 3% SiO_2 (Vogel, B A Munchen, 1867 437).

Action of H_2O on a glass containing 74% SiO_2 , 8 6% CaO , 14% Na_2O , 0 6% K_2O , with traces of Al_2O_3 , Fe_2O_3 , MnO , and MgO .

By boiling with H_2O a decrease of 3 9 mg was observed for the first hour, which soon became constant at 2 2 mg per hour. The action was then proportional to the time, and also to the surface in contact with the liquid, but independent of the amount of liquid evaporating.

The action decreases rapidly with the temperature, so that at 90 – 100° only $\frac{1}{4}$ as much glass is dissolved as by boiling H_2O (Emmerling, A 150 257).

When steam condenses in tubes of Na glass, they are so strongly attacked that the H_2O has an alkaline reaction, but tubes of hard or Bohemian K glass are not so strongly attacked (Tollens, B 9 1540).

The effect of H_2O is so great as to impart a distinctly alkaline reaction to water condensing in a tube of ordinary glass. By condensing water in long tubes of various kinds of glass the following results were obtained.

I Easily fusible Thuringian glass Surface exposed = 324 sq cm

After 2 hours, 620 mg KOH were dissolved

After 3 hours more, 360 mg KOH were dissolved

After 3 hours more, 332 mg KOH were dissolved

After 3 hours more, 208 mg KOH were dissolved

After 3 hours more, 208 mg KOH were dissolved

Or, in 14 hours, 1728 mg KOH were dissolved

II Less easily fusible Thuringian glass Surface exposed = 499 sq cm

After 3 hours, 192 mg KOH were dissolved

After 3 hours more, 152 mg KOH were dissolved

After 3 hours more, 124 mg KOH were dissolved

After 3 hours more, 112 mg KOH were dissolved

Or, after 12 hours, 580 mg KOH were dissolved

III Combustion tubing of very difficultly fusible Bohemian glass Surface exposed = 1130 sq cm

After 3 hours 416 mg KOH were dissolved

After 3 hours more 416 mg KOH were dissolved

After 3 hours more 416 mg KOH were dissolved

After 3 hours more 416 mg KOH were dissolved

Or, after 12 hours, 1664 mg KOH were dissolved

IV Easily fusible Bohemian glass Surface exposed = 1394 sq cm

After 3 hours, 788 mg KOH were dissolved

After 3 hours more, 856 mg KOH were dissolved

After 3 hours more, 197 mg KOH were dissolved

Or, after 9 hours, 2432 mg KOH were dissolved (Kreusler and Henzold, B 17 34)

From the above the following table has been calculated

50 ccm H₂O dissolves from a surface of 1000 sq m in 1 hour —

960 mg from easily fusible Thuringian glass

128 mg from less fusible Thuringian glass

12 mg from combustion tube of Bohemian glass

20 mg from harder tube of Bohemian glass

(Kreusler and Henzold, B 17 34)

100 ccm H₂O dissolves so much glass from a flask every 2 seconds when in contact therewith that 0.1 ccm $\frac{1}{2}$ normal oxalic acid is neutralised thereby (Bohlig, Z anal 23 518)

Action of H₂O on various kinds of Na glass
1 g of finely powdered glass was boiled 10–15 minutes in a silver dish with 100 ccm H₂O, and the per cent of Na₂O (or K₂O) in the solution was determined

	%Na ₂ O (K ₂ O)
Orthoclase feldspar	0 17
Glass of a Bohemian combustion tube	0 56
“ flask (German manuf)	0 69
“ champagne bottle	1 7
Natrolite	1 32
Glass of a wine bottle (Hungarian)	2 22
Glass which was attacked by H ₂ O under pressure	3 7
Lead glass	3 8
Glass that broke easily	4 8
Glass tubing that became rough when fused	6 1
Glass tubing that became opaque by fusing	14 35
Solid water glass	26 97

(Wartha, Z anal 24 220)

The relative ease by which various kinds of glass are attacked by H₂O is shown by the following table. The glass was powdered and heated on a water bath with exclusion of atmospheric CO₂

Potassium water glass	291
Sodium water glass	196
Yellow glass rich in alkali	34
Thuringian glass	19
Ditto from Tittel and Co	8
Window glass	8
Lead glass from Jena	6
Bohemian glass from Kavalier	2 4
Lead crystal glass	1 4
Thermometer glass, 16IV, from Jena	1 0
Zinc glass, 362, from Jena	0 8
Lead glass, 434, from Jena	0 6
Lead glass, 483, from Jena	0 2
Heaviest lead silicate, from Jena	0 0

(Mylius, C C 1888 1313)

Solubility of various kinds of glass in H₂O

The amounts dissolved from various kinds of glass by heating 5 hours with H₂O were as follows

Yellow glass rich in alkali (13% K ₂ O, 15% Na ₂ O)	249 mg
Poor Thuringian glass (6.6% K O, 16.5% Na ₂ O)	91 4 “
Glass from Tittel and Co (7.1% K ₂ O, 14.3% Na ₂ O)	30 4 “
Bottle glass from Schilling (4.2% K ₂ O, 11.9% Na ₂ O)	13 0 “
Bohemian glass from Kavalier (13.3% K ₂ O, 11.4% Na ₂ O)	10 1 “
Rhenish window glass (13.5% Na ₂ O)	8 4 “
Lead crystal glass from Ehrenfeld (12.1% K ₂ O)	8 5 “
Green bottle glass (1.3% K ₂ O, 9.5% Na ₂ O)	6 5 “

Solubility of various kinds of glass in H_2O —*Continued*

Thermometer glass 16III from Jena (14.0% Na_2O , 7% ZnO)	6 4 mg
Lead glass, No 483, from Jena (47% PbO , 7.3% K_2O)	3 3 "
Lead silicate	0 6 "

(Mylus and Forster, B 22 1100)

By calculation from the electrical conductivity of the solutions formed, various data were obtained by Kohlrausch (B 24 3565), which showed that different varieties of glass were attacked in very different degree by cold H_2O , and, moreover, the amount dissolved was proportionately much greater during the first few minutes of treatment with H_2O than afterwards, and, furthermore, the rate of decrease was much faster for good glass than poor. Increase of temperature increased the rate of solubility to a very great degree, the increase for $1^\circ C$ being about 17%. In 7 hours at 80° half as much was dissolved as in 6 months at 18° . Extensive tables are given (Kohlrausch, B 24 3651). See also Kohlrausch (W Ann 44 577).

A very extensive research on the action of H_2O on glass, with a historical review of the work previously done on the subject, has been published by Mylius and Forster (Z anal 31 241). The general results may be summed up as follows—

1 The solution of glass in H_2O is caused by a decomposition, by which free alkali is formed

2 The silicic acid of the glass is brought into solution by a secondary reaction of the free alkali in the solution

3 The constituents of the solution change according to the conditions of the digestion

4 The amount of alkali going into solution from a given surface under certain conditions is a measure for the resistance of a glass under those conditions

5 The rate of attack of glass surfaces by cold H_2O decreases rapidly with the length of time of digestion, and finally approaches a constant value

6 The solubility increases very rapidly with increase of temperature

7 The ratio of the solubility of several kinds of glass is dependent on the temperature

8 From glasses which show the same ease of attack unequal amounts of substance may be dissolved

9 The solubility of a glass is influenced by the condition of the surface from "weathering" by prolonged exposure to the CO_2 and H_2O of the air

10 The poorer a glass is the less will its solubility decrease by prolonged treatment with H_2O

11 A good glass is essentially less easily

attacked after having been previously treated with H_2O

12 After treatment with H_2O , glass surfaces have the property of fixing alkali from the solutions formed, and giving it up again by a subsequent treatment with H_2O

13 Potassium glass is much more sol than sodium glass (contrary to previous researches), but the difference decreases as the glass becomes richer in CaO

14 In glass flasks which are to be only slightly attacked by cold or hot H_2O , the CaO , alkalis, and SiO_2 must stand in a fixed relation to each other

15 Of the more common varieties of glass, lead flint glass is least sol in H_2O , but its surface is corroded, and it is easily decomposed by acids

(Mylus and Forster, Z anal 31 241)

Bottle glass containing much Al_2O_3 is easily attacked by acids

From powdered flint glass boiling $HCl + Aq$ extracts K but no Pb (Griffiths)

Bottles of flint glass with $(NH_4)_2CO_3 + Aq$ became so fragile that on shaking pieces of glass were detached (Griffiths)

All glass is decomposed by HF

Conc H_3PO_4 also attacks all glass

Glass containing small amounts of SiO_2 are attacked by H_2SO_4 poorer glass by boiling HCl , HNO_3 and aqua regia (Berzelius)

Conc HNO_3 does not act on flint glass at $145-150^\circ$ (Sorby C R 50 990)

Glass of ordinary chemical apparatus gives up traces of metals to HCl and $HNO_3 + Aq$, but hard Bohemian glass consisting of 75% SiO_2 , 15% K_2O , 10% CaO , resists the action of warm conc acids, also an easily fusible Na K glass with 77% SiO_2 , 77% K_2O , 5% Na_2O , 10.3% CaO , is not easily attacked (Stas)

KOH , and $NaOH + Aq$ dissolve SiO_2 from glass the more easily the hotter and the more conc the solutions are (Muller) NH_4OH , and $(NH_4)_2CO_3 + Aq$ attack many kinds of glass, especially flint glass. $CaO \cdot H_2O$ attacks glass appreciably at 45° and lower, still more strongly on boiling (Lamy, A ch (5) 14 155)

The action of various solvents on the glass mentioned on page 359 in Emmerling's experiments is as follows

The action of $HCl + Aq$ containing 0.2 to 3% HCl is practically null, but is increased either by dilution or concentration. A very small quantity (0.02%) HCl added to H_2O almost wholly prevents its action on glass. With $HCl + Aq$ (11% HCl) a decrease of 4.2 mg was noticed in the first hour, and only 3-4 mg afterwards. The same is the case for $HNO_3 + Aq$ in still greater degree, 0.008% HNO_3 sufficing to nearly counteract the solvent action of H_2O

$H_2SO_4 + Aq$ has about double the solvent effect possessed by H_2O

Oxalic and acetic acids both diminish the solvent action of H_2O

The addition of even traces (0.04%) of

Na_2CO_3 increases the solvent action, and this is further rapidly increased by an increase in the amount of Na_2CO_3 . $\text{Na}_2\text{CO}_3 + \text{Aq}$ containing 1% Na_2CO_3 dissolves about 10 times as much as pure H_2O , i.e. about 35 mg per hour.

The above is also the case with $\text{KOH} + \text{Aq}$, but in even greater degree. $\text{KOH} + \text{Aq}$ containing 0.025% KOH dissolved three times as much as pure H_2O .

$(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ has about the same action as H_2O .

With $\text{NH}_4\text{OH} + \text{Aq}$ (9% NH_3) 7 mg decrease for the first hour, and 3 mg afterwards was noticed. The concentration of the $\text{NH}_4\text{OH} + \text{Aq}$ was apparently without effect.

The addition of NH_4Cl decreases the solvent action of H_2O proportionately to the amount added, but with new flasks large amounts are dissolved.

With $\text{NH}_4\text{Cl} + \text{Aq}$ (7% NH_4Cl) 4.2 mg were dissolved in the first hour, and the amount dissolved gradually decreased to null after 24 hours on account of the liberation of HCl by the decompos. of NH_4Cl .

NaCl , KCl , KNO_3 , and Na_2SO_4 show a similar behaviour to that of NH_4Cl .

$\text{Na}_2\text{HPO}_4 + \text{Aq}$ containing 0.4% Na_2HPO_4

has six times the solvent action of pure H_2O but the action is not increased by further concentration.

In general, those salts the acids of which form insol. Ca salts, as Na_2CO_3 , Na_2SO_4 , Na_2HPO_4 , $(\text{NH}_4)_2\text{C}_2\text{O}_4$, increase the solvent action of H_2O , and this effect is greater the more concentrated the solution. KCl , KNO_3 , NH_4Cl , and CaCl_2 decrease the effect, and the stronger the solution the less is the action.

All Na glass with approximately the above composition has the same power of resistance against H_2O . Bohemian K glass shows a greater resistance, especially against acids (Emmerling, A 150 257).

Action of various reagents on hard Bohemian glass 100 ccm substance dissolved mg glass in 6 days at 100°

H_2O	10 0
$\text{H}_2\text{S} + \text{Aq}$	8 7
$\text{Dil } (\text{NH}_4)_2\text{S} + \text{Aq}$	52 5
$\text{Conc } (\text{NH}_4)_2\text{S} + \text{Aq}$	47 2
$\text{Conc } \text{NH}_4\text{OH} + \text{Aq}$	42 5
$\text{Dil } \text{NH}_4\text{OH} + \text{Aq}$	7 7
$\text{NH}_4\text{SH} + \text{Aq}$	51 2

(Cowper, Chem Soc 41 254)

Action of various solutions on glass of different composition (The figures denote decrease in weight in mg of a 100 ccm flask)

	Time	1	2	3	4	5	6	7	8	9	10
H_2O	5 hrs	62	31	29	17	13	9	7	7	5	4
$\text{H}_2\text{SO}_4 + \text{Aq}$ (25% H_2SO_4)	3 "		43	35	8	7	6	5	5	5	3
$\text{HCl} + \text{Aq}$ (12% HCl)	3 "	85		27	4	2	1	1	1	0	0
$\text{NH}_4\text{OH} + \text{Aq}$ (10% NH_3)	3 "			62	11	8	7	7	6	5	5
$\text{Na}_2\text{HPO}_4 + \text{Aq}$ (12% Na_2HPO_4)	3 "			81	64	40	35	34	30	15	12
$\text{Na}_2\text{CO}_3 + \text{Aq}$ (2% Na_2CO_3)	3 "	283	160	130	124	50	45	42	42	26	25

Composition of above varieties of glass

	1	2	3	4	5	6	7	8	9	10
SiO_2	76 22	74 09	76 39	68 56	74 48	74 69	66 75	74 12	77 07	74 40
Al_2O_3		0 40	0 50	1 85	0 50	0 45	1 31	0 50	0 30	0 70
CaO	4 27	5 85	5 50	7 60	7 15	7 85	13 37	8 55	8 10	8 85
K_2O		7 32	4 94	2 24	6 64	8 64	05 50	4 86	3 75	4 40
Na_2O	19 51	12 34	12 67	19 75	11 23	8 37	3 07	11 97	10 78	11 65

It is seen that glass which resists the attack of H_2O also resists acids and alkalis, and that the relative resistance of all varieties to any of the solutions is the same. Therefore the action of H_2O may be accepted as a criterion for judging of the resistance of a glass to all solvents. Glass No 10, in which the molecular ratio of SiO_2 : CaO : K_2O (Na_2O) is 8 : 1 : 1.5, is recommended as best suited for chemical uses (Weber and Sauer, B 25 70).

Mylus and Forster (B 25 97) recommend a glass in which the molecular ratio of SiO_2 : CaO : K_2O (Na_2O) is 7.2 : 1 : 1.1 as the best suited for chemical apparatus.

In an exhaustive research on the action of aqueous solutions on glass, which cannot be given in full on account of its great length, the following conclusions are reached—

1 Solutions of caustic alkalis act on glass much more strongly than H_2O , dissolving all the constituents of the glass—that is, the glass as such. Very dilute solutions form an exception.

2 Of the caustic alkalis, $\text{NaOH} + \text{Aq}$ has the strongest action, then come KOH , NH_4OH , and $\text{BaO}_2\text{H}_2 + \text{Aq}$ in the order named.

3 Increase in temperature increases the

strength of the attack of alkalis very considerably

4 At high temperatures, the ease with which glass is attacked increases at first rapidly with the concentration of the alkali, but afterwards more slowly

5 At ordinary temperatures very concentrated alkali solutions have less action on glass than dil solutions

6 Solutions of pure alkalis, if not too conc, act less on glass than when contaminated with small amounts of SiO_2

7 Alkali carbonates + Aq attack glass much more than H_2O , even when they are very dilute The action corresponds less to that of the caustic alkalis than to that of other salts With equivalent concentration, Na_2CO_3 + Aq has a stronger action than K_2CO_3 + Aq

8 The action of salt solutions on glass is a compound one, depending both on the concentration and the kind of salt dissolved, and is made up of the action of the H_2O and the salt in solution

9 Each kind of attack is differently influenced by the composition of the glass

10 Solutions of those salts, the acids of which form insol Ca salts, have a stronger action than H_2O , and the action increases with the concentration

11 Solutions of those salts, the acids of which form sol Ca salts, have less action than H_2O , and the action decreases with the concentration (Forster, B 25 2494)

Data on this subject published since the first edition of this work have not been considered

Glucinic acid

Potassium glucinate, K_2GLO_2

Very deliquescent Sol in H_2O and acids (Kruss and Moraht B 23 733)

Glucinum (Beryllium), Gl

Not attacked by hot or cold H_2O Sol in cold dil HNO_3 + Aq (Wohler, Pogg 13 577)

Sol only in boiling conc HNO_3 + Aq (Debray, A ch (3) 44 5)

Sol in dil HCl + Aq dil and conc H_2SO_4 + Aq, and KOH + Aq, but insol in NH_4OH + Aq (Wohler, Debray)

Sol in hot HCl , hot conc HNO_3 , and hot conc H_2SO_4 (Lebeau, A ch 1399, (7) 16 474)

Glucinum azonide, GIN_3

Decomp by hot H_2O (Curtius, J pr 1898, (2), 58 292)

Glucinum borocarbide, $3\text{Gl}_2\text{C}$, B_3C

Insol in H_2O Easily sol in mineral acids especially HNO_3 (Lebeau, A ch 1899, (7) 16 481)

$\text{C}_2\text{B}_6\text{Gl}_6$ Stable in air

Easily sol in mineral acids, conc and dil (Lebeau, C R 1898, 126 1349)

Glucinum bromide, GlBr_2

Sol in H_2O with evolution of much heat (Wohler)

Sol in abs alcohol (Lebeau, A ch 1899, (7) 16 484)

Glucinum carbide, Gl_2C

Decomp by H_2O Slowly attacked by cold or hot conc HCl and HNO_3 Gradually but completely sol in dil acids (Lebeau, A ch 1899, (7), 16 476)

GlC_2 Not easily decomp by strong acids Easily sol with decomp in dil acids (Lebeau, C R 1895, 121 497)

Glucinum chloride, GlCl_2

Anhydrous Fumes and deliquesces in air Sol in H_2O with hissing and evolution of much heat Easily sol in alcohol

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Sol in alcohol and ether Sl sol in C_6H_6 , CHCl_3 , Cl_4 and CS_2 (Lebeau, A ch 1899, (7) 16 493)

Insol in acetone (Naumann, B 1904, 37 4329)

+ $4\text{H}_2\text{O}$ Very hygroscopic

Easily sol in H_2O and in alcohol (Mieletner, Z anorg 1913, 80 73)

Glucinum chloride ammonia, $\text{GlCl}_2 \cdot 4\text{NH}_3$

(Mieletner, Z anorg 1913, 80 73)

Glucinum chloride iodine trichloride,

2ICl_3 , $\text{GlCl}_2 + 8\text{H}_2\text{O}$

Hygroscopic (Wainland, Z anorg 1902, 30 140)

Glucinum ferric chloride, GlCl_2 , $\text{FeCl}_3 + \text{H}_2\text{O}$

Decomp by H_2O (Neumann, A 244 329)

Glucinum mercuric chloride, GlCl_2 , $3\text{HgCl}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Atterberg, B 6 1288)

Glucinum thallic chloride, 3GlCl_2 , 2TiCl_3

Cryst from HCl solution (Neumann, A 244 348)

Glucinum stannic chloride

See Chlorostannate, glucinum

Glucinum fluoride, basic, 2GIO , 5GIF_2

Sol in H_2O (Lebeau, A ch 1899, (7) 16 484)

Glucinum fluoride, GIF_2

Deliquescent Sol in H_2O Insol in anhydrous HF Sol in alcohol (Lebeau, C R 1898, 126 1421)

Sol in H_2O in all proportions Somewhat sol in abs alcohol Easily sol in 90% alcohol, also in a mixture of alcohol and ether Insol in anhydrous HF (Lebeau, A ch 1899, (7) 16 484)

Glucinum potassium fluoride, GIF_2 , KF

Sl sol in H_2O (Awdejew) Much more sol in hot than cold H_2O (Berzelius)

GIF_2 , 2KF Sol in about 50 pts H_2O at 20° , and 19 pts boiling H_2O (Marignac)

Glucinum sodium fluoride, GIF_2 , 2NaF

Sol in 34 pts H_2O at 100° , and 68 pts at 18° (Marignac)

Glucinum hydroxide, GIO_2H_2

Easily sol in acids Sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in $\text{CO}_2 + \text{Aq}$, 100 ccm sat $\text{CO}_2 + \text{Aq}$ dissolve 0.0185 g GIO (Sestini, Gazz ch it 20 313)

Also sol in KOH, NaOH, NH_4OH , or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, especially when freshly precipitated, also in Na_2CO_3 , or $\text{K}_2\text{CO}_3 + \text{Aq}$ (Debray)

Insol in $\text{NH}_4\text{OH} + \text{Aq}$ containing $\text{NH}_4\text{Cl} + \text{Aq}$

Very sl sol in $\text{Li}_2\text{CO}_3 + \text{Aq}$ (Gmelin)

Sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Berthier)

Sol in $\text{BaO}_2\text{H}_2 + \text{Aq}$, from which it is pptd by NH_4 salts, but not by boiling Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ when freshly pptd

Sol in $\text{NH}_4\text{F} + \text{Aq}$ (Helmholtz, Z anorg 3 130)

Solubility of GIO_2H_2 in $\text{NaOH} + \text{Aq}$

G Na in 20 ccm	G GI in 20 ccm
0 3358	0 0358
0 6717	0 0882
0 8725	0 1175
1 7346	0 2847

(Rubenbauer, Z anorg 1902, 30 334)

When glucinum hydroxide is treated with alkali, more dissolves at first than corresponds with the true equilibrium under the prevailing conditions, for such solutions spontaneously deposit more or less glucinum hydroxide according to the concentration (Rubenbauer)

Solubility of freshly pptd GIO_2H_2 in $\text{NaOH} + \text{Aq}$ at room temperature

millimols Na per l	G GIO dissolved in 1 l
649	3 6
540	2 92
540	2 53
483	1 69
383	1 64
388	1 53
386	1 45
390	1 24

In the first two cases the values were obtained by adding to $\text{HCl}_2 + \text{Aq}$ at 0° , ice cold NH_4OH and treating the ppt with $\text{NaOH} + \text{Aq}$ In the remaining cases by dissolving basic GICO_3 in HCl and pouring into $\text{NaOH} + \text{Aq}$ (Haber, Z anorg 1904, 38 386)

Solubility of GIO_2H_2 , which is one week old, in $\text{NaOH} + \text{Aq}$ at t°

NaOH	t°	G GIO in 1 l
$\frac{1}{2}$ -N	$20-23^\circ$	0 060
1-N	$20-23^\circ$	0 170
2-N	$20-23^\circ$	0 570
$\frac{1}{2}$ -N	$50-53^\circ$	0 080
1-N	$50-53^\circ$	0 230
2-N	$50-53^\circ$	0 900
$\frac{1}{2}$ -N	100°	0 080
1-N	100°	0 290
2-N	100°	1 020

(Haber)

Solubility of GIO_2H_2 in $\text{NaOH} + \text{Aq}$ at 25°

G mols	
Na	GI
0 268	0 0330
0 318	0 0492
0 446	0 0841
0 526	0 089
0 563	0 101
0 801	0 143
0 854	0 202

(Wood, Chem Soc 1910, 97 884)

Insol in $\text{NH}_4\text{OH} + \text{Aq}$ and in alkyl amines (Renz, B 1903, 36 2753)

Sol in $\text{GISO}_4 + \text{Aq}$ (Parsons, J phys Chem 1907, 11 658)

A form insol in acids and alkalis can be obtained by sufficiently long heating in boiling H_2O , $\text{Na}_2\text{CO}_3 + \text{Aq}$, $\text{NH}_4\text{OH} + \text{Aq}$, or solutions of NaOH or KOH so dil that the GIO_2H_2 is either insol or very sl sol therein (van Oordt, C C 1906, 1 108)

100 ccm of glycerine + Aq containing about 60% by vol of glycerine dissolve 0.1 g GIO (Muller, Z anorg 1905, 43 322)

Contains $\frac{1}{3}\text{H}_2\text{O}$ (Schaffgotsch), $\frac{1}{4}\text{H}_2\text{O}$ (Atterberg)

Solubility of GlO_2H_3 , which has been boiled with alkali in various solvents

Alkali used	Time	Solvent	Solubility
10-N NaOH	2½ hrs	0 106-N NaOH 0 39-N NaOH 0 97-N NaOH 2 0-N NaOH 2 0-N NaOH	1 mol GlO_2H_3 331 mole NaOH 1 mol GlO_2H_3 183 mole NaOH 1 mol GlO_2H_3 91 8 mole NaOH 1 mol GlO_2H_3 49 mole NaOH 1 mol GlO_2H_3 49 mole NaOH
NaOH NaOH	Long time 2 hrs	10-N K_2CO_3 Dil HCl Hot conc HCl Dil acetic acid	Insol Sl sol Slowly sol Almost insol
KOH	Till flocculent ppt appeared	1-N KOH 1-N NaOH Warm dil HCl	Insol " Sol
½-N Na_2CO_3 { ½-N Na_2CO_3 for then 1/10-N Na_2CO_3 for	3 hrs 3 hrs and 4 hrs	1-N NaOH Dil HCl 1-N NaOH Dil HCl	Easily sol " Sl sol Slowly sol
½-N K_2CO_3 10-N K_2CO_3	6 hrs Short time	10-N K_2CO_3 1-N NaOH Cold 10-N K_2CO_3	Insol Easily sol Very slowly sol
NH_4OH	5 hrs	½-N NaOH	Very sl sol

(Haber)

Glucinum iodide, GII_2 Sol in H_2O with evolution of much heat (Wohler)Decomp in moist air and by H_2O

Sol in abs alcohol Insol in most neutral organic solvents, as benzene, toluene, etc (Lebeau, C R 1898, 126 1273)

Insol in C_6H_6 , C_2H_5 , and oil of turpentine Easily sol in CS_2 Sol in anhydrous alcohols without evolution of heat (Lebeau, A ch 1899, (7) 16 490)**Glucinum iodide ammonia, $2\text{GII}_2, 3\text{NH}_3$**

Ppt (Lebeau, A ch 1899, (7) 16 492)

Glucinum oxide, GlO *Crystalline* Insol in acids except conc H_2SO_4 (Ebelmen, C R 32 710)*Amorphous* Absolutely insol in H_2O The higher the temp to which the substance has been heated the more insol is it in acids Insol in $\text{NH}_4\text{OH}+\text{Aq}$ or $(\text{NH}_4)_2\text{CO}_3+\text{Aq}$ Insol in conc $\text{NH}_4\text{Cl}+\text{Aq}$, or KOH, and $\text{NaOH}+\text{Aq}$ (Rose)When obtained by ignition of GlSO_4 , it is very slowly but completely sol in HCl, and $\text{H}_2\text{SO}_4+\text{Aq}$ (Rose)Insol in hydracids Sol in conc H_2SO_4 (Lebeau, C R 1896, 123 819)Insol in liquid NH_3 (Gore, Am ch J 1898, 20 828)**Glucinum peroxide basic, $2\text{GlO}_2, 3\text{GlO}$** + $8\frac{1}{2}\text{H}_2\text{O}$ (Komarovski, Chem Soc 1913, 104 (2) 707)**Glucinum oxybromides**Sol in H_2O if three or less equivalents of base are present to one of acid, insol if more of the base is present (Ordway, Am J Sci (2) 26 207)**Glucinum oxychloride, $\text{Gl}_2\text{OCl}_3 = \text{GlO}, \text{GlCl}_2$** Insol in H_2O
 $3\text{GlCl}, 2\text{GlO}+2\text{H}_2\text{O} (?)$ Sol in H_2O (Atterberg) $\text{GlCl}_2, 3\text{GlO}+3\text{H}_2\text{O} (?)$ Sol in H_2O , but solution soon becomes cloudy and deposits a fine ppt By boiling the solution it is decomp into above salt, and $\text{GlCl}_2, 12\text{GlO}_2\text{H}_2+10\text{H}_2\text{O}$, which is insol in H_2O , decomp into GlO_2H_2 by washing Sol in acids (Atterberg)**Glucinum oxyfluoride, $5\text{GlF}_2, 2\text{GlO}$** Readily sol in H_2O (Lebeau, C R 1898, 126 1419)**Glucinum phosphide**Decomp by H_2O (Wohler)**Glucinum selenide**Sl sol in H_2O (Berzelius)

Glucinum sulphide

Slowly sol without decomp in H_2O , but easily decomp by acids (Wohler)

Gold, Au

Gold which has been pptd from $AuCl_3 + Aq$ by $FeSO_4$ is sl sol in HCl (Awerkiew, Z anorg 1909, 61 10)

Not attacked by H_2O Insol in HNO_3 or $HCl + Aq$ Easily sol in aqua regia or any mixture evolving Cl or Br Sol in selenic acid, or antimonie acid + Aq , less easily in arsenic acid + Aq Sol in mixtures of HCl and nitrates, or HNO_3 and chlorides, also in $(NaCl + KNO_3 + K_2Al_2(SO_4)_4) + Aq$ (?) Insol in H_2SO_4 , except in presence of $KMnO_4$, HNO_3 , or HIO_3 Sol in a solution of I in ether in direct sunlight

Sol in solutions of ferric, and cupric salts Sol in $HCl + Aq$ containing H_2CrO_4 , H_2MnO_4 , H_2SeO_4 , H_3AsO_4 , or $FeCl_3$ (Wurtz)

Attacked by fuming HCl (sp gr 1.178) at ord temp in direct light, especially in the presence of a trace of $MnCl_2$, but not attacked in the dark even in the presence of this salt (Berthelot, C R 1904, 138 1298)

100 ccm hot conc HCl dissolve 0.008 g yellow Au powder in 4 hours (Hanriot and Raoult, C R 1912, 155 1086)

Upon boiling 25 and 50 cc $HCl + Aq$ (sp gr 1.178), dil to 125 cc with 250 mg sheet $Au \frac{1}{8}$ in square, 0.009 in thick, weighing 250 mg for several hours, there was no loss of weight of Au (McCaughy, J Am Chem Soc 1909, 31 1263)

From 5 g finely divided ordinary yellow gold, 100 cc HNO_3 of 22° B dissolve 0.002 g in 2 hrs

100 cc HNO_3 of 32° B dissolve 0.0119 g in 2 hrs

100 cc HNO_3 of 36° B dissolve 0.028 g in 2 hrs

100 cc HNO_3 monohydrate dissolve 0.076 g in 2 hrs (Hanriot and Raoult, C R 1912, 155 1085)

From 5 g brown gold

100 ccm HNO_3 of 22° Baume dissolve 0.006 g in 2 hrs

100 ccm HNO_3 of 32° Baume dissolve 0.039 g in 2 hrs

100 ccm HNO_3 of 36° Baume dissolve 0.078 g in 2 hrs

100 ccm HNO_3 monohydrate dissolve 1.540 g in 2 hrs (Hanriot and Raoult)

Sl sol in boiling HNO_3 (sp gr = 1.42) The solution deposits Au by standing several days (Dewey, J Am Chem Soc 1910, 32 320)

Best composition of aqua regia for dissolving Au is 200 cc HCl (sp gr 1.1946) 45 cc HNO_3 (sp gr 1.4) and 245 cc H_2O 1 pt Au is sol in 4.3 pts of such a mixture (Priwoznik, C C 1910, II 1743)

Sol in 1 pt $HNO_3 + 4$ pts HCl as representing the most economical mixture (Priwoznik, Chem Soc 1911, 100 (2), 484)

Easily sol in nitrosulphonic acid from sulphuric acid manufacture, when mixed with equal parts conc $HCl + Aq$ (Borntrager, Rep anal Ch 1887 741)

Sol in hot conc H_2SO_4 in the presence of MnO_2 , Mn_2O_3 , Mn_3O_4 , PbO_2 , Pb_2O_3 , Pb_3O_4 , CrO_3 , CrO_4 and Ni_2O_3 Solution also takes place slowly in the cold Sol in hot $H_2SO_4 + KMnO_4$ Slowly sol in cold, more rapidly in hot $H_2SO_4 + HNO_3$ (Lenher, J Am Chem Soc 1904, 26 550)

Sol in a hot solution of crystalline telluric acid in H_2SO_4 or H_3PO_4

Sol in hot H_3PO_4 in the presence of MnO_2 , Mn_2O_3 , Mn_3O_4 , the higher oxides of lead, CrO_3 , chromium tetroxide and nickelic oxide Solution takes place more slowly in the cold Sol in hot H_3PO_4 in the presence of $KMnO_4$ Slowly sol in a cold, more rapidly sol in a hot mixture of H_3PO_4 and HNO_3

Sol in hot arsenic acid in the presence of MnO_2 , Mn_2O_3 and Mn_3O_4 (Lenher, J Am Chem Soc 1904, 26 550)

Gold leaf is not attacked by cold conc H_2SeO_4 , when completely free from halogens, but is dissolved by conc H_2SeO_4 at 300° (Lenher, J Am Chem Soc 1902, 24 354)

Solubility of thin sheet Au in HCl solution of non alum

Time hours	Mg Au dissolved			
	1 g Fe 25 cc HCl	1 g Fe 50 cc HCl	2 g Fe 25 cc HCl	2 g Fe 50 cc HCl

Temp 38–43°

16	1 00	1 30	1 08	1 47
22	1 12	1 55	1 20	1 81
40	1 52	2 15	1 82	2 75
46	1 71	2 34	2 02	2 95
64	1 96	3 10	2 60	3 79
72	2 12	3 30	2 83	4 05
89	2 32	3 65	3 22	4 65
100	2 40	3 76	3 38	4 81
113	2 45	3 95	3 51	5 12
124	2 60	4 09	3 63	5 39
161	2 78	4 36	3 95	5 96
185	2 90	4 49	4 11	6 22

Temp 98–100°

1	1 13	0 78	1 15	1 27
2	1 99	1 74	2 56	2 86
4	3 46	3 31	4 55	5 06
16	10 09	11 37	13 15	15 56
20	12 20	13 72	15 59	19 41
24	14 37	16 49	17 96	23 29
36	17 38	23 27	22 07	31 73
42	18 79	26 30	24 62	35 29
54	20 94	31 39	29 49	42 11
59½	21 64	33 12	30 64	44 43

The solution contained the given amounts of Fe as iron alum, the sp gr of the HCl was 1.178, and the solutions diluted to 125 cc (McCaughy, J Am Chem Soc 1909, 31 1263)

The solvent action of ferric salt occurs even in presence of a ferrous salt, but decreases with increase of concentration of ferrous salt (McCaughy)

Solubility of thin sheet Au in HCl solution of CuCl_2

Time hours	Mg Au dissolved			
	1 g Cu 25 cc HCl	1 g Cu 50 cc HCl	2 g Cu 25 cc HCl	2 g Cu 50 cc HCl
Temp 38-43°				
19	0 03	0 26	0 05	0 39
25	0 09	0 36	0 05	0 54
43	0 10	0 54	0 14	0 94
49½	0 12	0 61	0 15	1 07
66½	0 11	0 76	0 17	1 40
78	0 14	0 87	0 22	1 58
91	0 14	0 92	0 24	1 75
102	0 16	1 02	0 27	1 90
139	0 18	1 34	0 32	2 45
163	0 23	1 60	0 39	2 84

Temp 98-100°

1	0 15	0 34	0 17	0 46
4	0 55	1 23	0 55	1 35
16	1 34	5 00	2 12	8 80
20	1 63	6 57	2 78	11 86
26	2 17	9 13	3 59	15 70
38	3 13	13 98	5 07	23 14
43	3 61	16 54	5 77	26 62
48	4 07	19 26	6 26	30 80
60	4 82	26 37	7 47	39 09

Conditions the same as above for HCl + iron alum (McCaughy)

Finely powdered gold is sol in conc HCl in the presence of alcohol, etc

0.0302 g Au is sol in 100 cc HCl + 100 cc CH_3OH

0.0230 g Au is sol in 100 cc HCl + 100 cc CHCl_3

0.0066 g Au is sol in 100 cc HCl + 100 cc $\text{C}_2\text{H}_5\text{OH}$

0.0190 g Au is sol in 100 cc HCl + 100 cc $\text{C}_3\text{H}_7\text{OH}$

0.0125 g Au is sol in 100 cc HCl + 50 cc $\text{CCl}_3\text{CH}(\text{OH})_2$

(Awerkiew, C C 1908, II 1566)

Solubility of Au which has been pptd from $\text{AuCl}_3 + \text{Aq}$ by various precipitants in HCl + formaldehyde

HCHO (40%) ccm	HCl (1.19) ccm	Au dissolved g	Au used was pptd from $\text{AuCl}_3 + \text{Aq}$ by
150	150	0.0007	FeSO_4
100	100	0.0006	"
125	25	0.0008	"
100	200	0.0009	sugar
150	150	0.0003	oxalic acid
250	250	0.0002	"
500	500	0.0008	FeSO_4
100	500	0	oxalic acid
100	200	0.0004	"
100	200	0	"
150	300	0.0006	sugar
250	125	0.001	"
150	75	0.0013	FeSO_4
100	200	0.0008	"
100	200	0.0006	HCHO
100	100	0.0005	"
180	540	0	
360	720	0.001	FeSO_4
360	720	0.0019	sugar
209	400	0.0013	FeSO_4

In the last four cases the solubility was determined at the ordinary temp, in the first sixteen the gold was boiled with the mixture of HCl and HCHO

(Awerkiew, Z anorg 1909, 61 3)

Solubility of Au in boiling HCl + paraformaldehyde

$(\text{CH}_2\text{O})_x$ g	HCl (1.19) g	Dissolved Au g	Au used was pptd from $\text{AuCl}_3 + \text{Aq}$ by
5	25	0.0005	FeSO_4
5	25	0.0004	oxalic acid
25	125	0.006	sugar
20	400	0.0024	CHOH
20	400	0.0034	CH_2OH
20	400	0.003	"
20	400	0.0065	sugar
20	400	0.0044	formic acid
20	400	0.0005	"
40	400	0.001	CH_3OH
20	300	0.0024	FeSO_4
20	300	0.003	"
10	200	0.0008	CH_3OH
10	200	0.0006	oxalic acid
60	120	0.0015	FeSO_4

(Awerkiew)

Solubility of Au in boiling HCl+methyl alcohol

CH ₃ OH (99%) ccm	HCl (1 19) ccm	Dissolved Au g	Au used was pptd from AuCl ₃ +Aq by
100	100	0 0302	FeSO ₄
150	150	0 0043	oxalic acid
150	150	0 028	sugar
25	25	0 001	CH ₃ OH
50	50	0 0002	oxalic acid
50	50	0 0005	CH ₃ OH
50	50	0 0002	oxalic acid
50	50	0 0015	FeSO ₄
50	50	0 002	"
100	100	0 0009	oxalic acid
500	500	0 0128	FeSO ₄
1000	1000	0 0281	"
50	100	0 0084	"
100	200	0 0006	"
100	300	0	"
75	25	0 005	HCOH
90	30	0 005	"
75	25	0 0014	"
80	20	0 0005	"
100	50	0 0018	FeSO ₄
100	50	0 0008	CH ₃ OH
50	200	0 001	"

(Awerkiew)

Solubility of Au in boiling HCl+ethyl alcohol

C ₂ H ₅ OH (95%) ccm	HCl (1 19) ccm	Dissolved Au g	Au used was pptd from AuCl ₃ +Aq by
25	50	0 0006	FeSO ₄
100	200	0 0111	"
200	400	0 0017	"
150	50	0 0003	sugar
100	300	0 0004	"
100	100	0 0015	"
200	200	0 0055	C ₂ H ₅ OH
250	250	0 0021	sugar
300	300	0 0197	FeSO ₄
1000	1000	0 007	CH ₃ OH
150	150	0 008	"

(Awerkiew)

Solubility of Au in boiling HCl+amyl alcohol

C ₅ H ₁₁ OH g	HCl (1 19) g	Dissolved Au g	Au used was pptd from AuCl ₃ +Aq by
100	100	0 019	FeSO ₄
100	200	0 0048	"
150	150	0 0024	sugar
100	100	0 0027	"
150	50	0 0032	"
300	100	0 0023	FeSO ₄
200	200	0 0067	C ₅ H ₁₁ OH
500	500	0 028	FeSO ₄

(Awerkiew)

Solubility of Au in boiling HCl+phenol

C ₆ H ₅ OH g	HCl (1 19) g	Dissolved Au g	Au used was pptd from AuCl ₃ +Aq by
10+25	100	0 001	C ₆ H ₅ OH
10	40	0 0004	oxalic acid
20	50	0 0003	"
25	100	0 0005	FeSO ₄
25	150	0	HCOH
50	200	0 0005	"
25	250	0 0005	FeSO ₄
25	250	0 0012	"

(Awerkiew)

Solubility of Au in boiling HCl+chloroform

CHCl ₃ g	HCl (1 19) g	Dissolved Au g	Au used was pptd from AuCl ₃ +Aq by
50	100	0 0009	FeSO ₄
100	100	0 023	"
100	100	0 0017	"
150	50	0 0012	"
200	400	0 0024	sugar
250	250	0 002	"
300	300	0 0106	"

(Awerkiew)

Colloidal gold is sol in dil alkalis (Paal, B 1902, 35 2236)

Rather quickly sol in 10-15% solution I in KI+Aq

Very slowly sol in 5% solution of I in KI+Aq

Scarcely sol in more dil solution of I in KI+Aq

Easily sol in 10% NH₄I+I Less easily sol in 5% NH₄I+I (Doring)

Sol in cold Na₂S+Aq when Na₂S is present in proportion of 843 pts Na₂S to 1 pt Au (Becker, Sill, Am J (3) 33 199)

In finely divided state Au is sol in boiling KCN+Aq Not attacked by boiling HgCl₂+Aq (Vogel, J pr 20 366)

Solubility of Au (disks) in KCN+Aq with
(A) oxygen passed through solution, and
(B) agitated with oxygen

% KCN	g Au dissolved in 24 hours	
	A	B
1	0 00845	0 0187
5	0 01355	0 0472
20	0 0115	0 0314
50	0 00505	0 108

(MacLaurin, Chem Soc 1893, 63 729)

The solution of Au in KCN+Aq is essentially hastened by sunlight (Caldecott, Proc Chem Soc 1904, 20 199)

The presence of oxygen is necessary for the solution of Au in KCN+Aq. The rate of solution of Au in KCN+Aq varies with the strength of the solution, being small for conc solutions, increasing as the solution becomes more dilute, reaching a maximum at 0.25% KCN, and then again diminishing (MacLaurin, Chem Soc 1895, 67 211)

Solubility of Au (strips) in dil KCN+Aq

% KCN	Mg Au dissolved in 24 hours
0	0 010
0 0005	0 043-0 07
0 001	0 10-0 23
0 0016	0 16
0 002	0 44
0 00325	1 77
0 004	4 29
0 008	48 43
0 016	74 96
0 0325	150 54
0 065	168 12

(Christy, Elektrochem Z 1901, 7 205)

Finely divided metallic gold is completely sol at the ord temp in solutions of potassium ferrocyanide. Solution takes place very slowly even when the potassium ferrocyanide solution is boiling (Beutel, Z anorg 1912, 78 158)

Sol in RbCl_4 +Aq (Erdmann, Arch Pharm 1894, 232, 30)

Not attacked by FeCl_3 +Aq when air is excluded but very energetically attacked in presence of HCl and oxygen (McIlhiney, Am J Sci, 1896, (4), 2 293)

Not attacked by several days heating with SOCl_2 at 150° . At 200° there is action in 10 days (North, J Am Chem Soc 1912, 34 892)

SO_2Cl_2 in excess dissolves pulverulent Au by several hours heating at 160° (North, Bull Soc (4), 9 647)

Sol in PCl_3 (Baudrimont, A ch (4) 2 416)

Easily sol in acid solutions of thiocarbamide especially in presence of suitable oxidizing compounds (Morr, Chem Soc 1906, 89 1345)

Gold arsenide, AuAs

H_2O or alcohol slowly extracts As, HNO_3 +Aq converts into Au and H_3AsO_4 . Sol in aqua regia. Not attacked by cold, decomp by hot conc H_2SO_4 (Tivoli, C C 1887 778, J B 1887 610)

Gold bismuthide, Au_3Bi

Min Maldonite Sol in aqua regia

Aurous bromide, AuBr

Insol in H_2O (Thomsen, C C 1860 606)

Insol in H_2O , HNO_3 , H_2SO_4

Sol in NH_4OH +Aq with decomp

Decomp by HBr and KBr+Aq Sol in KCN+Aq without decomp Slowly decomp by alcohol, ether, acetone and moist CHCl_3 (Lengfeld, Am Ch J 1901, 26 325)

Gold (auroauric) bromide, Au_2Br_4

Not deliquescent H_2O or ether dissolves out AuBr_3 (Thomsen, C C 1860 606)

Does not exist (Kruss, B 20 640)

Existence is maintained by Petersen (J pr (2) 46 334)

Auric bromide, AuBr_3

Not deliquescent Slowly sol in H_2O , more readily in ether

Can be recryst from AsBr_3 , SbBr_3 , TlBr_3 or SnBr_2 (Lindet, Bull Soc 1886, (2) 45 149)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Aurous phosphorus tribromide, AuBr , PBr_3

Decomp by H_2O (Lindet, J pr (2) 32 494)

Auric phosphorus pentabromide, AuBr_3 , PBr_5

Decomp by H_2O (Lindet)

Aurous bromide phosphorus trichloride, AuBr , PCl_3

Decomp by H_2O (Lindet)

Auric praseodymium bromide,

PrBr_3 , AuBr_3 + $10\text{H}_2\text{O}$

Very sol in H_2O , sol in conc HBr (Von Schule, Z anorg 1898, 18 355)

Aurous bromide ammonia,

AuBr , 2NH_3

Decomp by H_2O and dil HCl

Sol in aqua regia (Meyer, C R 1906, 143 281)

Gold carbide, Au_2C_2

Ppt Decomp by boiling H_2O without evolution of C_2H_2 Decomp by HCl with evolution of C_2H_2 (Mathews, J Am Chem Soc 1900, 22 110)

Aurous chloride, AuCl

Insol in H_2O , but gradually decomp thereby into Au and AuCl_3 (Thomsen, J pr (2) 13 341)

Insol in H_2O and dil HNO_3

Decomp by conc HNO_3 to Au and AuCl_3

Sol in HCl, HBr and in sol of alkali chloride and bromides, with decomp

Decomp by alcohol, ether and acetone (Lengfeld, Am Ch J 1901, 26 324)

Gold (auric) chloride, AuCl₃

Deliquescent Very sol in H₂O Sol in 147 pts H₂O (Abl) Sol in conc HCl, or HNO₃+Aq without decomp

AsCl₃ dissolves about 22% at 160° and 2.5% at 15° Solubility in SbCl₃ is about the same Much less sol in SnCl₄ or TiCl₄, SnCl₄ dissolving 4% at 160° and hardly a trace at 0° Very sl sol in hot or cold SiCl₄ (Lindet, Bull Soc (2) 45 149)

Sl sol in liquid NH₃ (Franklin and Kraus, Am Ch J 1898, 20 829)

Sol in alcohol with gradual decomp (Gmelin) Sol in ether with decomp in light or on long standing Ether extracts AuCl₃ from AuCl₃+Aq (Proust) Sol in volatile oils with gradual decomp

Sol in ether (Myhus, Z anorg 1911, 70 207)

Very sol in ether (Willstätter, B 1903, 36 1830)

Completely sol in ether (Frank, C C 1913, II 541)

Insol in or decomp by alcohol, ether, CS₂, C₆H₆, oil of turpentine, pentane, hexane, CHCl₃, CCl₄, ethyl nitrate, nitrobenzol, ethyl acetate, ethyl propionate and pyridine (Lenher, J Am Chem Soc 1903, 25 1138)

+2H₂O (Thomsen)

Auroauric chloride, Au₂Cl₄

Decomp by H₂O into AuCl₃ and AuCl (Thomsen, J pr (2) 13 357)

Does not exist (Kruss and Schmidt, J pr (2) 38 77)

Existence is maintained by Christensen (J pr (2) 46 328)

Auric chloride with MCl

See Chloraurate, M

Auric nitrosyl chloride, AuCl₃, NOCl

Sol in H₂O with decomp (Sudborough, Chem Soc 59 662)

Aurous phosphorus trichloride, AuCl, PCl₃

Decomp by H₂O Sol in about 100 pts PCl₃ at 15°, and about 8 pts at 120° Sol in AsCl₃ (Lindet, C R 101 1492)

Auric phosphorus pentachloride, AuCl₃, PCl₅

Decomp by H₂O Nearly insol in PCl₅ Sol in AsCl₃ (Lindet)

Aurous potassium chloride, AuCl, KCl

Decomp by H₂O or HCl+Aq into KCl, KAuCl₄, and Au (Berzelius)

Auric potassium chloride

See Chloraurate, potassium

Auric selenium chloride, AuCl₃, SeCl₄

Decomp by H₂O Sol in AsCl₃ (Lindet, C R 101 1492)

Gold (aurous) sodium chloride, AuCl, NaCl

Insol in H₂O Sol in alcohol (Meillet, J Pharm 3 447)

Formula is 4NaCl, AuCl, AuCl₃ (Jørgensen)

Auric sodium chloride

See Chloraurate, sodium

Auric sulphur chloride, AuCl₃, SCl₄

Easily decomp by H₂O (Lindet, C R 101 1492)

Aurous chloride ammonia, AuCl, NH₃

Ppt Unstable (Diemer, J Am Chem Soc 1913, 35 554)

AuCl, 3NH₃ Decomp by H₂O and dil acids

Sol in aqua regia Sol in conc H₂SO₄ with decomp (Meyer, C R 1906, 143 282)

AuCl, 12NH₃ (Meyer)

Auric fluoride, AuF₃

Very unstable

Is incapable of existence not only in presence of H₂O but under the ordinary conditions met with in the laboratory and in nature (Lenher, J Am Chem Soc 1903, 25 1138)

Auric hydroxide, AuO₂H₃

Nearly insol in most acids Easily sol in very conc HNO₃+Aq (Proust), from which all AuO₂H₃ is separated by dilution (Fremy) Extremely sl sol in fuming HNO₃ Sol in dil HNO₃+Aq when pure (Kruss, A 237 281) Not attacked by H₃PO₄ Insol in HF Sol in HCl, or HBr+Aq (Fremy)

Sol in H₂SeO₄+Aq (Mitscherlich)

Sl sol in conc H₂SO₄, somewhat sol in HC₂H₃O₃+Aq (Rose)

Nearly insol in cold KOH+Aq, but dissolved on boiling Insol in NH₄OH+Aq or alkali carbonates + Aq (Rose) Sl sol in boiling CaCl₂+Aq, NaCl+Aq, BaCl₂+Aq (Pelletier) Sol in NH₄CN, and KCN+Aq (Himly)

Sl sol in KCl, or NaCl+Aq (Pelletier)

Sol in K₄Fe(CN)₆+Aq at ord temp rapidly on boiling (Beutel, Z anorg 1912, 78 154)

AuO, OH=Au₂O₃, H₂O (Kruss)

Auroauric hydroxide, Au₃O₂(OH)₂=3Au₂O₂+2H₂O

Insol in boiling conc KOH+Aq Decomp by conc HCl or HNO₃+Aq into Au and Au₂O₃, which dissolves (Schottlander, A 217 336)

Aurous iodide, AuI

Insol in cold, decomp by hot H₂O, H₂SO₄, HCl, or HNO₃+Aq, with separation of Au Decomp immediately by ether, more slowly by alcohol

Partially sol in KI, FeI_3 , or $\text{HI} + \text{Aq}$ (Pelletier) Sl attacked by NH_4OH , or $\text{NaCl} + \text{Aq}$ at 35° (Fordos) Instantly decomp by $\text{KOH} + \text{Aq}$

Gold (auric) iodide, AuI_3

Insol in H_2O Sol in alkali iodides, and $\text{HI} + \text{Aq}$ Decomp on air or by alkalis (Johnston, Phil Mag J 9 266)

Aurous iodide ammonia, AuI, NH_3

Decomp by H_2O or dil acids (Meyer, C R 1906, 143 281)

Sol in aqua regia

$\text{AuI}, 6\text{NH}_3$ (Meyer)

Aurous oxide, Au_2O

Insol in H_2O or alcohol Decomp by boiling with $\text{HCl} + \text{Aq}$ into Au and AuCl_3 H_2SO_4 , HNO_3 , or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ do not attack Sol in cold aqua regia Sol in $\text{HI} + \text{Aq}$ Sol in KOH , or $\text{NaOH} + \text{Aq}$ when freshly precipitated (Berzelius)

According to Kruss (A 237 281) all hitherto prepared Au_2O is impure Pure Au_2O is sol in cold H_2O when freshly precipitated, from which hydroxide is precipitated by boiling Partly sol in HCl , or $\text{HBr} + \text{Aq}$ Sol in KOH , or $\text{NaOH} + \text{Aq}$ when freshly precipitated Not affected by any other acid or solvent (Kruss)

The so-called solution of Au_2O in H_2O is in reality a colloidal suspension (Vanino, B 1905, 38 462)

Auric oxide, Au_2O_3

See Auric hydroxide

Auroauric oxide, Au_2O_2

Sol in cold $\text{HCl} + \text{Aq}$ forms insol comp with HF (Piat, C R 70 842)

Obtained pure by Kruss (A 237 296)

Gold phosphide, Au_4P_6

Not attacked by $\text{HCl} + \text{Aq}$ HNO_3 forms H_3PO_4 and leaves undissolved Au (Schrotter, J B 1849 247)

AuP Decomp on air or with H_2O (Cavazzi, Gazz ch it 15 40)

Au_3P_4 Readily attacked by aqua regia or $\text{Cl}_2 + \text{Aq}$ (Granger, C R 1897, 124 498)

Gold purple (mixture of Au and SnO_2)

Insol in H_2O Easily sol in aqua regia $\text{HCl} + \text{Aq}$ dissolves all Sn and leaves Au

Boiling $\text{HNO}_3 + \text{Aq}$ dissolves a little Sn

Insol in boiling $\text{KOH} + \text{Aq}$ (Berzelius) $\text{KOH} + \text{Aq}$ extracts excess of SnO_2 , and the residue becomes sol in H_2O , from which it is pptd by $\text{NH}_4\text{Cl} + \text{Aq}$ (Figuer, A ch (3) 11 353)

Sol, when still moist, in $\text{NH}_4\text{OH} + \text{Aq}$, but insol if it has been dried

Obtained in colloidal state in aqueous solution containing 0.58 g Au and 5.41 g SnO_2

in a litre This solution may be concentrated without coagulation The solution is coagulated by dil HNO_3 , or $\text{HCl} + \text{Aq}$, more easily by dil $\text{H}_2\text{SO}_4 + \text{Aq}$, also by KCl , HgCl_2 , $\text{FeSO}_4 + \text{Aq}$, and many other salts Not coagulated by alcohol, but easily when ether is added to the alcohol (Schneider, Z anorg 5 80)

Gold (auric) selenide, Au_2Se_3

$\text{HNO}_3 + \text{Aq}$ dissolves out Se Sol in aqua regia or alkali sulphides + Aq (Uelsmann, J B 1860 90)

Aurous sulphide, Au_2S

Easily sol in H_2O when freshly prepared, but precipitated from aqueous solution by HCl , KCl , or $\text{NaCl} + \text{Aq}$ When dried is insol in H_2O

Insol in boiling dil or conc HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$ Easily sol in aqua regia, $\text{HCl} + \text{Aq}$ with KClO_4 , etc Slowly sol in alkali monosulphides + Aq Easily sol in polysulphides + Aq

Insol in $\text{KOH} + \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$ (Kruss, B 20 2369)

Known also in colloidal state in aqueous solution containing 1.74 g Au_2S per l (Schneider, B 24 2241)

Auric sulphide, Au_2S_3

Insol in H_2O and acids except aqua regia, sol in alkali sulphides, or $\text{KOH} + \text{Aq}$ (Berzelius)

Does not exist (Kruss, B 22 2369), but has since been made by Antony and Lucchesi (Gazz ch it 20 601) Insol in HCl , or dil $\text{HNO}_3 + \text{Aq}$ Decomp by conc HNO_3 , KOH , or $\text{NaOH} + \text{Aq}$ with separation of Au Sl decomp by $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in $\text{KCN} + \text{Aq}$, decomp by $(\text{NH}_4)_2\text{S} + \text{Aq}$ Sol in cold Na_2S or $\text{K}_2\text{S} + \text{Aq}$, decomp on boiling (Antony and Lucchesi, Gazz ch it 21, 2 209)

Insol in ether (Hofmann, B 1904, 37 246)

Auroauric sulphide, Au_2S_2

Insol in H_2O or acids except aqua regia Sl sol in cold alkali monosulphides + Aq, but easily sol on warming Sol in cold polysulphides + Aq, but less in ammonium polysulphide than the other alkali polysulphides

Not attacked by cold, but easily sol in hot $\text{KOH} + \text{Aq}$ Sol in $\text{KCN} + \text{Aq}$ (Hoffmann and Kruss, B 20 2704)

Obtained also in colloidal state in aqueous solution containing 0.8 g per l (Schneider)

Insol in $\text{Na}_2\text{S} + \text{Aq}$ sat with S (Ditte, A ch 1907, (8) 12 273)

Aurous potassium sulphide, $\text{Au}_2\text{S}, 3\text{K}_2\text{S}$

(Antony and Lucchesi, Gazz ch it 1896, 26 (2) 350)

Au_2S_3 , $4\text{K}_2\text{S}+12\text{H}_2\text{O}$ Very sol in H_2O
(Ditte, C R 1895, 120 322)

Gold silver sulphide, Ag_2AuS_2

Ppt (Lucchesi, Gazz ch it 1896, 26 350-53)

Aurous sodium sulphide, $\text{NaAuS}+4\text{H}_2\text{O}$

Sol in H_2O and alcohol (Yorke, Chem Soc Q J 1 236)

$+5\text{H}_2\text{O}$ Sol in H_2O (Ditte, C R 1895, 120 321)

Na_2AuS_2 Sol in H_2O (Lucchesi, Gazz ch it 1896, 26 350-53)

Au_2S_3 , $2\text{Na}_2\text{S}+20\text{H}_2\text{O}$ Very sol in H_2O
(Ditte, C R 1895, 120 321)

Gold telluride

Ppt (Berzelius, Pogg 8 178)

Gold silver telluride, Au_2Te_2 , Ag_2Te

Min *Sylvanite* Sol in HNO_3 +Aq with separation of Au, in aqua regia with separation of AgCl

$3\text{Ag}_2\text{Te}$, Au_2Te Min *Petzite* |

Hartshorn, salts of

See Carbonate carbamate, ammonium hydrogen

of absorption for H_2O at
(Ramsay, Z phys Ch 1906,

Absorption of helium by H_2O at t° and 760 mm pressure

t°	Coefficient of absorption
0	0 01500
0 5	0 01487
5	0 01460
10	0 01442
15	0 01396
20	0 01386
25	0 01371
30	0 01382
35	0 01380
40	0 01387
45	0 01403
50	0 01404

(Estreicher, Z phys Ch 1899, 31 184)

Absorption by H_2O at t°

t°	Coefficient of absorption
0	0 0134
10	0 0100
20	0 0138
30	0 0161
40	0 0191
50	0 0226

(Antropoff, Roy Soc Proc 1910, 83 A 480)

Completely insol in benzene and in alcohol
(Ramsay, Chem Soc 1895, 67 684)

Hexamine chromium compounds

See Luteochromium compounds

Hexamine cobaltic compounds,

$\text{Co}_2(\text{NH}_3)_6\text{X}_2$

See Dichrochromic compounds

$\text{Co}(\text{NH}_3)_6\text{X}_3$

See Luteocobaltic compounds

Hexamine iridium chloride, $\text{Ir}_2(\text{NH}_3)_6\text{Cl}_6$

See Iridotriamine chloride

Hexathionic acid, $\text{H}_2\text{S}_6\text{O}_6$

Known only in aqueous solution, which decomposes rapidly, even in presence of free sulphuric acid (Debus, A 244 76)

Potassium hexathionate, $\text{K}_2\text{S}_6\text{O}_4$

Sol in H_2O , with rapid decomp Not obtained in pure state (Debus, A 244 76)

Holmium, Ho

Holmium oxide, Ho_2O_3

(Cleve, C R 89 478, 91 328)

Consists of at least two elements (Lecoq de Boisbaudran, C R 102 1005)

Consists of seven elements (Kruss and Nilson)

Sesquihydraurylamine, $(\text{AuOH})_3\text{N}$, $\text{NH}_3 = \text{Au}_3\text{N}_2+3\text{H}_2\text{O}$

Decomp by boiling with H_2O (Raschig, A 235 341)

Hydrazidophosphoric acid

Barium hydrazidophosphate,

$\text{OP}(\text{N}_2\text{H}_3)_2\text{O}_2\text{Ba}$

(Ephraim, B 1911, 44 3420)

Lead hydrazidophosphate, $\text{OP}(\text{N}_2\text{H}_3)_2\text{O}_2\text{Pb}$

Easily sol in HNO_3 (Ephraim)

Potassium hydrazidophosphate,

$\text{OP}(\text{N}_2\text{H}_3)_2(\text{OK})_2$ (Ephraim)

Sodium hydrazidophosphate,

$\text{OP}(\text{N}_2\text{H}_3)_2(\text{ONa})_2$

Can be cryst from dil alcohol (Ephraim)

Hydrazine, $\text{N}_2\text{H}_4 = \text{NH}_2-\text{NH}_2$

Very sol in H_2O (Curtius, B 20 1632)

Very hygroscopic, decomp by H_2O , solvent for sulphur, KCl, KBr, KNO_3 (de Bruyn, R t c 1894, 13 433-40, Chem Soc 1895, 68 (2) 347)

Mixes in all proportions with alcohols, sl sol in organic solvents (Lobry de Bruyn, Chem Soc 1897, 72 (2) 22)

Hydrazine amidosulphonate,

Very sol in H_2O (Sabanejeff, Z anorg 1899, 20 22)

Hydrazine azouimide, $\text{N}_2\text{H}_4, \text{HN}_3$

Deliquescent Easily sol in H_2O Sl sol in alcohol, and can be crystallised therefrom (Curtius, B 24 2344)

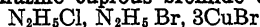
Hydrazine borate, $(\text{N}_2\text{H}_4)_2(\text{B}_2\text{O}_3)_3$

Sol in H_2O (Dschawachow, C C 1902, I 1394)

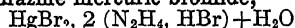
$(\text{N}_2\text{H}_4)_3(\text{H}_2\text{B}_2\text{O}_7)_2$ Sol in H_2O (Dschawachow, C C 1902, I 1394)

+5 H_2O Sol in H_2O (Dschawachow, C C 1902 I 1394)

+10 H_2O Ppt (Dschawachow, C C 1902 I 1394)

Hydrazine cuprous bromide chloride,

(Ranfaldi, Real Ac Linc 1906 (5) 15, II, 95)

Hydrazine mercuric bromide,

Very sol in H_2O , sol in alcohol and acetone Sl sol in acetic ether

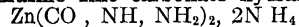
Insol in ethyl ether (Ferratin, C A 1912 1612)

Hydrazine zinc bromide, $2\text{N}_2\text{H}_4\text{HBr}, \text{ZnBr}_2 + \text{H}_2\text{O}$

Very sol in H_2O , sol in alcohol and acetone (Ferratin, C A 1912 1612)

Hydrazine carbonate

Very deliquescent, but only sl sol in H_2O Sl sol in alcohol (Curtius and Jay, J pr 1889, (2) 39 41)

Hydrazine zinc carbonate hydrazine,

Easily sol in H_2O (Ebler and Schott, J pr 1909, (2) 79, 72)

Hydrazine chlorate, $\text{N}_2\text{H}_4, \text{HClO}_3$

Very sol in H_2O , sl sol in alcohol Insol in ether, CHCl_3 and benzol (Salvadori, Gazz ch it 1907, 37, (2) 32)

Hydrazine dichlorate, $\text{N}_2\text{H}_4, 2\text{HClO}_3$

Ppt Decomp in aq solution (Luricentine, J Am Chem Soc 1915, 37 1123)

Hydrazine cupric chloride, $\text{N}_2\text{H}_4\text{Cl}, \text{CuCl}_2 + \frac{1}{2}\text{H}_2\text{O}$

Decomp by H_2O (Ranfaldi, Real Ac Linc 1906, (5) 15, II 95)

+2 H_2O Decomp by H_2O (Ranfaldi)

Hydrazine mercuric chloride, $\text{N}_2\text{H}_4\text{Cl}, \text{HgCl}_2$

(Hoffmann and Marburg, A 1899, 305 221)

Hydrazine dithionate, $\text{N}_2\text{H}_4, \text{H}_2\text{S}_2\text{O}_6$

Sol in H_2O , decomp on standing in aq solution (Sabanejeff, Z anorg 1899, 20 21)

$2\text{N}_2\text{H}_4, \text{H}_2\text{S}_2\text{O}_6$ Sol in H_2O (Sabanejeff)

Hydrazine fluosilicate, $\text{N}_2\text{H}_4, \text{H}_2\text{SiF}_6$

Easily sol in H_2O

Difficultly sol in ethyl and methyl alcohol (Ebler, J pr 1910, (2) 81 552)

Hydrazine fluotitanate, $(\text{N}_2\text{H}_4)_2, \text{H}_2\text{TiF}_6 + 2\text{H}_2\text{O}$

Ppt Sol in H_2O (Ebler, J p r 1910, (2) 81 555)

Hydrazine monohydrobromide, $\text{N}_2\text{H}_4, \text{HBr}$

Very easily sol in H_2O or hot alcohol (Curtius and Schultz, J pr (2) 42 537)

Hydrazine dihydrobromide, $\text{N}_2\text{H}_4, 2\text{HBr}$

Easily sol in H_2O Sl sol in alcohol (Curtius and Schulz, J pr (2) 42 535)

Hydrazine monohydrochloride, $\text{N}_2\text{H}_4, \text{HCl}$

Extremely sol in H_2O Sl sol in boiling absolute alcohol (Curtius and Jay, J pr (2) 39 38)

Hydrazine dihydrochloride, $\text{N}_2\text{H}_4, 2\text{HCl}$

Easily sol in cold H_2O , sl sol in hot alcohol (Curtius, l c)

Sol in 2 67 pts H_2O at 23° Sp gr of sat solution at 20°/4°=1 4226 (Schiff, Z phys Ch 1896, 21 292)

Sp gr of aqueous solution at 20°

% salt	Sp gr
25	1 1183
20	1 0923
15	1 0675
10	1 0436
5	1 0206

(Schiff, Z phys Ch 1896, 21 292)

Nearly insol in hot absolute alcohol (Curtius and Jay, J pr (2) 39 37)

Hydrazine dihydrofluoride, $\text{N}_2\text{H}_4, 2\text{HF}$

Easily sol in H_2O Nearly insol in alcohol (Curtius and Schulz, J pr (2) 42 533)

Hydrazine monohydroiodide, $\text{N}_2\text{H}_4, \text{HI}$

Easily sol in H_2O (Curtius and Schulz)

Hydrazine dihydroiodide, $\text{N}_2\text{H}_4, 2\text{HI}$

Very deliquescent Easily sol in H_2O Sl sol in alcohol (Curtius and Schulz, J pr (2) 42 536)

Trihydrazine dihydroiodide, $3N_2H_4, 2HI$

Easily sol in H_2O and alcohol (Curtius and Schulz, J pr (2) 42 540)

Hydrazine hydroxide, N_2H_4, H_2O

Miscible with H_2O or alcohol, but not with ether, chloroform, or benzene (Curtius and Schulz, J pr (2) 42 530)

Hydrazine hypophosphate, $N_2H_4, H_4P_2O_6$

Sl sol in H_2O 15 pts dissolve in 100 pts H_2O (Sabanejeff, Z anorg 1898, 17 490)

Hydrazine hypophosphate ammonia, $N_2H_4, H_4P_2O_6, NH_3$

Sol in H_2O (Sabanejeff, Z anorg 1899, 20 23)

Hydrazine mercuric iodide, $2N_2H_4, HgI_2 + H_2O$

Very sol in H_2O , alcohol, acetone, acetic ether

Insol in ether Excess of H_2O decomp (Ferratin, Gazz ch it 1912, 42 (1), 172)

Hydrazine zinc iodide, $ZnI_2, 2N_2H_4, HI + \frac{1}{2}H_2O$

Very sol in H_2O , sol in alcohol and acetone (Ferratin, C A 1912 1612)

Hydrazine nitrate, N_2H_4, HNO_3

Very sol in H_2O , sl sol in abs alcohol (Sabanejeff, Z anorg 1899, 20 24)

Solubility in H_2O at t°

t°	g N_2H_4, HNO_3 per 100 g	
	Sat solution	H_2O
10	63 63	174 9
15	68 47	217 2
20	72 70	266 3
25	76 61	327 5
30	80 09	402 2
35	83 06	490 3
40	85 86	607 2
45	88 06	737 6
50	91 18	1034
55	93 53	1458
60	95 51	2127

(Sommer, Z anorg 1914, 86 85)

 $N_2H_4, 2HNO_3$ Very unstable

Sol in H_2O but solution cannot be concentrated beyond 30% without decomp

Decomp by abs alcohol

Very sol in hydrazine hydroxide + Aq (Sabanejeff, Z anorg 1898, 20 25)

Hydrazine nitrite, N_2H_4, HNO_2

Very sol in H_2O Pptd by ether from solution in alcohol, insol in ether

Very hygroscopic (Sommer, Z anorg 1913, 83 125)

Hydrazine perchlorate, $N_2H_4, HClO_4 + 2H_2O$

Sol in 148 pts H_2O at 30° and 34 pts alcohol, crystallizes from boiling absolute alcohol (Salvador, Ch Z 31 680)

+ $3H_2O$

Solubility in H_2O at t°

t°	% $N_2H_4, HClO_4$	Sp gr
18	41 72	1 264
35	66 9	1 391

(Carlson, Dissert 1910)

Hydrazine dperchlorate, $N_2H_4, 2HClO_4 + 2H_2O$

Efflorescent

Deliquescent

102 pts salt sol in 100 pts H_2O at 29°

2 8 pts salt sol in 100 pts alcohol

1 0 pt " " " 100 " ether

(Turrentine, J Am Chem Soc 1915, 37 1123)

Hydrazine phosphate, N_2H_4, H_3PO_4

Verv sol in H_2O (Sabanejeff, Z anorg 1898, 17 488)

$N_2H_4, 2H_3PO_4$ Sol in H_2O (Sabanejeff)

Hydrazine phosphite, N_2H_4, H_3PO_3

Sol in H_2O (Sabanejeff, Z anorg 1898, 17 468)

Hydrazine hydrogen phosphite, $N_2H_4, 2H_3PO_3$

Less sol in H_2O than the normal salt (Sabanejeff)

Hydrazine selenate, N_2H_4, H_2SeO_4

Sol in H_2O with decomp (Rimini, C C 1907, I 86)

Hydrazine zinc selenate, $(N_2H_4)_2SeO_4, ZnSeO_4$

Sl sol in H_2O but more sol than Cu salt (Rimini and Malagnini, Gazz ch it 1907, 37 (1), 265)

Hydrazine sulphocyanide, $N_2H_4, HSCN$

Very deliquescent Sol in H_2O and alcohol (Curtius and Herdenreich, J pr 1895, [2] 52 488)

Hydrazine sulphate, N_2H_4, H_2SO_4

Sol with difficulty in cold, easily in hot H_2O Insol in alcohol (Curtius, l c)

100 pts H_2O dissolve 3 055 pts salt at 22° (Curtius and Jay, J pr (2) 39 39)

$2N_2H_4, H_2SO_4$ Very deliquescent, and

sol in H_2O Insol in alcohol (Curtius, J pr (2) 44 101)

Hydrazine sulphite, $(N_2H_4)_2H_2SO_3$
(Sabanejeff, Z anorg 1899, 20, 24)

Hydrazine pyrosulphite, $2N_2H_4, H_2S_2O_5$
Sol in H_2O with decomp, insol in alcohol
(Sabanejeff, Z anorg 1899, 20 23)

Hydrazine thiosulphate, $(N_2H_4)_2H_2S_2O_3$
Ppt (Not pure) (Ferratin, Gazz ch it 1912, 42 (1) 138)

Hydrazine lead thiosulphate,
 $PbS_2O_3, 2(N_2H_4)_2H_2S_2O_3 + H_2O$
Insol in H_2O and alcohol
Sol in $HCl + Aq$ and in $HNO_3 + Aq$
(Ferratin, C A 1912 1612)

Hydrazine silver thiosulphate,
 $Ag_2S_2O_3, (N_2H_4)_2H_2S_2O_3$
Insol in H_2O , sol in $NH_4OH + Aq$ and in
 HNO_3 (Ferratin)

Hydrazine sulphinic acid

Barium hydrazine disulphate,
 $Ba_2N_2(SO_2)_2$
Insol in H_2O , sol in acids (Ephraim,
B 1911, 44 390)

Hydrazinesulphonic acid, $N_2H_3SO_2OH$
Sol in about 24 pts H_2O at ord temp De-
comp by mineral acids, nearly insol in
alcohol and other organic solvents (Traube,
B 1914, 47 941)

Ammonium hydrazinesulphonate,
 $(N_2H_3SO_3)NH_4$
Deliquescent, decomp by acids (Traube)

Barium hydrazinesulphonate,
 $(N_2H_3SO_3)_2Ba + 2H_2O$
Sol in H_2O , pptd by alcohol, decomp by
acids (Traube)

Calcium hydrazinesulphonate,
 $(N_2H_3SO_3)_2Ca + H_2O$
Sol in H_2O Decomp by acids Insol in
alcohol (Traube)

Potassium hydrazinesulphonate, $N_2H_3SO_3K$
Decomp by acids (Traube)

Silver hydrazinesulphonate, $N_2H_3SO_3Ag$
(Traube)

Sodium hydrazinesulphonate,
 $N_2H_3SO_3Na + H_2O$
Decomp by acids (Traube)

Strontium hydrazinesulphonate,
 $(N_2H_3SO_3)_2Sr + 2H_2O$

Sol in H_2O Decomp by acids Insol in
alcohol (Traube)

Hydriodic acid, HI
See Iodhydric acid

Hydrobromic acid, HBr
See Bromhydric acid

Hydrochloric acid, HCl
See Chlorhydric acid

Hydrofluorboric acid, HBF_4
See Fluoborhydric acid

Hydrofluoric acid, HF
See Fluorhydric acid

Hydrogen, H_2
Sl absorbed by H_2O

Sol in 150 pts H_2O 1 vol H_2O absorbs 0 016 vol H
Recently boiled H_2O absorbs 1 53% H (Henry 1803)
100 vols H_2O at 18° absorb 4 6 vols H (de Saussure
1814)

1 vol H_2O absorbs 0 0193 vol H at 760 mm
and all temperatures between 0° and $23 6^\circ$
(Bunsen)

Later work does not confirm the above state-
ment

Absorption of H by H_2O at t and 760 mm
 β = coefficient of absorption, β_1 = "solu-
bility" (see under Oxygen)

t°	β	β_1
0	0 02153	0 02140
1	0 02134	0 02120
2	0 02115	0 02100
3	0 02097	0 02081
4	0 02079	0 02062
5	0 02061	0 02043
6	0 02044	0 02025
7	0 02027	0 02207
8	0 02010	0 01989
9	0 01994	0 01971
10	0 01978	0 01954
11	0 01962	0 01937
12	0 01947	0 01920
13	0 01932	0 01904
14	0 01918	0 01888
15	0 01903	0 01872
16	0 01889	0 01856
17	0 01876	0 01840
18	0 01863	0 01825
19	0 01850	0 01810
20	0 01837	0 01795
21	0 01825	0 01781
22	0 01813	0 01767
23	0 01802	0 01753
24	0 01791	0 01739
25	0 01780	0 01725
26	0 01770	0 01712

(Timofejeff, Z phys Ch 6 147)

Absorption of H by H_2O at t° and 760 mm
 β = coefficient of absorption

t°	β	t°	β	t°	β
0	0 0203	16	0 0182	32	0 0161
1	0 0202	17	0 0180	33	0 0160
2	0 0200	18	0 0179	34	0 0159
3	0 0199	19	0 0178	35	0 0157
4	0 0198	20	0 0177	36	0 0156
5	0 0196	21	0 0175	37	0 0155
6	0 0195	22	0 0174	38	0 0154
7	0 0194	23	0 0172	39	0 0153
8	0 0192	24	0 0171	40	0 0152
9	0 0191	25	0 0170	45	0 0149
10	0 0190	26	0 0168	50	0 0146
11	0 0189	27	0 0167	60	0 0144
12	0 0187	28	0 0166	70	0 0146
13	0 0186	29	0 0164	80	0 0149
14	0 0184	30	0 0163	90	0 0155
15	0 0183	31	0 0162	100	0 0166

(Bohr and Bock, W Ann 44 318)

Absorption of hydrogen by H_2O at t° and 760 mm pressure β = coefficient of absorption β_1 = "solubility" (see under Oxygen)

t°	β	β_1
0	0 02148	0 02135
1	0 02126	0 02112
2	0 02105	0 02090
3	0 02084	0 02068
4	0 02064	0 02047
5	0 02044	0 02026
6	0 02025	0 02006
7	0 02007	0 01987
8	0 01989	0 01968
9	0 01972	0 01950
10	0 01955	0 01932
11	0 01940	0 01915
12	0 01925	0 01899
13	0 01911	0 01883
14	0 01897	0 01867
15	0 01883	0 01851
16	0 01869	0 01836
17	0 01856	0 01821
18	0 01844	0 01706
19	0 01831	0 01792
20	0 01819	0 01777
21	0 01805	0 01761
22	0 01792	0 01746
23	0 01779	0 01730
24	0 01766	0 01715
25	0 01754	0 01700
26	0 01742	0 01685
27	0 01731	0 01670
28	0 01720	0 01656
29	0 01709	0 01642
30	0 01699	0 01630
31	0 01692	0 01618
32	0 01685	0 01606
33	0 01679	0 01596
34	0 01672	0 01585
35	0 01666	0 01574

Absorption of hydrogen by H_2O at t° and 760 mm pressure — *Continued*

t°	β	β_1
36	0 01661	0 01564
37	0 01657	0 01554
38	0 01652	0 01544
39	0 01648	0 01535
40	0 01644	0 01525
41	0 01640	0 01515
42	0 01635	0 01504
43	0 01631	0 01493
44	0 01627	0 01482
45	0 01624	0 01475
46	0 01620	0 01460
47	0 01617	0 01449
48	0 01614	0 01437
49	0 01611	0 01425
50	0 01608	0 01413
52	0 01606	0 01392
54	0 01605	0 01369
56	0 01603	0 01343
58	0 01602	0 01316
60	0 01600	0 01287
62	0 01600	0 01256
64	0 01600	0 01223
66	0 01600	0 01188
68	0 01600	0 01150
70	0 01600	0 01109
72	0 01600	0 01065
74	0 01600	0 01017
76	0 01600	0 00966
78	0 01600	0 00912
80	0 01600	0 00853
82	0 01600	0 00790
84	0 01600	0 00723
86	0 01600	0 00652
88	0 01600	0 00575
90	0 01600	0 00494
92	0 01600	0 00407
94	0 01600	0 00315
96	0 01600	0 00216
98	0 01600	0 00111
100	0 01600	0 0000

(Winkler, B 24 99)

Critical t_c —232° (Natanson, Z phys Ch 1895, 17 43-48)

Coefficient of absorption for H_2O = 0 01750 at 25°, 0 01905 at 20°, 0 02059 at 15°, 0 02213 at 10°, 0 02366 at 5° (Braun, Z phys Ch 1900, 33 734)

Solubility in H_2O at 25° = 0 01926 (Geffcken, Z phys Ch 1904, 49 267)

Coefficient of absorption for H_2O = 0 01810 at 20 11° (Hufner, Z phys Ch 1907, 57 623)

Solubility in H_2O at 25° = 0 01962 (Drucker and Moles, Z phys Ch 1910, 75 417)

Coefficient of absorption for H_2O at 15° = 0 01892, at 20° = 0 01829 (Muller, Z phys Ch 1912, 81 493)

Solubility of hydrogen in water at 25°
 S = Solubility calculated according to formula, for which see original article
 P = Pressure

P	S	P	S
756	0 0199	1095	0 0195
757	0 0198	1097	0 0197
850	0 0200	1244	0 0202
877	0 0193	1252	0 0196
986	0 0194	1380	0 0196
992	0 0198	1393	0 0198

(Findlay, Chem Soc 1912, 101 1465)

Absorption by H₂O at different pressures

P = Hg-pressure in metres

λ = coefficient of solubility

Table I Volume of the absorbing liquid = 32.32 ccm T = 19.5°

P	λ	P	λ
0 9010	0 01798	3 3926	0 01789
0 9967	0 01796	4 1405	0 01776
1 0809	0 01799	4 6629	0 01761
1 2133	0 01800	5 4705	0 01748
1 3711	0 01794	5 9580	0 01725
1 5448	0 01791	6 6507	0 01706
1 8002	0 01793	7 4548	0 01674
2 5208	0 01793	7 8783	0 01652
2 9971	0 01795	8 2439	0 01632

Table II Volume of the absorbing liquid = 32.007 ccm T = 23°

P	λ	P	λ
1 1154	0 01736	4 6220	0 01716
1 3758	0 01739	5 1130	0 01702
1 7416	0 01733	5 9702	0 01687
2 1712	0 01731	7 1920	0 01649
2 8724	0 01734	7 4493	0 01631
3 4115	0 01732	7 8696	0 01618
4 0229	0 01728	8 1913	0 01603

(Cassuto, Phys Zeit 1904, 5 235)

Absorption of H₂ by acids + Aq

M = content in gram-equivalents per liter

S = solubility (See under Oxygen)

Absorption of H₂ by HNO₃ + Aq

M	S 25°
0 741	0 01851
0 753	0 01868
1 22	0 01812
1 45	0 01782
2 09	0 01739
2 96	0 01690
3 18	0 01667
3 22	0 01633
4 13	0 01611
4 23	0 01589

(Geffcken, Z phys Ch 1904, 49 267)

Absorption of H₂ by HCl + Aq

M	S 25°
0 426	0 01875
0 432	0 01868
1 063	0 01789
1 602	0 01732
1 802	0 01699
1 928	0 01688
2 338	0 01652
2 438	0 01627
2 836	0 01606

(Geffcken)

Absorption of H₂ by $\frac{\text{H}_2\text{SO}_4}{2}$ + Aq

M	S 25°
0 527	0 01869
0 562	0 01838
0 985	0 01780
1 122	0 01768
1 866	0 01642
1 905	0 01632
2 605	0 01575
3 045	0 01496
3 174	0 01456
3 962	0 01422
3 989	0 01402

(Geffcken)

Solubility of H₂ in H₂SO₄ + Aq at 20°

% H ₂ SO ₄	λ 20°
0	0 0208
35.82	0 00954
61.62	0 00708
95.6	0 01097

(Christoff, Z phys Ch 1906, 55 627)

Solubility of H₂ in colloidal ferric hydroxide solution is practically the same as its solubility in pure H₂O

Solubility of H₂ in a solution containing 18.11 g Fe(OH)₃ per liter at 25° = 0.3085

Solubility of H₂ in a solution containing 18.309 g Fe(OH)₃ per liter at 25° = 0.3083

(Geffcken, Z phys Ch 1904, 49 299)

Absorption of H₂ by bases + Aq

M = content in gram-equivalents per liter

S = solubility (See under Oxygen)

Absorption of H₂ by KOH + Aq

M	S 25°
0 536	0 01658
0 715	0 01539
1 059	0 01378
1 056	0 01389
1 480	0 01195

(Geffcken, Z phys Ch 1904, 49 267)

Absorption of H ₂ by NaOH + Aq		
M	S 25°	
0 543	0 01632	
0 571	0 01608	
0 692	0 01442	
0 974	0 01409	
1 059	0 01372	
1 137	0 01348	
1 850	0 01018	
3 400	0 00648	
3 430	0 00639	
4 687	0 00483	
(Geffcken)		
Solubility of H ₂ in salts + Aq at 15°		
Salt	% Salt	Coefficient of absorption
H ₂ O	0 00	0 01883
CaCl ₂	3 47	0 01619
	6 10	0 01450
	11 33	0 01138
	17 52	0 00839
	26 34	0 00519
MgSO ₄	4 94	0 01501
	10 19	0 01159
	23 76	0 00499
LiCl	3 48	0 01619
	7 34	0 01370
	14 63	0 0099
K ₂ CO ₃	2 82	0 01628
	8 83	0 01183
	16 47	0 00761
	24 13	0 00462
	41 81	0 00160
KCl	3 83	0 01667
	7 48	0 01489
	12 13	0 01279
	19 21	0 01012
	22 92	0 00892
KNO ₃	4 73	0 01683
	8 44	0 01559
	16 59	0 01311
	21 46	0 01180
NaNO ₃	5 57	0 01603
	11 16	0 01370
	19 77	0 01052
	37 43	0 00578
Na ₂ CO ₃	2 15	0 01639
	8 64	0 01385
	11 53	0 00839
Na ₂ SO ₄	4 58	0 01519
	8 42	0 0154
	16 69	0 00775

Absorption by salts + Aq							
Salt	t ₁	Sp gr salt + Aq at t ₁ /4°	% salt	t ₂	Absorption coefficient at t ₂	Absorption coefficient at 15° (Calculated)	
KCl	15°	1 1565	22 92	18 62	0 00869	0 00892	
		1 1294	19 21	18 82	0 00985	0 01012	
		1 0794	12 13	18 71	0 01246	0 01279	
		1 0480	7 48	19 00	0 01447	0 01489	
		1 0240	3 83	19 23	0 01618	0 01667	
KNO ₃	15°	1 1460	21 46	17 -	-	-	
		1 1101	16 59	17 -	-	-	
		1 0936	14 26	16 -	-	-	
		1 0539	8 44	17 58	0 01531	0 01559	
		1 0295	4 73	17 82	0 01650	0 01683	
K ₂ CO ₃	15°	1 4395	41 81	13 17	0 00162	0 00160	
		1 3112	30 99	12 77	0 00290	0 00285	
		1 2353	24 13	12 62	0 00470	0 00462	
		1 1555	16 47	12 51	0 00775	0 00761	
		1 0807	8 83	11 32	0 01216	0 01183	
NaCl	15°	1 0405	4 53	12 29	0 01532	0 01501	
		1 0248	2 82	11 23	0 01675	0 01628	
		1 1817	23 84	13 48	0 00602	0 00595	
		1 1088	14 78	13 17	0 00938	0 00925	
		1 0807	11 09	13 80	0 01140	0 1130	
NaNO ₃	18°	1 0315	4 47	13 56	0 01565	0 01548	
		1 2963	37 43	17 -	-	-	
		1 2099	27 95	17 -	-	-	
		1 1417	19 77	17 -	-	-	
		1 0765	11 16	17 -	-	-	
Na ₂ CO ₃	15°	1 0367	5 57	17 -	-	-	
		1 0217	2 15	11 94	0 01677	0 01639	
		1 1608	16 69	18 41	0 00757	0 00775	
		1 0768	8 42	18 57	0 01223	0 01254	
		1 0412	4 58	18 51	0 01482	0 01519	
LiCl	15°	1 0843	14 63	12 77	0 01006	0 00990	
		1 0416	7 34	12 40	0 01396	0 01370	
		1 0192	3 48	10 47	0 01676	0 01619	
MgSO ₄	15°	1 2679	23 76	18 26	0 00487	0 00499	
		1 1805	16 64	17 55	0 00783	0 00797	
		1 1064	10 19	17 30	0 01140	0 01159	
		1 0503	4 97	17 10	0 01479	0 01501	
ZnSO ₄	18°	-	-	-	-	-	
		1 1394	12 73	17 95	0 01151	0 01175	
		1 0602	6 03	17 79	0 01495	0 01525	
CaCl ₂	15°	1 2470	26 34	17 68	0 00510	0 00 19	
		1 2150	23 33	17 84	0 00600	0 00619	
		1 1568	17 52	18 09	0 00821	0 00839	
		1 0285	3 47	18 52	0 01579	0 01619	
AlCl ₃	15°	1 2647	32 30	17 14	0 00525	0 00533	
		1 1589	20 75	17 28	0 00860	0 00874	
		1 0914	12 46	17 30	0 01190	0 01210	
		1 0488	6 88	17 46	0 01460	0 01486	
C ₁₂ H ₂₂ O ₁₁	17 5°	-	-	-	-	-	

(Steiner, W Ann 1894 (2), 52 291)

(Gordon, Z phys Ch 1895, 18 14)

Solubility in salt solutions
C = concentration of the solution in terms of normal

α = coefficient of absorption

Absorption of hydrogen by $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 20°

P	C	α
1 037	0 1308	0 01872
2 167	0 2765	0 01845
3 378	0 4363	0 01823
4 823	0 6333	0 01773
6 773	0 9069	0 01744
11 550	1 6308	0 01647

(Knopp, Z phys Ch 1904, 48 103)

Absorption of hydrogen by $\text{KNO}_3 + \text{Aq}$ at 20°

P	C	α
1 244	0 1245	0 01835
2 094	0 2114	0 01818
4 010	0 4127	0 01785
5 925	0 6225	0 01743
7 742	0 8293	0 01667
13 510	1 5436	0 01436

(Knopp)

Absorption of hydrogen by $\text{NaNO}_3 + \text{Aq}$ at 20°

P	C	α
1 041	0 1236	0 01839
2 192	0 2634	0 01774
4 405	0 5416	0 01694
6 702	0 8442	0 01518
12 637	1 7394	0 01300

(Knopp)

Absorption of hydrogen by $\text{KCl} + \text{Aq}$ at 20°

P	C	α
1 089	0 1475	0 01823
2 123	0 2907	0 01757
4 070	0 5687	0 01661
6 375	0 9127	0 01531
7 380	1 0682	0 01472
13 612	2 1222	0 01255

(Knopp)

Absorption of H by $\text{NaCl} + \text{Aq}$
 αt° = coefficient of absorption at t°

Percent of NaCl in the solution	α_{25}	α_{20}	α_{15}	α_{10}	α_0
5 990	0 01353	0 01128	0 01640	0 01749	0 01839
5 506	0 01395	0 01532	0 0166	0 01769	0 01861
4 496	0 01429	0 01587	0 01714	0 01817	0 01920
3 798	0 01476	0 01623	0 01760	0 01876	0 01977
1 523	0 01603	0 01754	0 01896	0 02030	0 02155
1 250	0 01621	0 01771	0 01914	0 02052	0 02180

(Braun, Z phys Ch 1900, 33 735)

Absorption of H by $\text{BaCl}_2 + \text{Aq}$
 αt° = coefficient of absorption at t°

Percent of BaCl_2 in the solution	α_{25°	α_{20°	α_{15°	α_{10°	α_0
7 002	0 01455	0 01591	0 01715	0 01833	0 01937
6 453	0 01474	0 01605	0 01734	0 01857	0 01957
3 600	0 01562	0 01700	0 01839	0 01971	0 02089
3 291	0 01570	0 01719	0 01847	0 01983	0 02110

(Braun)

1 vol alcohol at t° and 760 mm absorbs V vols H gas reduced to 0° and 760 mm

t°	V	t°	V	t°	V
0	0 06925	9	0 06799	18	0 06690
1	0 06910	10	0 06787	19	0 06679
2	0 06896	11	0 06774	20	0 06668
3	0 06881	12	0 06761	21	0 06657
4	0 06867	13	0 06749	22	0 06646
5	0 06853	14	0 06737	23	0 06636
6	0 06839	15	0 06725	24	0 06621
7	0 06826	16	0 06713		
8	0 06813	17	0 06701		

(Bunsen's Gasometry, p 286)

One vol alcohol absorbs 0 06925—
0 000148t + 0 000001 t^2 vols H at t°
(Bunsen)

Solubility in alcohol + Aq at 20° and 760 mm

Wt % alcohol	Vol H ₂ absorbed	Wt % alcohol	Vol H ₂ absorbed
0	1 93	28 57	1 04
9 09	1 43	33 33	1 17
16 67	1 29	50	2 02
23 08	1 17	66 67	2 55

(Iubarsch, W Ann 1889, (2) 37 525)

Absorption of hydrogen by alcohol

t	Coeff of absorption	t°	Coeff of absorption
0	0 0676	13 4	0 0705
6 2	0 0693	18 8	0 0740

(Timofeeff)

Solubility of H₂ in ethyl ether at t°

t	Solubility
0	0 1115
5	0 1150
10	0 1195
15	0 1257

(Christoff, Z phys Ch 1912, 79 459)

Coefficient of absorption in petroleum =
0 0582 at 20° , and 0 0652 at 10° (Griewasz
and Walfisz, Z phys Ch 1 70)

Absorption of hydrogen by chloralhydrate + Aq at 20°

P	C	α
4 911	0 310	0 01839
7 69	0 504	0 01802
14 56	1 030	0 01712
18 77	1 397	0 01653
29 50	2 530	0 01542
32 00	2 845	0 01518
38 42	3 770	0 01440
49 79	6 000	0 01353
60 12	9 120	0 01324
63 90	10 700	0 01307

(Knopp, Z phys Ch 1904, 48 103)

Absorption of H₂ by chloralhydrate + Aq t° = temp of the solution

P = % chloralhydrate in the solution

 βt° = coefficient of absorption at t° $\beta 15^\circ$ = coefficient of absorption at 15°

t°	P	βt°	$\beta 15^\circ$
15 0	10 0	0 01740	0 01740
16 4	16 1	0 01719	0 01737
15 8	33 35	0 01475	0 01484
15 0	39 4	0 01470	0 01470
15 6	51 0	0 01300	0 01306
16 2	60 8	0 01281	0 01230
15 5	70 7	0 01282	0 01287
15 0	79 0	0 01320	0 01320

t°	P	βt°	$\beta 20^\circ$
19 4	15 5	0 01732	0 01724
17 4	28 3	0 01569	0 01540
18 7	46 56	0 01388	0 01375
16 5	52 0	0 01314	0 01280
17 0	63 0	0 01270	0 01243
17 2	66 0	0 01285	0 01260
17 9	68 0	0 01286	0 01270
18 3	78 4	0 01398	0 01380

(Muller, Z phys Ch 1912, 81 499)

Solubility of H₂ in glycerol + Aq

t°	% glycerol	Coefficient of absorption
14	0	0 0193
	2 29	0 0189
	5 32	0 0186
	8 57	0 0182
	10 83	0 01815
	15 31	0 01765
21	0	0 0184
	2 29	0 0181
	5 68	0 0177
	6 46	0 0176
	10 40	0 0171
	18 20	0 0160

(Henkel, in Landolt-Börnstein, Tab 4th Ed 602)

Absorption of H₂ by glycerine + Aq t° = temp of the solution

P = % glycerine in the solution

 βt° = coefficient of absorption at t° $\beta 15^\circ$ = coefficient of absorption at 15°

t°	P	βt°	$\beta 15^\circ$
14 5	14 9	0 01654	0 01647
13 0	22 8	0 01532	0 01510
13 8	38 0	0 01226	0 01216
14 5	43 5	0 01117	0 01110
13 7	49 15	0 01019	0 01010
14 9	51 5	0 01026	0 01025
12 3	68 0	0 00822	0 00806
18 0	90 7	0 00853	0 00870

(Muller, Z phys Ch 1912, 81 496)

Solubility of H₂ in glycerine + Aq at 25°

G = % by wt glycerine in the solvent

S = Solubility of H₂

P = corrected pressure at end of experiment in mm Hg at 0°

P	G	S
716 3	4 0	0 0186
736 1	10 5	0 0178
684 3	22 0	0 0154
709 9	49 8	0 0099
730 1	50 5	0 0097
672 2	52 6	0 0090
741 1	67 0	0 0067
708 0	80 0	0 0051
665 5	82 0	0 0051
662 3	88 0	0 0044
741 8	95 0	0 0034

(Drucker and Moles, Z phys 1910, 75 417)

Absorption of H₂ by glucose + Aq t° = temp of the solution

P = % glucose in the solution

 βt° = coefficient of absorption at t° $\beta 20^\circ$ = coefficient of absorption at 20°

t°	P	βt	$\beta 20$
20 5	12 2	0 01595	0 01600
20 5	20 7	0 01445	0 01450
21 1	32 56	0 01243	0 01250
21 8	45 8	0 01000	0 01015
21 2	59 0	0 00775	0 00780

(Muller, Z phys Ch 1912, 81 494)

Solubility in sugar + Aq at 15°

% Sugar	Absorption Coefficient
16 67	0 01561
30 08	0 01284
47 65	0 00892

(Gordon, Z phys Ch 1895, 18 14)

Absorption of H_2 by sucrose + Aq
 t° = temp of the solution in the absorption vessel
 P = % sucrose in the solution
 β_{t° = coefficient of absorption at t°
 β_{15° = coefficient of absorption at 15°

t°	P	β_{t°	β_{15°
12 7		0 01862	0 01892
19 3		0 01840	β_{20° = 0 01829
15 2	5 04	0 01723	0 01726
11 6	14 7	0 01547	0 01510
12	20 26	0 01500	0 01462
12 7	29 86	0 01290	0 01257
11 8	31 74	0 01220	0 01185
13 3	39 65	0 01047	0 01033
12 6	42 94	0 00956	0 00939

(Muller)

Absorption of H_2 by propionic acid + Aq
 α_{t° = coefficient of absorption at t°

Percent of propionic acid in the solution	α_{25°	α_{20°	α_{15°	α_{10°	α_5°
9 910	0 01602	0 01782	0 01908	0 02029	0 02129
9 763	0 01638	0 01788	0 01929	0 02042	0 02120
6 500					
5 267					
3 373	0 01706	0 01866	0 01987	0 02120	0 02221
2 634	0 01722	0 01876	0 02003	0 02142	0 02245

(Braun, Z phys Ch 1900, 33 735)

Absorption of H by organic acids + Aq
 M = content in gram-equivalents per liter
 S = solubility

Absorption of H_2 by CH_3COOH + Aq

M	S_{25}
0 517	0 01925
0 523	0 01923
1 160	0 01903
1 20	0 01895
1 963	0 01885
1 980	0 01882
3 178	0 01862
3 220	0 01858
4 157	0 01849

(Geffcken, Z phys Ch 1904 49 267)

Absorption of H_2 by $CH_2ClCOOH$ + Aq

M	S_{25}
0 527	0 01905
0 990	0 01852
1 773	0 01783

(Geffcken)

Absorption of H by organic substances + Aq at t°
 V = absorbed volume reduced to 0° and 760 mm
 α = coefficient of absorption

Substance	Grams in 1 liter	Vol of solution used in ccm	t°	V ccm	α
Glucose	174	409 94	20 28°	5 48	0 01516
Glucose	80 8		20 16°	6 12	0 01649
Glucose	41 45		20 00°	6 36	0 01759
Urea	69		20 17°	6 26	0 01703
Acetamide	59		20 11°	6 51	0 01795
Alanine	89		20 08	5 57	0 01550
Glycocoll	75		20 16°	5 67	0 01577

(Hufner, Z phys Ch 1907, 57 623-4)

Solubility in organic solvents

Solvent	Solubility at $20^\circ C$	Solubility at $20^\circ C$	$\frac{ds}{dt}$
Glycerine	Not measurable		
Water	0 01992	0 02000	-0 000016
Aniline	0 02849	0 03033	-0 000368
Amyl alcohol	0 03708	0 03533	+0 00030
Nitrobenzene	0 03708	0 03533	+0 00030
Carbon bisulphide	0 03708	0 03358	+0 00079
Glacial acetic	0 06330	0 06172	+0 000316
Benzene	0 07560	0 07071	+0 000978
Acetone	0 07641	0 07027	+0 001228
Amyl acetate	0 07738	0 07432	+0 00061
Xylene	0 08185	0 07834	+0 000702
Ethyl acetate	0 08516	0 07877	+0 001278
Toluene	0 08742	0 08384	+0 000716
Ethyl alcohol (99 8%)	0 08935	0 08620	+0 00063
Methyl alcohol	0 09449	0 09016	+0 000866
Isobutyl acetate	0 09758	0 09287	+0 000942
Chloroform	no constant value		
Carbon tetrachloride			

(Just, Z phys Ch 1901, 37 359)

Extended investigations have been made by Findlay and Shen (Chem Soc 1912, 101 1465) on the effect of colloids on solubility of H_2 in H_2O . See original article

Hydrogen arsenide
 See Arsenic hydride

Hydrogen peroxide, H_2O_2

Miscible with H_2O . Not stable in conc solution. Aqueous solution gives up its H_2O_2 to ether. Ethereal solution is more stable than an aqueous solution of the same strength, and may be distilled without decomp. Miscible with alcohol.

Very stable in aq solution of various conc if perfectly free from impurity such as compds of heavy metals, etc (Woffenstein, B 1894, 27 3307)

Coefficient of distribution between ether and H_2O determined at 3° , 7° , and 17° with varying quantities (17-5%) of H_2O_2 (Osipoff, C C 1903, II 1265)

As sol in ether as in H_2O . A 50% solution in H_2O still contained about 25% H_2O_2 after

being shaken 6 times with large quantities of fresh ether

Insol in petroleum ether (Bruhl, B 1895, 28 2855)

+H₂O, and +2H₂O Does not solidify at -20° (Wolffenstein, B 1894, 27 3311)

Hydrogen phosphide, gaseous (Phosphine), PH₃

Very slightly absorbed by H₂O

Statements as to solubility in H₂O vary considerably

(a) *Difficultly inflammable gas*—

1 vol H₂O absorbs 0 1122 vol PH₃ (Dyb-kowsky, J B 1866 735)

1 vol H₂O absorbs 0 125 vol PH₃ (H Davy)

(b) *Easily inflammable gas*—

1 vol H₂O absorbs 0 018 vol PH₃ (Gengembre, Crell Ann 1 450)

1 vol H₂O absorbs 0 0214 vol PH₃ (Henry)

1 vol H₂O absorbs 0 025 vol PH₃ (Davy)

1 vol H₂O absorbs 0 125 vol PH₃ (Dalton, Ann Phil 11 7)

1 vol H₂O absorbs 0 255 vol PH₃ (Raymond, Scher J 5 389)

1 vol H₂O dissolves 0 26 vols PH₃ at 17° (Stock, Bottger and Lenger, B 1909, 42 2855)

Sol in conc H₂SO₄ without immediate decomp (Buff, Pogg 16 363)

1 vol 50% H₂SO₄ dissolves 0 05 vol PH₃ (S B and L)

Absorbed by CuSO₄+Aq and by Br (Berthelot)

Absorbed rapidly by Cu₂Cl₂+Aq with formation of Cu₂Cl₂, 2PH₃, and Cu₂Cl₂, 4PH₃ (Ruban, C R 88 581)

1 vol alcohol of 0 85 sp gr absorbs 0 5 vol, 1 vol ether absorbs 2 vols (Graham)

Sol in volatile oils, 1 vol oil of turpentine absorbs 3 25 vols (Graham)

Several varieties of blood absorb PH₃

Hydrogen phosphide, liquid, P H₄

Insol in H₂O Apparently sol in alcohol and oil of turpentine, but solution is very quickly decomp (Thénard, A ch (3) 145)

Hydrogen phosphide, solid, P₄H

Insol in H₂O and alcohol (Leverrier, A ch 60 174)

Insol in all liquids except liquid PH₂ (Thénard, A ch (3) 14 5)

Instantly decomp by HNO₃, or H SO₄+Aq Sol with decomp in alcoholic solution of KOH (Thénard)

Somewhat sol in liquid phosphorus (Buck, Dissert 1904)

P₄H₂ Insol in all solvents (Stock, Bottger and Lenger, B 1909, 42 2851)

P₄H₆ Sol in liquid hydrogen phosphide and molten P There are no other solvents which appreciably dissolve it Insol in liquid PH₃ (S B and L)

Hydrogen selenide, H₂Se

More sol in H₂O than hydrogen sulphide (Berzelius)

Solubility coefficient of H₂Se at t°

t°	Sol Coeff
4	3 77 vols
9 65	3 43
13 2	3 31
22 5	2 70

(Forcrand and Fonzes-Diacon, C R 1902, 134 171)

Sol in cold COCl₂ (Besson, C R 1869, 122 140)

Hydrogen silicide

See Silicon hydride

Hydrogen sulphide, H₂S

(a) *Liquid* Dissolves S on warming, which separates on cooling

(b) *Gas*

1 vol H₂O absorbs 1 08 vols H₂S at 10° (Henry 1803)

1 vol H₂O absorbs 2 53 vols H₂S at 15° (de Sausure Ann Phil 6 340)

1 vol H₂O absorbs 3 vols H₂S at 11° (Gay Lussac and Thénard)

1 vol H₂O absorbs 3 66 vols H₂S at ord temp (Thompson)

1 vol H₂O absorbs 2 5 vols H₂S at ord temp (Dalton)

1 vol H₂O absorbs 4 3706-0 083687t+0 0005213t² vols H₂S at temperatures between 2 and 43 3° (Bunsen and Schonfeld, A 93 26)

At 0° and about 820 mm pressure, 1 ccm H₂O absorbs 100 ccm H S, while only about 4 ccm are absorbed at ord pressure (de Forcrand and Villard, C R 106 1402)

1 vol H₂O at 760 mm pressure and t° absorbs V vols H₂S, reduced to 0° and 760 mm

t	V	t°	V	t°	V
0	4 3706	14	3 3012	28	2 4357
1	4 2874	15	3 2326	29	2 3819
2	4 2053	16	3 1651	30	2 3290
3	4 1243	17	3 0986	31	2 2771
4	4 0442	18	3 0331	32	2 2262
5	3 9652	19	2 9687	33	2 1764
6	3 8872	20	2 9053	34	2 1277
7	3 8103	21	2 8430	35	2 0799
8	3 7345	22	1 7817	36	2 0332
9	3 6596	23	2 7215	37	1 9876
10	3 5858	24	2 6623	38	1 9430
11	3 5132	25	2 6091	39	1 8994
12	3 4415	26	2 5470	40	1 8569
13	3 3708	27	2 4909		

(Schonfeld, A 93 26)

Absorption coefficient of H_2S in H_2O at $0^\circ = 4.6796$ (Prytz and Holst, W Ann 1895, **54**, 137)
 1 l H_2O dissolves 0.1004 mol H_2S at 25° and 760 mm (Polltzer, Z anorg 1909, **64** 145)

Absorption of hydrogen sulphide by H_2O at t°

t°	Coefficient of absorption
0°	4.686
10°	3.520
20°	2.672

[Calc fr data of Fauser (C C 1889, 1 754)]

(Winkler, Z phys Ch 1906, **55** 350)

Absorption of hydrogen sulphide by H_2O at t°

t°	Coefficient of absorption
0	4.621
10	3.362
20	2.554
30	2.014
40	1.642
50	1.376
60	1.176

(Winkler, Z phys Ch 1906, **55** 350)

Solubility of H_2S in H_2O

Layer rich in H_2S	
t	Mols H_2S per 100 mols H_2O
0	0.4
6	0.5
17	0.8
26	1.2
29.5	1.6

Layer rich in H_2O

t°	Mols H_2S per 100 mols H_2O
29.4	96.3
28.5	96.9
26.9	97.3
26.3	97.5
23.8	98.1
23.3	98.1
22.9	98.2
17.2	98.8
13.7	99.1
11.4	99.25
5.3	99.5

(Scheffer, Proc K Ak Amsterdam, 1911, **14** 198)

Difficultly sol in conc H_2SO_4 with decomp
 Instantly decomp by fuming HNO_3
 Solubility of H_2S in $\text{HI} + \text{Aq}$ at 25° and 760 mm

HI Mol per l	H_2S Mol per l
0.00	0.1004
1.01	0.111
1.51	0.113
1.93	0.125
2.65	0.130
2.64	0.138
3.42	0.142
4.38	0.163
5.005	0.165
5.695	0.181
6.935	0.197
* (9.21)	0.267

* Not exact

(Polltzer, Z anorg 1909, **64** 145)

Solubility in acids + Aq

l = value of H_2S dissolved in acid + Aq as determined by titration

lo = value of H_2S dissolved in H_2O as determined by titration
 $t^\circ = 25^\circ$

Acid	l/lo
$\frac{1}{2}\text{-N HCl}$	0.975
$\frac{1}{2}\text{-N H}_2\text{SO}_4$	0.905

(McLauchlan, Z phys Ch 1903, **44** 615)

Less sol in NaCl , or $\text{CaCl}_2 + \text{Aq}$ than in H_2O

Sol in $\text{CdCl}_2 + \text{NH}_4\text{OH} + \text{Aq}$ (Crobaugh, Z anorg 1894, **5** 321)

Solubility in salts + Aq

l = value of H_2S dissolved in salt + Aq as determined by titration

lo = value of H_2S dissolved in H_2O as determined by titration
 $t^\circ = 25^\circ$

Salt + Aq	l/lo	Salt + Aq	l/lo
$\frac{1}{2}\text{-N Na}_2\text{SO}_4$	0.73	$\frac{1}{4}\text{-N Na}_2\text{SO}_4$	0.855
$\frac{1}{2}\text{-N K}_2\text{SO}_4$	0.78	$\frac{1}{4}\text{-N K}_2\text{SO}_4$	0.890
$\frac{1}{2}\text{-N (NH}_4)_2\text{SO}_4$	0.82	$\frac{1}{4}\text{-N (NH}_4)_2\text{SO}_4$	0.91
N NaCl	0.847	$\frac{1}{2}\text{-N NaCl}$	0.930
N KCl	0.853	N NaBr	0.935
N NH_4Cl	0.960	N KBr	0.945
N NaNO_3	0.893	N NH_4Br	1.00
N KNO_3	0.913	N KI	0.98
N NH_4NO_3	0.990		

(McLauchlan, Z phys Ch 1903, **44** 615)

Solubility of H_2S in $NaSH + Aq$
(g mol H_2S dissolved in 1 l)

t°	0.05 g mol $NaSH$ per l	0.1 g mol $NaSH$ per l	0.2 g mol $NaSH$ per l
15		0.132	0.129
25		0.104	0.1035
35	0.082	0.082	
45	0.064		

(Goldschmidt and Larsen, Z phys Ch 1910, 71 449)

At 18° and ord pressure 100 vols alcohol of 0.84 sp gr absorb 606 mols H_2S (de Saussure 1814)

1 vol alcohol absorbs 17 891-0 65598t+0 00661t² vols H_2S between 0 and 22° (Carius)

1 vol alcohol at t° and 760 mm absorbs V vols H_2S reduced to 0° and 760 mm

t°	V	t°	V	t°	V
0	17 891	9	12 523	18	8 225
1	17 242	10	11 992	19	7 814
2	16 606	11	11 475	20	7 415
3	15 983	12	10 971	21	7 030
4	15 373	13	10 480	22	6 659
5	14 776	14	10 003	23	6 300
6	14 193	15	9 539	24	5 955
7	13 623	16	9 088		
8	13 066	17	8 650		

(Carius, A 94 140)

Solubility in alcohol + Aq at 25°

Molecules of C_2H_5OH in 100 molecules C_2H_5OH + H ₂ O	Molecules H_2O in 100 molecules $C_2H_5OH + H_2O$	1/10
0.00	100	1.00
1.60	98 (?)	0.96
5.18	94.82	0.933
9.25	90.75	0.91
23.60	76.40	1.28
47.75	52.25	1.95
* (100)	0	2.16

* Carius

(McLauchlan)

Sol in methyl acetate (Marchand), ether (Higgins)

Insol in caoutchou

Sol in glycerine in less amount than in H_2O . If a certain vol of H_2O dissolves 100 pts H_2S , the same vol of glycerine (1 pt glycerine + 1 pt H_2O) dissolves only 60 pts H_2S , but the solution is very stable. After standing a year there is no appreciable decomp (Lapage, J Pharm (4) 5 256)

According to Lindo (C N 57 173), the solution in glycerine is no more stable than that in H_2O

Sol in CS_2

Solubility in organic substances + Aq
1 = value of H_2S dissolved in organic substance + Aq as determined by titration
10 = value of H_2S dissolved in H_2O as determined by titration
 $t^\circ = 25^\circ$

Solution	1/10
$N-NH_4C_2H_3O_2$	1.09
$N-C_4H_9O_6$	0.944
$3-N-C_4H_9O_6$	0.858
$N-(NH_2)_2CO$	1.02
pure $C_2H_5(OH)_3$	0.863

(McLauchlan, Z phys Ch 1903, 44 615)

Solubility in acetic acid + Aq at 25°

Molecules of CH_3COOH in 100 molecules $CH_3COOH + H_2O$	Molecules of H_2O in 100 molecules $CH_3COOH + H_2O$	1/10
0	100	1.00
8.85	91.15	0.98
16.7	83.30	0.955
21.0	79	1.00
35.5	64.5	1.035
53.5	40.5	1.21
55.7		1.29
67.8	32.2	1.40
81.0	19.0	1.83
98.58	1.42	3.81

(McLauchlan)

Hydrogen persulphide, H_2S_2 or H_2S_8

Decomp by contact with H_2O , in which it is apparently insol. Sol in ether with subsequent decomp. Sol in CS_2 (Thénard, A ch 48 79)

H_2S_2 Quickly decomp by ether, acetic ether, ethyl, or amyl alcohol. H_2S has no action

Conc HCl , or $HC_2H_3O_2 + Aq$ have no action. Sol in a solution of S in CS_2 , and in liquid hydrocarbons

Chloroform dissolves without decomp (Sabatier, C R 100 1346, 1585)

Alkalies, and $K_2S + Aq$ decomp instantly

Decomp by H_2O , dil and conc HCl , conc H_2SO_4 , alkali and alcohol. Sol in alcohol containing HCl but soon decomp in this solution. Miscible in all proportions and without decomp with benzene, ether and CS_2 (Bloch, B 1908, 41 1977)

Formula is H_2S_8 (Rebs, A 246 356)
+ $7H_2O$. Easily decomp by heat (de Forcrand and Villard, C R 106 1402)

Hydrogen trisulphide, H_2S_3

Decomp by H_2O , dil and conc HCl , conc H_2SO_4 , alkali and alcohol. Somewhat sol in alcohol containing HCl , but slowly decomp in this solution. Miscible with ether, benzene and CS_2 , and these solutions are relatively stable (Bloch, B 1908, 41 1974)

Hydrogen telluride, H_2Te

Sl sol in H_2O Decomp in the air (Ernyei, Z anorg 1900, 25 313)

Hydrosulphuric acid, H_2S

See Hydrogen sulphide

Hydrosulphurous acid, H_2SO_2

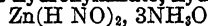
See Hyposulphurous acid

Hydroxylamic acid
Calcium hydroxylamate, $Ca(ONH_2)_2$

Very explosive, decomp by H_2O (Ebler and Schott, J pr 1908, (2) 78 323)

Zinc hydroxylamate $Zn(ONH_2)_2$

Decomp by H_2O (Ebler and Schott)

Zinc hydroxylamate, hydroxylamme,


Very unstable

Insol in abs alcohol (Ebler and Schott)

Hydroxylamine, $NH_2O = NH_2(OH)$

Known only in solution

Sol in alcohol (Lossen, J pr 96 462)

Prepared in free state by de Bruyn

Very deliquescent, and sol in H_2O and alcohol Sl sol or insol in $CHCl_3$, C_6H_6 , ether, or ethyl acetate

Methyl alcohol at 5° dissolves 35%, ethyl alcohol at 15°, 15%, boiling dry ether, 1 2%, boiling ethyl acetate, 1 6% (de Bruyn, R t c 11 18)

Hydroxylamine arsenate, $AsO_4H_3(NH_2O)_3$

Sl sol in cold H_2O , sol in hot H_2O from which it can be cryst (Hofmann, A 1899, 307 331)

Hydroxylamine azouimide

See Azouimide, hydroxylamine

Hydroxylamine bromide, NH_2OH, HBr

Very sol in H_2O , insol in ether by which it is pptd from solution in alcohol (Adams, Am Ch J 1902, 28 205)

$2NH_2OH, HBr$ Easily sol in H_2O , insol in ether and ligroin Sl sol in alcohol (Adams)

Hydroxylamine mercuric bromide hydroxylamine, $2NH_2OH, 2HBr, HgBr_2, 2NH_2OH$

Decomp by H_2O and methyl alcohol

Readily decomp by alkalis (Adams)

Hydroxylamine calcium, $HO Ca ONH_2$

Partially decomp by H_2O at ordinary temp (Hofmann, Z anorg 1898, 16 464)

Hydroxylamine chloride, basic, $NH_2(OH)Cl, NH_2OH$

Sol in H_2O Alcohol precipitates from aqueous solution Insol in ether (Lossen) $2NH_2(OH)Cl, NH_2OH$ Deliquescent, very sol in H_2O , less in alcohol, and insol in ether (Lossen)

Hydroxylamine chloride, $NH_2(OH)Cl$

Not deliquescent Very sol in H_2O and hot ordinary alcohol Sl sol in absolute alcohol Insol in ether (Lossen)

Sol in 1 2 pts H_2O at 17° (Schiff, Z phys Ch 1896, 21 290)

Sp gr of aqueous solution at 17°

% salt	sp gr
40	1 1852
28	1 1260
20	1 0888
14	1 0616
10	1 0437
7	1 0303
5	1 0214
3 5	1 0147

(Schiff, Z phys Ch 1896, 21 290)

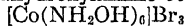
100 pts absolute methyl alcohol dissolve 16 4 pts at 19 75°, 100 pts absolute ethyl alcohol dissolve 4 43 pts at 19 75° (de Bruyn, Z phys Ch 10 783)

Somewhat sol in alcohol (Adams, Am Ch J 1902, 28 204)

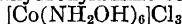
Hydroxylamine mercuric chloride, $NH_2OH, HCl, HgCl_2$

Very sol in H_2O and alcohol Less sol in ether (Adams, Am Ch J 1902, 28 213)

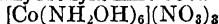
$5(NH_2OH)_2, HCl, 2HgCl_2$ Sol in cold H_2O alcohol and ether More easily sol in methyl alcohol Sol in HCl The slightest trace of alkali causes decomp (Adams)

Hexahydroxylamine cobaltic bromide,


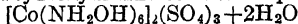
(Werner, B 1905, 38 897)

Hexahydroxylamine cobaltic chloride,


Very stable toward HCl (Werner, B 1905, 38 895)

Hexahydroxylamine cobaltic nitrate,


(Werner)

Hexahydroxylamine cobaltic sulphate,


Easily sol in H_2O (Werner)

Hydroxylamine columbate, $CbO_6N_3H_{10}$

Explosive Sl sol in H_2O (Hofmann, Z anorg 1898, 16 473)

Hydroxylamine dithionate, $(\text{NH}_2\text{OH})_2$,

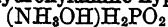
Sol in H_2O , decomp on heating the aq solution (Sabanejeff, Z anorg 1898, 17 485)

Hydroxylamine fluosilicate, $(\text{NH}_3\text{O})_2$, H_2SiF_6 + $2\text{H}_2\text{O}$

Easily sol in H_2O Nearly insol in methyl and abs ethyl alcohol (Ebler, J pr 1908, (2), 78 338)

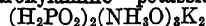
Hydroxylamine fluotitanate, $(\text{NH}_3\text{O})_2$, H_2TiF_6

Sol in H_2O Sl sol in methyl alcohol (Ebler, J pr 1908, (2) 78 340)

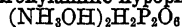
Hydroxylamine hypophosphite,

Very sol in H_2O (Sabanejeff, Z anorg 1898, 17 483)

Sol in H_2O and absolute alcohol Insol in ether (Hofmann and Kohlschutter, Z anorg 1898, 16 469)

Hydroxylamine potassium hypophosphite,

Easily sol in H_2O , decomp on heating, sol in hot abs alcohol (Hofmann and Kohlschutter, Z anorg 1898, 16 468)

Hydroxylamine hypophosphate,

Easily sol in H_2O (Sabanejeff, Z anorg 1898, 17 489)

Hydroxylamine iodide, NH_2OH , HI

Hygroscopic, sol in methyl alcohol Very explosive (Wolfenstein and Groll, B 1901, 34 2419)

Dihydroxylamine iodide, $(\text{NH}_2\text{OH})_2$, HI

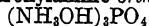
Deliquescent More sol in H_2O , methyl and ethyl alcohol than the tri compound Is decomp when recryst from these solvents Insol in ether (Dunstan, Chem Soc 1896, 69 841)

Trihydroxylamine iodide, $(\text{NH}_2\text{OH})_3$, HI

Deliquescent in moist air Sol in H_2O , methyl and ethyl alcohol Insol in ether (Dunstan)

Hydroxylamine nitrate, $\text{NH}_3(\text{OH})\text{NO}_3$

Very sol in H_2O and absolute alcohol (Lossen)

Hydroxylamine orthophosphate,

Sl sol in cold H_2O (Lossen)

Only sl sol in H_2O (Hofmann, A 1899, 307 330)

Moderately sol in H_2O (Ross, Chem Soc 1906, 90, (2) 19)

Solubility in H_2O

1 g of aqueous solution contains at

0°	10°	
0 012	0 015 g	hydroxylamine phosphate,
20°	30°	
0 019	0 027 g	hydroxylamine phosphate,
40°	50°	
0 040	0 055 g	hydroxylamine phosphate,
60°	70°	
0 077	0 102 g	hydroxylamine phosphate,
80°	90°	
0 133	0 168 g	hydroxylamine phosphate

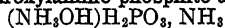
(Adams, Am Ch J 1902, 28 204)

$(\text{NH}_3\text{OH})\text{H}_2\text{PO}_4$ Hygroscopic Aq solution is decomp on heating (Sabanejeff, B 1897, 30 287)

Hydroxylamine phosphite, $(\text{NH}_3\text{OH})_2\text{HPO}_3$

Sol in H_2O and absolute alcohol (Hofmann and Kohlschutter, Z anorg 1898, 16 467)

$(\text{NH}_3\text{OH})\text{H}_2\text{PO}_3$ Sol in H_2O Insol in alcohol (Sabanejeff, Chem Soc 1900, 78, (2), 14)

Hydroxylamine phosphite ammonia,

Sol in H_2O (Sabanejeff, Chem Soc 1900, 78, (2) 14)

Hydroxylamine sodium, NaONH_2

Very hygroscopic (de Bruyn, R t c 1892, 11 18)

Hydroxylamine sulphate, $(\text{NH}_3\text{OH})_2\text{SO}_4$

Easily sol in H_2O Precipitated from concentrated aqueous solution by alcohol (Lossen)

Sol in conc NH_4OH + Aq Insol in alcohol and ether (Preibisch, J pr 1873, (2) 7 480)

Not deliquescent Sol in $\frac{3}{4}$ of its wt of H_2O at 20° (Divers and Haga, Chem Soc 1896, 69 1665)

1 g of aqueous solution contains at

-8°	0°	+10°	
0 307	0 329	0 366 g	hydroxylamine sulphate,
20°	30°	40°	
0 413	0 441	0 482 g	hydroxylamine sulphate,
50°	60°	90°	
0 522	0 560	0 685 g	hydroxylamine sulphate

(Adams, Am Ch J 1902, 28 203)

Dry hydroxylamine sulphate is insol in abs and almost insol in 95% alcohol (Adams)

For double salts, see under sulphuric acid NH_2OH , H_2SO_4 Deliquescent Sol in H_2O (Divers, Chem Soc 1895, 67 226)

Hydroxylamine tungstate, $4\text{NH}_2\text{OH}$, 3WO_3 + $3\text{H}_2\text{O}$

Moderately sol in H_2O (Allen and Gottschalk, Am Ch J 1902, 27 338)

Hydroxylamine uranate, $\text{UO}_4(\text{NH}_3\text{O})_2 + \text{H}_2\text{O}$
Decomp by heat (Hofmann, Z anorg 1897, 15 78)

Hydroxylamine uranate ammonia,
 $\text{UO}_4(\text{NH}_3\text{O})_2, 2\text{NH}_3$
Decomp by H_2O (Hofmann, Z anorg 1897, 15 79)

Hydroxylamine metavanadate, $\text{VO}_3\text{N}_5\text{H}_{15}$
Decomp by moisture (Hofmann, Z anorg 1898, 16 472)

Hydroxylamine metavanadate ammonia,
 $\text{VO}_3\text{H}, (\text{NH}_3\text{O})_2, 2\text{NH}_3$
Easily decomp by H_2O and HCl (Hofmann, Z anorg 1898, 16 471)

Hydroxylamine monosulphonic acid,
 $\text{HONH}(\text{SO}_3\text{H})$
"Sulphazidic acid" of Fremy
"Sulphhydroxylamic acid" of Claus
Sol in H_2O Slowly decomp on boiling (Raschig, A 241 161)

Ammonium hydroxylamine monosulphonate,
 $(\text{OH})\text{HN}, \text{SO}_3\text{NH}_4$
(Sabanéjeff, Z anorg 1898, 17 491)

Monobarium — — —, $(\text{HONHSO}_3)_2\text{Ba} + \text{H}_2\text{O}$
Easily sol in H_2O (Divers and Haga, Chem Soc 55 760)

Dibarium — — —, $\text{Ba}(\text{HONSO}_3)_2\text{Ba} + \text{H}_2\text{O}$
Nearly insol in H_2O , sol in $\text{HCl} + \text{Aq}$ (Divers and Haga, Chem Soc 55 760)

Potassium — — —, $\text{HONH}(\text{SO}_3\text{K})$
"Potassium sulphazidic acid" of Claus
"Potassium sulphazidic acid" of Fremy
Sol in cold H_2O Easily sol in hot H_2O without decomp Insol in alcohol (Raschig, A 241 161)

Hydroxylamine disulphonic acid,
 $\text{HON}(\text{SO}_3\text{H})_2$
"Disulphhydroazotic acid" of Claus
"Sulphazotic acid" of Fremy
Not known in free state (Raschig, A 241 161)

Barium hydroxylamine disulphonate,
 $\text{Ba}_3(\text{NS}_2\text{O}_7)_2 + 4\text{H}_2\text{O}$ and $+8\text{H}_2\text{O}$
Practically insol in H_2O Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Divers, Chem Soc 1894, 65 559)

Barium potassium — — —
 $\text{Ba}_2\text{K}_3\text{H}_4(\text{NS}_2\text{O}_7)_6 + 9\text{H}_2\text{O}$
 $\text{BaKNS}_2\text{O}_7 + \text{H}_2\text{O}$
 $(\text{HO})_2\text{Ba}_2\text{K}_4\text{H}(\text{NS}_2\text{O}_7)_6 + \text{H}_2\text{O}$

$\text{Ba}_3\text{K}_3(\text{NS}_2\text{O}_7)_7 + 14\text{H}_2\text{O}$
 $3\text{Ba}(\text{OH})_2, \text{Ba}_3\text{K}_3(\text{NS}_2\text{O}_7)_7$
Above salts are all ppts (Divers, Chem Soc 1894, 65 561)

Barium sodium hydroxylamine disulphonate,
 $\text{Ba}_2\text{Na}_3(\text{NS}_2\text{O}_7)_6 + 7\text{H}_2\text{O}$
 $\text{Ba}_3\text{Na}_2(\text{NS}_2\text{O}_7)_7 + 7\text{H}_2\text{O}$
 $\text{Ba}_{11}\text{Na}_{15}(\text{NS}_2\text{O}_7)_{17} + 24\text{H}_2\text{O}$
Above salts are ppts (Divers)

Potassium — — —, $\text{HON}(\text{SO}_3\text{K})_2 + 2\text{H}_2\text{O}$
"Potassium disulphhydroxazotate" of Claus (A 158 75) Insol in cold H_2O
Very unstable Very difficultly sol in H_2O , more easily in dil $\text{KOH} + \text{Aq}$ (Raschig, A 241 161)
 $\text{HON}(\text{SO}_3\text{K})_2, \text{KON}(\text{SO}_3\text{K})_2 + \text{H}_2\text{O}$ True composition of potassium sulphazotate of Fremy (Divers and Haga, Chem Soc 1900, 77 432)

Potassium sodium — — —
 $3\text{K}_2\text{NS}_2\text{O}_7, 2\text{Na}_3\text{NS}_2\text{O}_7 + 2\text{H}_2\text{O}$ Sol in H_2O
 $6\text{K}_2\text{NS}_2\text{O}_7, \text{Na}_3\text{NS}_2\text{O}_7, \text{H}_3\text{NS}_2\text{O}_7 + 20\text{H}_2\text{O}$ Sol in H_2O
 $\text{K}_2\text{Na}_{11}\text{H}_3(\text{NS}_2\text{O}_7)_7 + 5\text{H}_2\text{O}$ Less sol in H_2O than the others
 $\text{K}_{11}\text{Na}_5\text{H}_4(\text{NS}_2\text{O}_7)_8 + 9\text{H}_2\text{O}$ Sol in H_2O
 $\text{KNa}_4\text{H}(\text{NS}_2\text{O}_7)_2 + \text{H}_2\text{O}$ Readily sol in H_2O
 $\text{K}_6\text{NaH}_2(\text{NS}_2\text{O}_7)_3 + 2\text{H}_2\text{O}$ Moderately sol in H_2O
 $\text{KNaHNS}_2\text{O}_7 + 3\text{H}_2\text{O}$ Sol in H_2O (Divers, Chem Soc 1894, 65 552)

Potassium strontium — — —,
 $(\text{HO}, \text{Sr})_3\text{NS}_2\text{O}_7, 8(\text{SrKNS}_2\text{O}_7, 2\text{H}_2\text{O})$
Ppt (Divers)

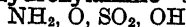
Potassium hydroxylamine disulphonate nitrite, $\text{HON}(\text{SO}_3\text{K})_2, \text{KNO}_2$
Very sl in H_2O (Divers and Haga, Chem Soc 1900, 77 433)
 $\text{K}_5\text{H}(\text{NS}_2\text{O}_7)_2, 3\text{KNO}_2 + \text{H}_2\text{O}$ Decomp by H_2O (Divers and Haga)
 $2\text{KON}(\text{SO}_3\text{K})_2, \text{KNO}_2 + 4\text{H}_2\text{O}$ Very sol in H_2O which decomp it into its constituent salts (Divers and Haga)
 $+6\text{H}_2\text{O}$ Very sol in H_2O which decomp it into its constituent salts (Divers and Haga)
 $2\text{K}_5\text{H}(\text{NS}_2\text{O}_7)_2, 7\text{KNO}_2 + 3\text{H}_2\text{O}$ Decomp by H_2O (Divers and Haga)
 $3\text{K}_5\text{H}(\text{NS}_2\text{O}_7)_2, 7\text{KNO}_2$ Decomp by H_2O (Divers and Haga)

Potassium hydroxylamine disulphonate sodium chloride, $5\text{K}_2\text{HNS}_2\text{O}_7, 8\text{NaCl} + 3\text{H}_2\text{O}$
Decomp by H_2O (Divers, Chem Soc 1894, 65 551)

Sodium hydroxylamine disulphonate,

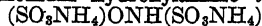
Sol in somewhat more than its own wt of H_2O at 14° (Divers, Chem Soc 1894, 65 546)

$\text{Na}_2\text{HNS}_2\text{O}_7$, $2\text{Na}_2\text{NS}_2\text{O}_7 + 3\text{H}_2\text{O}$ Sol in less than 1.5 pts H_2O at 14° (Divers)

Hydroxylamine isomonosulphonic acid,

Very hygroscopic Sol in water, sol in alcohol (Sommer, B 1914, 47 1226)

[Compare Raschig, A 1887, 241 161]

Hydroxylamine isodisulphonic acid**Ammonium hydroxylamine isodisulphonate,**

3 pts are sol in 2 pts H_2O at 18° Apt to form supersat solutions (Haga, Chem Soc 1906, 89 246)

Dipotassium ———, $\text{K}_2\text{HS}_2\text{O}_7\text{N}$

Only sl sol in cold H_2O Easily sol in boiling H_2O Decomp by hot dil HCl (Raschig, B 1906, 39 246)

6.44 pts are sol in 100 pts H_2O at 16.4°

7.18 " " " " 100 " H_2O " 17.8°

8.05 " " " " 100 " H_2O " 20°

(Haga, Chem Soc 1906, 39 243)

Tripotassium ———, $(\text{SO}_3\text{K})\text{ONK}(\text{SO}_3\text{K}) + 2\text{H}_2\text{O}$

Very sol in H_2O , ppt by alcohol (Haga)

Disodium ———, $(\text{SO}_3\text{Na})\text{ONH}(\text{SO}_3\text{Na})$

Very sol in H_2O , insol in alcohol by which it is ppt from aqueous solution (Haga)

Trisodium ———, $(\text{SO}_3\text{Na})\text{ONNa}(\text{SO}_3\text{Na}) + 2\text{H}_2\text{O}$

Sol in H_2O , ppt by alcohol (Haga)
 $+ 3\text{H}_2\text{O}$ Sol in 1.3 pts H_2O at 20° Less sol in $\text{NaOH} + \text{Aq}$ (Divers, Chem Soc 1894, 65 546)

Hydroxylamine trisulphonic acid**Ammonium hydroxylamine trisulphonate,**

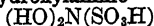
Sol in 0.61 pts H_2O at 16° (Haga, Chem Soc 1904, 85 84)

Potassium ———, $2(\text{SO}_3\text{K})\text{ON}(\text{SO}_3\text{K})_2 + 3\text{H}_2\text{O}$

1 pt is sol in 25.37 pts H_2O at 18° (Haga)

Sodium ———, $(\text{SO}_3\text{Na})\text{ON}(\text{SO}_3\text{Na})_2 + 2\text{H}_2\text{O}$

Sol in 2.84 pts H_2O at 21.5°

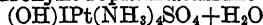
Dihydroxylamine sulphonic acid,

"Sulphazinous acid" of Fremy
 Known only in its salts (Raschig, A 241 161)

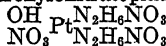
Potassium dihydroxylamine sulphonate,

Not obtained in pure state, forms basic salt $\text{KO} \cdot \text{N}(\text{SO}_3\text{K})_2$, which is quite sol in H_2O , and corresponds to "sulfazite de potasse" of Fremy (A ch (3) 15 421)

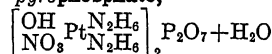
Sol in H_2O , insol in alcohol and ether (Fremy)

Hydroxylodoplatin diamine sulphate,

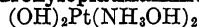
Very sl sol, even in boiling H_2O (Carl-gren, Sv V A F 47 312)

Hydroxylonitratoplatin diamine nitrate,

Sl sol in cold, more easily in hot H_2O
 Very sl sol in H_2O containing HNO_3 (Cleve)

—— pyrophosphate,

Very sl sol in H_2O (Cleve)

Hydroxyloplatinamine hydroxide,

Insol in H_2O Easily sol in dil acids, even $\text{HCl} \cdot \text{H}_2\text{O}_2 + \text{Aq}$ Not decomp by boiling $\text{KOH} + \text{Aq}$ (Gerhardt, Compt Chem 1849 490)

Hydroxyloplatinamine nitrate,

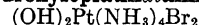
Sl sol in cold, easily in hot H_2O , not attacked by cold $\text{HCl} + \text{Aq}$ (Cleve)

—— oxalate, $(\text{OH})_2\text{Pt}(\text{NH}_3)_2 \text{C}_2\text{O}_4 + \text{H}_2\text{O}$

Sol in hot H_2O

—— sulphate, $(\text{OH})_2\text{Pt}(\text{NH}_3)_2\text{SO}_4 + \text{H}_2\text{O}$

Difficultly sol in H_2O (Cleve)

Hydroxyloplatin diamine bromide,

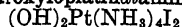
Sl sol, even in boiling H_2O (Carl-gren, Sv V A F 47 320)

—— chloride, $(\text{OH})_2\text{Pt}(\text{NH}_3)_4\text{Cl}_2$

Sol in 206 pts cold, and 49 pts boiling H_2O (Carl-gren, Sv V A F 47 316)

—— chromate, $(\text{OH})_2\text{Pt}(\text{NH}_3)_4\text{Cr}_2\text{O}_7$

Very sl sol in cold or hot H_2O (Carl-gren, Sv V A F 47 319)

Hydroxyloplatindiamine iodide,

Sl sol in hot or cold H_2O (Carlgren)

— **nitrate,** $(\text{OH})_2\text{Pt}(\text{NH}_3)_4(\text{NO}_3)_2$

Sl sol in cold, moderately sol in hot H_2O (Gerhardt, A 76 315)

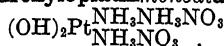
Sol in 343 pts cold, and 38 pts boiling H_2O (Carlgren, Sv V A F 47 318)

— **nitrite,** $(\text{OH})_2\text{Pt}(\text{NH}_3)_4(\text{NO}_2)_2$

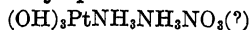
Easily sol in H_2O (Carlgren)

— **sulphate,** $(\text{OH})_2\text{Pt}(\text{NH}_3)_4\text{SO}_4$

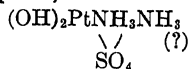
Very sl sol in boiling H_2O (Cleve)
+ $4\text{H}_2\text{O}$ Efflorescent (Carlgren, Sv V A F 47 313)

Hydroxyloplatindiamine nitrate,

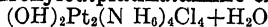
Very easily sol in H_2O (Cleve)

Hydroxyloplatinsemidiamine nitrate,

Easily sol in H_2O (Cleve)

— **sulphate,**

Sol in hot H_2O

Hydroxylodiplatindiamine chloride,

Extremely sl sol in H_2O

— **dichromate,** $(\text{OH})_2\text{Pt}_2(\text{N}_2\text{H}_6)_4(\text{Cr}_2\text{O}_7)_2$

Ppt (Cleve)

— **nitrate,** $(\text{OH})_2\text{Pt}_2(\text{N}_2\text{H}_6)_4(\text{NO}_3)_4$

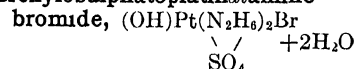
Very sl sol in cold, more easily in hot H_2O (Cleve)

— **phosphate,** $(\text{OH}) \text{Pt}_2(\text{N}_2\text{H}_6)_4(\text{PO}_4\text{H})_2$

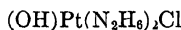
Ppt

— **sulphate,** $(\text{OH})_2\text{Pt}_2(\text{N}_2\text{H}_6)_4(\text{SO}_4)_2 + 2\text{H}_2\text{O}$

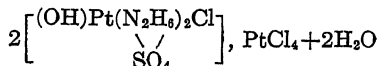
Ppt Nearly insol in H_2O

Hydroxylsulphatoplatindiamine

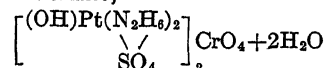
Easily sol in H_2O (Cleve)



— **chloride,**
Moderately sol in cold, very sol in hot H_2O

Hydroxylsulphatoplatindiamine chloroplatinate,

Ppt

— **chromate,**

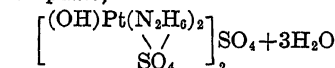
Sl sol in H_2O

— **dichromate,** $\left[(\text{OH})\text{Pt}(\text{N}_2\text{H}_6)_2 \begin{array}{c} \text{SO}_4 \end{array} \right]_2 \text{Cr}_2\text{O}_7$

Sl sol in H_2O

— **nitrate,** $(\text{OH})\text{Pt}(\text{N}_2\text{H}_6)_2 \begin{array}{c} \text{NO}_3 \\ \text{SO}_4 \end{array}$

Sol in hot H_2O

— **sulphate,**

Sl sol in H_2O (Cleve)

Hypoantimonic acid**Calcium hypoantimonate (?)**, $\text{Ca}_2\text{Sb}_3\text{O}_8$

Min Romeite Insol in acids

Potassium hypoantimonate, $\text{K}_2\text{Sb}_2\text{O}_5$

Sol in hot H_2O Sol in 425 pts boiling H_2O (Brandes) Sol in boiling $\text{KOH} + \text{Aq}$ (Berzelius)

$\text{K}_2\text{Sb}_4\text{O}_9$ Ppt

Hypoboric acid**Sodium hypoborate,** NaOBH_3

Deliquescent, decomp in aq solution at room temp Decomp by acids Sl sol in alcohol with decomp (Stock, B 1914, 47 821)

Hypobromous acid, HBrO

Known only in aqueous solution

Solution containing 6.21 pts Br as HBrO in 100 ccm H_2O decomposes at 30° If dilute solution is distilled in vacuo, an acid containing 0.736 pt Br as HBrO in 100 ccm is obtained at first, but the distillate slowly grows weaker Dil solution, stable at ordinary temp, decomp by heating over 60° (Dancer A 125 237)

Barium hypobromite

Known only in solution

Calcium hypobromite bromide

Deliquescent, and sol in H_2O with partial decomp (Berzelius)

Potassium hypobromite, $KBrO$

Known only in solution

Sodium hypobromite

Known only in solution

Strontium hypobromite

Known only in solution

Hypochlorous acid, $HClO$

Miscible with H_2O . Decomposes at 0° in the dark, more rapidly at higher temp or in light. The stronger the solution the more rapid the decomposition. Moderately strong acid may be distilled without any considerable decomp, a stronger acid distilling over at first, and afterwards an acid weaker than the original acid. Very conc or very dil acids decomp by distillation.

Ammonium hypochlorite

Known only in aqueous solution, which decomposes at once

Barium hypochlorite

Known only in solution

Calcium hypochlorite, $Ca(OCl)_2 + 4H_2O$

Deliquescent, and sol in H_2O (Kinzgett, Chem Soc (2) 13 404)

Calcium hypochlorite chloride, etc (bleaching powder), $Ca(OCl)_2$, $CaCl_2$, $Ca(OH)_2 + H_2O$

Not deliquescent. Sol in H_2O . Alcohol does not dissolve out $CaCl_2$. Sol in 20 pts H_2O with a slight residue.

Correct formula is $CaOCl_2$ (Lunge and Schappi, Kraut, A 214 354), $Ca\overset{OCl}{OH}$ (Stahlschmidt, B 8 869), $CaOCl$, Cl (Odling)

$CaCl_2$ is dissolved out by alcohol. Formula = $2Ca\overset{OH}{OCl}CaCl + 2H_2O$ (Dreyfuss, Bull Soc (2) 41 600)

Didymium hypochlorite, $D_1(OCl)_3$

Difficultly sol in H_2O . Easily sol in acids (Frerichs and Smith, A 191 348)

Lanthanum hypochlorite, $La(OCl)_3$

Easily sol in H_2O (Frerichs and Smith)

Lithium hypochlorite, $LiClO$

Known only in solution (Kraut, A 1882, 214 356)

Magnesium hypochlorite

Known only in solution

Potassium hypochlorite, $KClO$

Known only in solution

Silver hypochlorite, $AgClO$

Very sol in H_2O , and decomp very quickly (Stas, Acad R de Belg 35 103)

Sodium hypochlorite, $NaClO$

Known only in solution

Hypoiodic acid, I_2O_4

See Iodine tetroxide

Hypoiodous acid, HOI

Known only in solution which decomp on standing (Taylor, C N 1897, 76 97)

Calcium hypoiodite iodide, $Ca(OI)_2$, CaI_2

Not very unstable (Lunge and Shoch, B 15 1883)

Hyponitric acid, N_2O_4

See Nitrogen tetroxide

Hyponitrous acid, HNO , or better $H_2N_2O_2$

Known only in aqueous solution. Solution is quite stable (van der Plaats, B 10 1507)

Very deliquescent, sol in H_2O and alcohol, sol in ether, chloroform, benzene, sl sol in petroleum ether (Hantzsch and Kaufmann, A 1896, 292 323)

Ammonium hyponitrite, $(NH_4)_2N_2O_2$

Sol in H_2O and in alcohol (Jackson, C N 1893, 68 266)

Ammonium hydrogen hyponitrite, $NH_4HN\cdot O_2$

Easily sol in H_2O . The solid salt slowly decomp at ord temp into ammonia, H_2O and N_2O (Hantzsch and Kaufmann, A 1896, 292 328)

Barium hyponitrite, $Ba\cdot N_2O_2$

Nearly insol in, but gradually decomp by H_2O . Sol in conc acids with evolution of N_2O , but sol in dil $HC_2H_3O_2 + Aq$ without decomp (Zorn, B 15 1007)

+ $4H_2O$ Sl sol in H_2O , insol in alcohol and ether (Kirschner, Z anorg 1898, 16 424)

+ zH_2O Efflorescent (Maquenne, C R 108 1303)

Barium hydrogen hyponitrite, $BaH_2(N_2O_2)_2$

Easily sol in H_2O (Zorn, B 1882, 15 1011)

Calcium hyponitrite, $Ca\cdot N_2O_2 + 4H_2O$

Nearly insol in H_2O , easily sol in dil acids (Maquenne, C R 108 1303)

Sl sol in H_2O , insol in alcohol (Kirschner, Z anorg 1898, 16 426)

Cupric hyponitrite, basic, CuN_2O_2 , $\text{Cu}(\text{OH})_2$

Insol in H_2O , not decomp by hot H_2O
Sol in dil acids and in ammonia. Decomp
by NaOH (Divers, Chem Soc 1899, **75** 121)
Insol in H_2O Sol in dil acids and in
 $\text{NH}_4\text{OH} + \text{Aq}$ (Kirschner, Z anorg 1898,
16 430)

Cuprous hyponitrite, $\text{Cu}_2\text{N}_2\text{O}_2 + 2\text{H}_2\text{O}$

Ppt (Kolotow, C C **1891**, I 1859)
Cannot be formed (Divers, Chem Soc
1899, **75** 121)

Lead hyponitrite, basic, PbN_2O_2 , PbO

Insol in H_2O Sol in dil acids from which
it may be pptd by $\text{NaOH} + \text{Aq}$ or $\text{NH}_4\text{OH} +$
 Aq (Kirschner, Z anorg 1898, **16** 430)

Lead hyponitrite, PbN_2O_2

Insol in H_2O , sol in dil acids from which
it may be pptd by $\text{NaOH} + \text{Aq}$ or $\text{NH}_3 + \text{Aq}$
(Kirschner)

Mercuric hyponitrite, basic, 3HgO , $\text{HgN}_2\text{O}_2 + 3\text{H}_2\text{O}$

Ppt Sl sol even in boiling dil HNO_3
Scarcely sol in conc, very sol in warm dil
 HCl (Ray, Chem Soc 1897, **71** 349)

Mercurous hyponitrite, $\text{Hg}_2\text{N}_2\text{O}_2$

Sol in dil HNO_3 with slow decomp (Ray,
Chem Soc 1907, **91** 1404)

Mercuric hyponitrite, HgN_2O_2

Sol in HCl , and in $\text{NaCl} + \text{Aq}$
Sl sol in very dil alkali (Divers, Chem
Soc 1899, **75** 119)

Potassium hyponitrite, $\text{K}_2\text{N}_2\text{O}_2$

Sol in H_2O (van der Plaats)
Stable when dry
Sol in 90% alcohol, and sl sol in abs
alcohol (Divers, Chem Soc 1899, **75** 103)

**Silver hyponitrite (nitrosyl silver),
 $\text{Ag}_2\text{N}_2\text{O}_2$**

Insol in H_2O Easily sol in dil $\text{HNO}_3 +$
 Aq or $\text{H}_2\text{SO}_4 + \text{Aq}$

Decomp by H_3PO_4 , H_2S , and boiling
 $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (van der Plaats)

Insol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, sol in NH_4OH
 $+ \text{Aq}$ (Divers, C N **23** 206)

Sol in dil HNO_3 and H_2SO_4 and in conc
 $\text{NH}_4\text{OH} + \text{Aq}$, decomp by HCl (Kirsch-
ner, Z anorg 1898, **16** 431)

Sodium hyponitrite, $\text{Na}_2\text{N}_2\text{O}_2 + 6\text{H}_2\text{O}$

Sol in H_2O (van der Plaats)

Strontium hyponitrite, SrN_2O_2

Easily sol in H_2O (Roederer, Bull
Soc 1906, (3) **35** 715)
 $+ 5\text{H}_2\text{O}$ Nearly insol in H_2O , easily sol

in dil acids (Maquenne, C R **108** 1303)

Sl sol in H_2O , insol in alcohol (Kirsch-
ner, Z anorg 1898, **16** 426)

**Hypophosphomolybdic acid, Mo_6O_8 ,
 $7\text{H}_2\text{PO}_2 + 3\text{H}_2\text{O}$**

Very sl sol in cold H_2O Scarcely sol
in cold dil H_2SO_4 Sol in cold conc H_2SO_4
Sol in warm conc HCl Warm HNO_3
oxidizes forming clear solution (Mawrow,
Z anorg 1901, **28** 164)

**Ammonium hypophosphomolybdate,
 $2(\text{NH}_4)_2\text{O}$, $2\text{H}_3\text{PO}_2$, $8\text{MoO}_3 + 2\text{H}_2\text{O}$**

Not very sol in cold H_2O , readily in hot
 H_2O (Gibbs, Am Ch J **3** 402)

Hypophosphoric acid, $\text{H}_4\text{P}_2\text{O}_6$

Very deliquescent, and sol in the least
amount of H_2O (Joly, C R **101** 1058)
100 cc $\text{H}_4\text{P}_2\text{O}_6 + \text{Aq}$, containing 4 1% P_2O_4
has sp gr = 1 036

100 cc $\text{H}_4\text{P}_2\text{O}_6 + \text{Aq}$, containing 12 3%
 P_2O_4 has sp gr = 1 122

(Salzer, A 1878, **194** 28)

$+ \text{H}_2\text{O}$ (Sanger, A **232** 14)

Does not exist (Joly)

$+ 2\text{H}_2\text{O}$ Appears to be the only stable
hydrate between 0° and 60°

Sanger's hydrate, $\text{H}_4\text{P}_2\text{O}_6 + \text{H}_2\text{O}$, and
Joly's anhydride could not be obtained
(Rosenheim, B 1908, **41** 2711)

**Aluminum hypophosphate, $\text{Al}_4(\text{P}_2\text{O}_6)_3 +$
 $23\text{H}_2\text{O}$**

Easily sol in mineral acids Sol in $\text{Na}_4\text{P}_2\text{O}_6$
 $+ \text{Aq}$ (Palm, Dissertation, Rostock, **1890**)

**Ammonium hypophosphate, $(\text{NH}_4)_4\text{P}_2\text{O}_6 +$
 H_2O**

Sol in 30 pts H_2O (Salzer, A **194** 32)

**Ammonium hydrogen hypophosphate,
 $(\text{NH}_4)_2\text{H}_2\text{P}_2\text{O}_6$**

Sol in 14 pts cold, and 4 pts boiling H_2O
(Salzer, A **194** 32)

**Ammonium trihydrogen hypophosphate,
 $\text{NH}_4\text{H}_3\text{P}_2\text{O}_6$**

Sol in H_2O (Salzer, A **211** 1)

**Ammonium magnesium hypophosphate,
 $(\text{NH}_4)_2\text{MgP}_2\text{O}_6 + 6\text{H}_2\text{O}$**

Precipitate (Salzer, A **232** 114)

Barium hypophosphate, $\text{Ba}_2\text{P}_2\text{O}_6$

Very slightly sol, but not wholly insol in
 H_2O Very slightly sol in acetic acid, but
more soluble in hydrochloric, and hypophos-
phoric acids (Salzer, A **194** 34)

**Barium hydrogen hypophosphate, $\text{BaH}_2\text{P}_2\text{O}_6$
 $+ 2\text{H}_2\text{O}$**

Soluble in about 1000 pts H_2O Solution
decomposes by heating (Salzer, A **194** 34)

Bismuth hypophosphate, $\text{Bi}_4(\text{P}_2\text{O}_6)_3 + 8\frac{1}{2}\text{H}_2\text{O}$ Completely sol in $\text{HCl} + \text{Aq}$, also in warm $\text{HNO}_3 + \text{Aq}$ Insol in boiling dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Sl sol by long boiling with conc H_2SO_4 (Palm, Rostock, 1890) Cadmium hypophosphate, $\text{Cd}_2\text{P}_2\text{O}_6 + 2\text{H}_2\text{O}$ Insol in H_2O Sol in dil acids (Draue, B 21 3403) Cadmium potassium hydrogen hypophosphate, $\text{CdK}_3(\text{H}_2\text{P}_2\text{O}_6)_2 + 2\frac{1}{2}\text{H}_2\text{O}$ (Bausa, Z anorg 1894, 6 147) Cadmium sodium hypophosphate, $\text{CdNa}_2\text{P}_2\text{O}_6 + 6\text{H}_2\text{O}$ Insol in H_2O, but decomp thereby Sol in dil acids (Draue) Calcium hypophosphate, $\text{Ca}_2\text{P}_2\text{O}_6 + 2\text{H}_2\text{O}$ Insol in H_2O, difficultly sol in $\text{HC}_2\text{H}_3\text{O}_2$, easily sol in $\text{H}_4\text{P}_2\text{O}_6$, or $\text{HCl} + \text{Aq}$ (Salzer, A 194 36) Calcium hydrogen hypophosphate, $\text{CaH}_2\text{P}_2\text{O}_6 + 6\text{H}_2\text{O}$ Sol in 60 pts H_2O (Salzer, A 232 114) Chromic hypophosphate, $\text{Cr}_4(\text{P}_2\text{O}_6)_2 + 34\text{H}_2\text{O}$ Sol in $\text{HCl} + \text{Aq}$ on sl warming, also in $\text{HNO}_3 + \text{Aq}$ Not completely sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$, but completely sol in conc (Palm, Dissertation, Rostock, 1890) Cobaltous hypophosphate, $\text{Co}_2\text{P}_2\text{O}_6 + 8\text{H}_2\text{O}$ Insol in H_2O Easily sol in acids (Draue, B 21 3403) Cobaltous potassium hypophosphate, $\text{CoK}_2\text{P}_2\text{O}_6 + 5\text{H}_2\text{O}$ Ppt (Bausa, Z anorg 1894, 6 156) Cobaltous potassium hydrogen hypophosphate, $\text{CoH}_2\text{P}_2\text{O}_6, 3\text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 15\text{H}_2\text{O}$ Cobaltous sodium hypophosphate, $\text{CoNa}_2\text{P}_2\text{O}_6 + 1\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O, but decomp thereby Sol in dil acids (Draue, B 21 3403) Cupric hypophosphate, $\text{Cu}_2\text{P}_2\text{O}_6 + 6\text{H}_2\text{O}$ Insol in H_2O Sol in dil acids (Draue, B 21 3403) Ppt (Bausa, Z anorg 1894, 6 145) Cupric potassium hydrogen hypophosphate, $\text{CuH}_2\text{P}_2\text{O}_6, 3\text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 15\text{H}_2\text{O}$ Ppt (Bausa, Z anorg 1894, 6 152) Glucinum hypophosphate, $\text{Gl}_2\text{P}_2\text{O}_6 + 7\text{H}_2\text{O}$ Insol in H_2O Moderately sol in all mineral acids (Palm, Rostock, 1890) $+ 3\text{H}_2\text{O}$ (Rammelsberg)	Iron (ferrous) hypophosphate, $\text{Fe}_2\text{P}_2\text{O}_6 + 4\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O Sol in cold $\text{HCl} + \text{Aq}$ Decomp by hot $\text{HNO}_3 + \text{Aq}$ into $\text{Fe}_4(\text{P}_2\text{O}_6)_3$ Insol in $\text{HNO}_3 + \text{Aq}$ Insol in boiling dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Somewhat sol in cold H_2SO_4, but a ppt separates out on heating (Palm, Rostock, 1890) Iron (ferric) hypophosphate, $\text{Fe}_4(\text{P}_2\text{O}_6)_3 + 20\text{H}_2\text{O}$ Easily sol in $\text{HCl} + \text{Aq}$ Wholly insol in HNO_3, and dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Completely sol in conc H_2SO_4 by warming a short time, but a ppt separates out on boiling (Palm) Lead hypophosphate, $\text{Pb}_2\text{P}_2\text{O}_6$ Insol in H_2O, $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_4\text{P}_2\text{O}_6 + \text{Aq}$, sol in dil $\text{HNO}_3 + \text{Aq}$ (Salzer) Lithium hypophosphate, $\text{Li}_4\text{P}_2\text{O}_6 + 7\text{H}_2\text{O}$ Very sl sol in H_2O (Salzer, A 194 28) Sol in 120 pts H_2O at ord temp (Rammelsberg, J pr (2) 45 153) $\text{Li}_2\text{H}_2\text{P}_2\text{O}_6 + 2\text{H}_2\text{O}$ Deliquescent (Rammelsberg) Magnesium hypophosphate, $\text{Mg}_2\text{P}_2\text{O}_6 + 12\text{H}_2\text{O}$ Sol in 15,000 pts H_2O, sl sol in acetic, easily in hypophosphoric, or mineral acids (Salzer, A 232 114) $+ 24\text{H}_2\text{O}$ (Rammelsberg) Magnesium hydrogen hypophosphate, $\text{MgH}_2\text{P}_2\text{O}_6 + 4\text{H}_2\text{O}$ Sol in 200 pts H_2O (Salzer, A 232 114) Manganese hypophosphate, $\text{Mn}_2\text{P}_2\text{O}_6 + 2\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O, sol in mineral acids, insol in acetic acid (Palm, Dissertation, Rostock, 1890) Manganous potassium hydrogen hypophosphate, $\text{MnH}_2\text{P}_2\text{O}_6, \text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 3\text{H}_2\text{O}$ Ppt (Bausa, Z anorg 1894, 6 150) Manganous sodium hypophosphate, $\text{Mn}_2\text{P}_2\text{O}_6, \text{Na}_4\text{P}_2\text{O}_6 + 11\text{H}_2\text{O}$ Insol in H_2O, sol in mineral acids (Palm) Nickel hypophosphate, $\text{Ni}_2\text{P}_2\text{O}_6 + 12\text{H}_2\text{O}$ Insol in H_2O Sol in dil acids (Draue, B 21 3401) Nickel potassium hypophosphate, $\text{NiK}_2\text{P}_2\text{O}_6 + 6\text{H}_2\text{O}$ Ppt (Bausa, Z anorg 1894, 6 155) Nickel potassium hydrogen hypophosphate, $\text{NiH}_2\text{P}_2\text{O}_6, 3\text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 15\text{H}_2\text{O}$ Ppt (Bausa, Z anorg 1894, 6 144)
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Nickel sodium hypophosphate, $\text{NiNa}_2\text{P}_2\text{O}_6 + 12\text{H}_2\text{O}$

Insol in H_2O , but decomp thereby Easily sol in dil acids (Draue)

Potassium hypophosphate, $\text{K}_4\text{P}_2\text{O}_6 + 8\text{H}_2\text{O}$

Sol in $\frac{1}{4}$ pt H_2O , insol in alcohol (Salzer, A 211 1)

Potassium hydrogen hypophosphate, $\text{K}_2\text{HP}_2\text{O}_6 + 3\text{H}_2\text{O}$

Sol in $\frac{1}{2}$ pt H_2O (Salzer, A 211 1)

Potassium dihydrogen hypophosphate, $\text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 3\text{H}_2\text{O}$, and $+2\text{H}_2\text{O}$

Sol in 3 pts cold, and 1 pt boiling H_2O (Salzer, A 211 1)

Potassium trihydrogen hypophosphate, $\text{KH}_3\text{P}_2\text{O}_6$

Sol in $1\frac{1}{2}$ pts cold, and $\frac{1}{2}$ pt hot H_2O (Salzer, A 211 1)

Potassium pentahydrogen dihypophosphate, $\text{K}_3\text{H}(\text{P}_2\text{O}_6)_2 + 2\text{H}_2\text{O}$

Sol in $2\frac{1}{2}$ pts cold, and $\frac{4}{5}$ pt boiling H_2O (Salzer, A 211 1)

Potassium sodium hypophosphate, $\text{Na}_2\text{K}_2\text{P}_2\text{O}_6 + 9\text{H}_2\text{O}$

Sol in about 25 pts cold, and 3 pts hot H_2O (Bausa, Z anorg 1894, 6 158)

Potassium zinc hydrogen hypophosphate, $\text{ZnH}_2\text{P}_2\text{O}_6 \cdot 3\text{K}_2\text{H}_2\text{P}_2\text{O}_6 + 15\text{H}_2\text{O}$

Ppt (Bausa, Z anorg 1894, 6 148)

Silver hypophosphate, $\text{Ag}_4\text{P}_2\text{O}_6$

Sl sol in H_2O Easily sol in HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$ Very sl sol in $\text{H}_4\text{P}_2\text{O}_6 + \text{Aq}$ (Salzer, A 232 114)

Sodium hypophosphate, $\text{Na}_4\text{P}_2\text{O}_6 + 10\text{H}_2\text{O}$

Sol in about 30 pts cold, much more easily in hot H_2O (Salzer)

Sodium hydrogen hypophosphate, $\text{Na}_2\text{HP}_2\text{O}_6 + 9\text{H}_2\text{O}$

Sol in 22 pts H_2O (Salzer)

Sodium dihydrogen hypophosphate, $\text{Na}_2\text{H}(\text{P}_2\text{O}_6) + 6\text{H}_2\text{O}$

Sol in 45 pts cold, and 5 pts boiling H_2O More sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Insol in alcohol (Salzer, A 187 331)

Sodium trihydrogen hypophosphate, $\text{NaH}_3\text{P}_2\text{O}_6$

Sol in H_2O (Salzer, A 211 1)

Sodium trihydrogen dihypophosphate,

Very efflorescent Sol in 15 pts cold H_2O (Salzer, A 211 1)

Thallium hypophosphate, $\text{Tl}_4\text{P}_2\text{O}_6$

Sl sol in H_2O Decomp in sunlight (Joly, C R 1894, 118 650)

Thallium hydrogen hypophosphate, $\text{Tl}_2\text{H}_2\text{P}_2\text{O}_6$

Sol in H_2O (Joly)

Zinc hypophosphate, $\text{Zn}_2\text{P}_2\text{O}_6 + 2\text{H}_2\text{O}$

Insol in H_2O Easily sol in dil acids (Draue, B 21 3403)

Hypophosphorosomolybdic acid

Barium hypophosphorosomolybdate,

$\text{BaO}, \text{Mo}_7\text{O}_{20}, 3\text{H}_3\text{PO}_4 + 12\text{H}_2\text{O}$
Very sol in H_2O and $\text{BaCl}_2 + \text{Aq}$ (Mawrow, Z anorg 1902, 29 156)

Hypophosphorous acid, H_3PO_2

Very sol in H_2O and alcohol (Rose)

Aluminum hypophosphite

Not deliquescent, but very sol in H_2O (Rose, Pogg 12 86)

Ammonium hypophosphite, $\text{NH}_4\text{H}_2\text{PO}_2$

Sol in H_2O , less deliquescent than the potassium salt (Wurtz, A ch (3) 7 193)

Very sol in absolute alcohol (Dulong)
Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Barium hypophosphite, $\text{Ba}(\text{H}_2\text{PO}_2)_2 + \text{H}_2\text{O}$

Sol in 3 5 pts cold, and 3 pts boiling H_2O
Insol in alcohol (Wurtz, A 43 323)

Bismuth hypophosphite, $\text{Bi}(\text{H}_2\text{PO}_2)_3$

Ppt (Vanino, J pr 1906, (2) 74 150)
 $+ \text{H}_2\text{O}$ Sol in acid $\text{Bi}(\text{NO}_3)_3 + \text{Aq}$ (Haga, Chem Soc 1895, 67 229)

Cadmium hypophosphite

Sol in H_2O (Rose, Pogg 12 91)

Calcium hypophosphite, $\text{Ca}(\text{PH}_2\text{O}_2)_2$

Sol in 6 pts cold, and not much more sol in hot H_2O Insol in strong, very sol in weak alcohol (Rose, Pogg 9 361)

Calcium cobaltous hypophosphite

$2\text{Ca}(\text{PH}_2\text{O}_2)_2, \text{Co}(\text{PH}_2\text{O}_2)_2 + 2\text{H}_2\text{O}$
Efflorescent (Rose, Pogg 12 295)

Calcium ferrous hypophosphite

Sol in H_2O (Rose, Pogg 12 294)

Cerous hypophosphite, $\text{Ce}(\text{PH}_2\text{O}_2)_3 + \text{H}_2\text{O}$

Sl sol in H_2O (Rammelsberg, B A B 1872 437)

Chromium hypophosphite, $\text{Cr}_2(\text{OH})_2(\text{H}_2\text{PO}_2)_4$

Anhydrous Insol in H_2O or dil acids
+ $3\text{H}_2\text{O}$ Sol in H_2O (Wurtz, A ch (3) 16 196)

Cobaltous hypophosphite, $\text{Co}(\text{PH}_2\text{O}_2)_2 + 6\text{H}_2\text{O}$

Efflorescent Easily sol in H_2O (Rose, Pogg 12 87)

Cupric hypophosphite, $\text{Cu}(\text{PH}_2\text{O}_2)_2$

Very sol in H_2O , but very easily decomp on heating (Wurtz, A ch (3) 16 199)

Glucinum hypophosphite

Sol in H_2O (Rose, Pogg 12 86)

Iron (ferrous) hypophosphite, $\text{Fe}(\text{PH}_2\text{O}_2)_2 + 6\text{H}_2\text{O}$

Sol in H_2O (Rose, Pogg 12 294)

Iron (ferric) hypophosphite

Difficultly sol in H_2O or acids Decomp on boiling Sl sol in $\text{H}_3\text{PO}_2 + \text{Aq}$ (Rose)

Lead hypophosphite, $\text{Pb}(\text{PH}_2\text{O}_2)_2$

Difficultly sol in cold, more easily in hot H_2O Insol in alcohol (Rose, Pogg 12 288)

Lithium hypophosphite, $\text{LiH}_2\text{PO}_2 + \text{H}_2\text{O}$

Sol in H_2O (Rammelsberg, B A B 1872 416)

Magnesium hypophosphite, $\text{Mg}(\text{PH}_2\text{O}_2)_2 + 6\text{H}_2\text{O}$

Efflorescent in dry air Sol in H_2O (Rose)

Manganous hypophosphite, $\text{Mn}(\text{H}_2\text{PO}_2)_2 + \text{H}_2\text{O}$

Permanent Very sol in H_2O (Wurtz, A ch (3) 16 195)

Mercurous hypophosphite nitrate,

$\text{Hg}_2\text{H}_2\text{PO}_2, \text{HgNO}_3 + \text{H}_2\text{O}$

Sl sol in H_2O with rapid decomp
Sol in hot conc HNO_3 (Haga, Chem Soc 1895, 67 227)

Nickel hypophosphite, $\text{Ni}(\text{PH}_2\text{O}_2)_2 + 6\text{H}_2\text{O}$

Efflorescent Sol in H_2O (Rammelsberg, B 5 494)

Nickel hypophosphite ammonia,

$\text{Ni}(\text{HPO}_2)_2, 6\text{NH}_3$
(Ephraim, B 1913, 46 3111)

Platinous hypophosphite $\text{Pt}(\text{PH}_2\text{O}_2)_2$

Insol in H_2O , HCl , $\text{H}_2\text{SO}_4 + \text{Aq}$, etc Sol in $\text{HNO}_3 + \text{Aq}$ Insol in alcohol (Engel, C R 91 1068)

Potassium hypophosphite, KH_2PO_2

Very deliquescent Very sol in H_2O sol in weak, less in absolute alcohol Insol in ether (Wurtz, A ch (3) 7 192)
Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sodium hypophosphite, $\text{NaH}_2\text{PO}_2 + \text{H}_2\text{O}$

Very deliquescent Somewhat less sol than the K salt Very sol in absolute alcohol (Dulong)

Very sol in H_2O , and somewhat less sol in alcohol (Rammelsberg, B A B 1872 412)
Sl sol in liquid NH_3 (Franklin, Am Ch. J 1898, 20 829)

Strontium hypophosphite, $\text{Sr}(\text{PH}_2\text{O}_2)_2$

Very easily sol in H_2O (Dulong)
Insol in alcohol (Wurtz)

Thallous hypophosphite, TlH_2PO_2

Sol in H_2O (Rammelsberg, B A B 1872 492)

Uranyl hypophosphite, $\text{UO}_2(\text{H}_2\text{PO}_2)_2 + \text{H}_2\text{O}$

Sl sol in H_2O Easily sol in HCl , or $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Chem Soc (2) 11 1)

Vanadyl hypophosphite, $\text{V}_2\text{O}_5(\text{H}_2\text{PO}_2)_4 + 2\text{H}_2\text{O}$

Insol in cold, sl sol in hot H_2O
Sol in hot dil HCl , H_2SO_4 and HNO_3 and in warm conc HCl and H_2SO_4
Insol in oxalic acid (Mawrow, Z anorg 1907, 55 147)

Zinc hypophosphite, $\text{Zn}(\text{H}_2\text{PO}_2)_2 + \text{H}_2\text{O}$

Sol in H_2O
+ $6\text{H}_2\text{O}$ Efflorescent (Wurtz, A ch (3) 16 195)

Zirconium hypophosphite, $\text{Zr}(\text{OPH}_2\text{O})_4 + \text{H}_2\text{O}$

Sensitive to light Insol in alcohol, by which it is pptd from aqueous solution (Hauser, Z anorg 1913, 84 93)

Hypophosphotungstic acid

Potassium hypophosphotungstate, $4\text{K}_2\text{O}, 6\text{H}_3\text{PO}_2, 18\text{WO}_3 + 7\text{H}_2\text{O}$

Precipitate Sol in hot, very sl sol in cold H_2O (Gibbs, Am Ch J 5 361)

Hyposulpharsemous acid

Hyposulpharsenites, $\text{As}_2\text{S}_2, \text{M}_2\text{S}$

Difficultly sol in H_2O (Berzelius)
Do not exist (Nilson, B 4 989)

Hyposulphuric acid, $\text{H}_2\text{S}_2\text{O}_6$

See Dithionic acid

Hyposulphurous acid, $\text{H}_2\text{S}_2\text{O}_3$ See **Thiosulphuric acid****Hyposulphurous (Hydrosulphurous) acid, H_2SO_2**

Known only in dil aqueous solution, which decomposes rapidly

Correct formula is $\text{H}_2\text{S}_2\text{O}_4$, according to Bernthsen (A 211 285)More sol in alcohol than in H_2O (Rossler, Arch Pharm (3) 25 845)**Ammonium hyposulphite, $(\text{NH}_4)_2\text{S}_2\text{O}_4$**

Known only in solution (Prudhomme, Bull Soc 1899, (3) 21 326)

Ammonium hydrogen hyposulphite, $\text{NH}_4\text{HS}_2\text{O}_4$

Known only in solution (Prudhomme, Bull Soc 1899, (3) 21 326)

Calcium hyposulphite, $\text{CaS}_2\text{O}_4 + 1.5\text{H}_2\text{O}$ Difficultly sol in H_2O (Bazlen, B 1905, 38 1059)**Magnesium hyposulphite, MgS_2O_4**

(Bilvy, C R 1905, 140 936)

Potassium hyposulphite, $\text{K}_2\text{S}_2\text{O}_4 + 3\text{H}_2\text{O}$

Easily decomp

Insol in alcohol (Bazlen, B 1905, 38 1058)

Sodium hyposulphite, $\text{Na}_2\text{S}_2\text{O}_4$ *Anhydrous* Stable in dry air (Bazlen, B 1905, 38 1061)100 g H_2O dissolve 24.1 g of the anhydrous salt at 20° (Jellinek, Z anorg 1911, 70 130) $+2\text{H}_2\text{O}$ Solubility in H_2O

11.6 g of the solution contain at

 20° 1.91 g $\text{Na}_2\text{S}_2\text{O}_4$ 10° 1.67 g " 1° 1.49 g "

(Jellinek, Z anorg 1911, 70 128)

Insol in alcohol (Bazlen, B 1905, 38 1058)

Sodium zinc hyposulphite, $\text{Na}_2\text{S}_2\text{O}_4, \text{ZnS}_2\text{O}_4$ Less sol in H_2O than ZnS_2O_4 (Bazlen, B 1905, 38 1060)**Strontium hyposulphite, SrS_2O_4** Sol in H_2O (Moissan, C R 1902, 135 653)**Zinc hyposulphite, ZnS_2O_4** Easily sol in H_2O , about 1 pt in 7 pts H_2O . Forms supersat solutions readily (Bazlen, B 1905, 38 1060)**Hypovanadic acid, $\text{V}_2\text{O}_2(\text{OH})_4$** See **Vanadium tetrhydroxide****Hypovanadic acid, $\text{H}_2\text{V}_4\text{O}_9$** See **Vanadous acid****Hypovanadic acid with vanadic acid**See **Vanadicovanadic acid****Imidodimetaarsenic acid****Ammonium imidodimetaarsenate,** $(\text{NH}_4\text{O}_2\text{As}_2\text{O}_5\text{NH})$

(Rosenheim and Jacobsohn, Z anorg 1906, 50 307)

Imidochromic acid**Ammonium imidochromate,** $\text{NECrO}(\text{ONH}_4)_2$ Very sol in H_2O with decomp (Rosenheim and Jacobsohn, Z anorg 1906, 50 299)**Ammonium potassium imidochromate,** $\text{NH}_4\text{KCrO}_5\text{NH}$ Decomp on solution in H_2O (Rosenheim, Z anorg 1906, 50 302)**Imidodimidochromic acid****Ammonium imidodimido chromate,** $\text{NH}[\text{CrO}(\text{NH})\text{ONH}_4]_2$

(Rosenheim and Jacobsohn, Z anorg 1906, 50 303)

Imidomolybdic acid**Potassium imidomolybdate, $\text{NKMbO}(\text{OK})_2$**

Unstable in air

Very hygroscopic Very sol in H_2O (Rosenheim, Z anorg 1906, 50 305)**Dimidodiphosphorhamic acid,** $\text{HO}-\text{PO} < \begin{smallmatrix} \text{NH} \\ \text{NH} \end{smallmatrix} > \text{PO}-\text{NH}_2$ Correct formula for *pyrophosphotriamic acid* of Gladstone (Mente, A 248 241)**Imidodiphosphoric acid,** $\text{HO}-\text{PO} < \begin{smallmatrix} \text{O} \\ \text{NH} \end{smallmatrix} > \text{PO}-\text{OH}$ Correct name for *pyrophosphamic acid* (Mente, A 248 251)**Barium imidodiphosphate, $\text{Ba} \begin{smallmatrix} \text{O} \\ \text{O} \end{smallmatrix} \begin{smallmatrix} \text{PO} \\ \text{PO} \end{smallmatrix} > \text{NH}$** Sl sol in H_2O (Mente, A 248 243)**Barium imidodiphosphate, basic,** $\text{Ba} \begin{smallmatrix} \text{O} \\ \text{O} \end{smallmatrix} \begin{smallmatrix} \text{PO} \\ \text{PO} \end{smallmatrix} > \text{N}-\text{Ba}-\text{N} \begin{smallmatrix} \text{PO}-\text{O} \\ \text{PO}-\text{O} \end{smallmatrix} \text{Ba} +$ $2\text{H}_2\text{O}$

Ppt (Mente)

Ferric imidodiphosphate

Sl sol in conc acids (Mente, A 248 241)

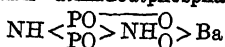
Silver imidodiphosphate, $\text{Ag}_3\text{H}_2\text{P}_2\text{NO}_6$

Insol in H_2O (Stokes, Am Ch J 1896, 18 660)

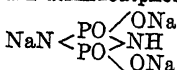
$\text{Ag}_4\text{HP}_2\text{NO}_6$ Ppt (Stokes)

Dimidodiphosphoric acid,

Correct name for *pyrophosphodiamic acid* (Mente, A 248 241)

Barium dimidodiphosphate,

Sl sol in dil acids (Mente, A 248 244)

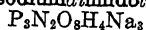
Sodium dimidodiphosphate, basic,

Sl sol in H_2O (Mente, A 248 245)

Dimidotriphosphoric acid**Silver dimidotriphosphate, $\text{Ag}_3\text{H}_4\text{P}_3\text{N}_2\text{O}_8$**

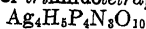
Insol in H_2O Very sol in $\text{NH}_4\text{OH} + \text{Aq}$
Rather sl sol in dil HNO_3 (Stokes, Am Ch J 1896, 18 657)

$\text{Ag}_5\text{H}_2\text{P}_3\text{N}_2\text{O}_8$ Insol in H_2O Very sol in $\text{NH}_4\text{OH} + \text{Aq}$
Decomp by HNO_3 (Stokes)

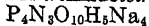
Trisodiumdimidodiphosphate,

Sol in H_2O

Insol in alcohol (Stokes)

Trumidotetraphosphoric acid**Silver trumidotetraphosphate**

Ppt (Stokes, Am Ch J 1898, 20 755)

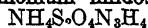
Sodium trumidotetraphosphate,

Easily sol in H_2O , insol in sodium acetate solution and dil alcohol (Stokes, Am Ch J 1898, 20 754)

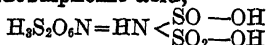
Imidosulphamide, $\text{NH}_2\text{SO}_2\text{NH}\text{SO}_2\text{NH}_2$

"Sulphamide" of Traube

Very sol in H_2O with decomp appreciably sol in cold, easily sol in hot methyl and ethyl alcohol Insol in C_6H_6 , and CHCl_3 Sl sol in ether, cold and hot acetic ether and glacial acetic acid Moderately stable toward alkalis (Hantzsch and Stuer, B 1905, 38 1022)

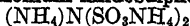
Ammonium imidosulphamide,

(Hantzsch and Stuer)

Imidosulphonic acid,

Ammondisulphonic acid of Claus Known only in aqueous solution (Divers and Haga, Chem Soc 61 943)

Very unstable (Berglund, B 9 252)

Ammonium imidosulphonate, basic,

Sol in 9 pts of H_2O Solution is stable Insol in alcohol

Sl sol in warm conc H_2SO_4 without decomp (Rose, Pogg 1834, 32 81)

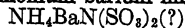
Much less sol than the neutral salt (Berglund, B 9 255)

"Parasulphatammon"

+ H_2O Gradually efflorescent Sol in H_2O with subsequent decomp (Divers and Haga)

Ammonium imidosulphonate, $\text{HN}(\text{SO}_3\text{NH}_4)_2$

Sol in H_2O (Raschig, A 241 161)

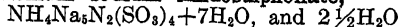
Ammonium barium imidosulphonate,

Very sl sol in H_2O (Divers and Haga)

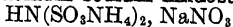
$(\text{NH}_4)_2\text{Ba}_5\text{N}_4(\text{SO}_3)_8 + 8\text{H}_2\text{O}$ (D and H)

Ammonium calcium imidosulphonate

(Divers, Chem Soc 1892, 61 968)

Ammonium sodium imidosulphonate,

Very sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Divers and Haga)

Ammonium sodium imidosulphonate nitrate,

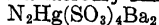
Very sol in H_2O (Divers and Haga)

Barium imidosulphonate, $\text{Ba}[\text{N}(\text{SO}_3)_2\text{Ba}]_2 + 5\text{H}_2\text{O}$

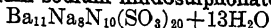
Sl sol in H_2O (Berglund, B 9 255)

Sol in dil $\text{HNO}_3 + \text{Aq}$ without decomp (Divers and Haga)

$\text{HN}(\text{SO}_3)_2\text{Ba} + \text{H}_2\text{O}$ Moderately sol in H_2O (D and H)

Barium mercury imidosulphonate,

Almost insol in cold H_2O (Divers and Haga, Chem Soc 1892, 61 977)

Barium sodium imidosulphonate,

Sparsingly sol in H_2O Readily sol in HNO_3 or HCl (Divers, Chem Soc 1892, 61 967)

Calcium imidosulphonate, $\text{Ca}[\text{N}(\text{SO}_3)_2\text{Ca}]_2 + 6\text{H}_2\text{O}$

Sl sol in H_2O (Berglund)

Calcium mercury imidosulphonate,
 $\text{N}_2\text{Hg}[(\text{SO}_3)_2\text{Ca}]_2$

Very sol in H_2O (Divers and Haga, Chem Soc 1896, 69 1629)

Calcium mercury imidosulphonate chloride,
 $(\text{NS}_2\text{O}_6\text{Ca})_2\text{Hg}_2\text{Cl} + 12\text{H}_2\text{O}$

Decomp by H_2O (Divers and Haga, Chem Soc 1896, 69 1629)

Calcium sodium imidosulphonate,
 $\text{NaN}(\text{SO}_3)_2\text{Ca} + 3\text{H}_2\text{O}$

Sl sol in cold H_2O (Divers and Haga, Chem Soc 61 968)

Lead imidosulphonate, $(\text{PbOH}\text{SO}_3)_2\text{NPbOH}$

Ppt (Berglund)

Insol in H_2O (Divers and Haga)

$(\text{PbOH})_3\text{N}(\text{SO}_3)_2$, PbO Insol in H_2O , easily sol in dil $\text{HNO}_3 + \text{Aq}$ (D and H)

Mercurous imidosulphonate, basic,
 $[\text{Hg}_2\text{N}(\text{SO}_3)_2\text{Hg}_2]\text{O} + 6\text{H}_2\text{O}$

Much more sol in dil HNO_3 than mercuric salt Sol in cold conc $\text{KI} + \text{Aq}$, leaving half Hg as metal (Divers and Haga, Chem Soc 1896, 69 1631)

Mercuric imidosulphonate, basic,
 $\text{NH}(\text{SO}_3)_2\text{Hg}$

Easily decomp (Divers and Haga)

Mercuriomercuric imidosulphonate,
 $[\text{Hg}^{\text{II}}\text{N}(\text{SO}_3)_2\text{Hg}^{\text{I}}]\text{O} + 3\text{H}_2\text{O}$

(Divers and Haga)

$[\text{Hg}^{\text{II}}\text{N}(\text{SO}_3)_2\text{Hg}^{\text{I}}]\text{O}$, $[\text{Hg}^{\text{II}}\text{N}(\text{SO}_3)_2\text{Hg}_2]$, $\text{Hg}^{\text{II}}\text{N}(\text{SO}_3)_2\text{Hg}^{\text{I}}\text{O} + 6\text{H}_2\text{O}$ (Divers and Haga)

Mercury sodium imidosulphonate, basic,
 $\text{Hg}_2\text{ON}(\text{SO}_3)_2\text{Na} + 2\text{H}_2\text{O}$

Slightly efflorescent Decomp by long washing with H_2O Much more readily sol in HCl than in HNO_3 or H_2SO_4 and is wholly decomp thereby (Divers and Haga, Chem Soc 1892, 61 983)

Mercury sodium imidosulphonate,
 $\text{HgN}_2(\text{SO}_3)_2\text{Na} + 6\text{H}_2\text{O}$

Sparsely sol in cold H_2O

Readily sol in HNO_3 and in HCl

Decomp by HCl immediately, but not by HNO_3 (Divers and Haga, Chem Soc 1892, 61 951)

Potassium imidosulphonate, basic,
 $\text{KN}(\text{SO}_3\text{K})_2 + \text{H}_2\text{O}$

Sol in H_2O (Raschig, A 241 161)

Less sol than neutral salt (Berglund)

Potassium imidosulphonate, $\text{HN}(\text{SO}_3\text{K})_2$

Sol in H_2O (Raschig, A 241 161)

= Potassium ammoniumsulphonate of Claus
Difficultly sol in cold H_2O , sol in 64 pts H_2O at 23° (Fremy) Gradually decomp by boiling (Claus)

Sl sol in H_2O (Berglund, B 9 255)

Potassium mercury imidosulphonate,
 $\text{N}_2\text{Hg}(\text{SO}_3\text{K})_4 + 4\text{H}_2\text{O}$

See Mercurimidosulphonic acid.

Silver imidosulphonate, $\text{AgN}(\text{SO}_3\text{Ag})_2$

Sl sol in H_2O (Berglund)

Silver sodium imidosulphonate,
 $\text{NaN}(\text{SO}_3\text{Ag})_2$

Sl sol in H_2O (Divers and Haga)

$\text{AgNa}_2\text{N}(\text{SO}_3)_2$ Sl sol in H_2O , but more sol than the two preceding salts (D and H)

Sodium imidosulphonate, $\text{HN}(\text{SO}_3\text{Na})_2 + 2\text{H}_2\text{O}$

Not efflorescent Very sol in H_2O (Divers and Haga)

$\text{NaN}(\text{SO}_3\text{Na})_2 + 12\text{H}_2\text{O}$ Efflorescent Sl sol in cold H_2O , but very sol in hot H_2O Sol in 5.4 pts H_2O at 27.5° (Divers and Haga)

Sodium strontium imidosulphonate,
 $\text{SrNaNS}_2\text{O}_6 + 3\text{H}_2\text{O}$

Sl sol in H_2O (Divers, Chem Soc 1896, 69 1625)

Strontium imidosulphonate,
 $\text{Sr}[\text{N}(\text{SO}_3)_2\text{Sr}]_2 + 6\text{H}_2\text{O}$

Sl sol in H_2O (Berglund)

$+ 12\text{H}_2\text{O}$ Somewhat sol in hot H_2O (Divers, Chem Soc 1896, 69 1623)

Imidotrisulphoorthophosphoric acid,
 $\text{NH}_4\text{P}(\text{SH})_3$

Insol in CS_2 and readily decomp by H_2O (Stock, B 1906, 39 1991)

Ammonium imidotrisulphoorthophosphate,
 $\text{NH}_4\text{P}(\text{SNH}_2)_3$

Very hygroscopic

Loses NH_3 in the air

Somewhat sol in liquid NH_3

Decomp by any other solvent in which it is sol (Stock, B 1906, 39 1983)

Diammonium hydrogen imidotrisulphoorthophosphate, $\text{SHP}(\text{SNH}_2)_2\text{NH}_4$

(Stock, B 1906, 39 1983)

Ammonium dihydrogen ———,
 $\text{SNH}_4\text{P}(\text{SH})_2\text{NH}_2$

(Stock)

Dissodium hydrogen imidosulphocorophosphate, SHP(SNa)₂NH

Very easily sol in H₂O Decomp by H₂O
Somewhat sol in methyl and ethyl alcohol (Stock)

Diamidopentasilphopyrophosphoric acid, P₂S₅N₂H₈

Not known in pure state (Stock, B 1906, 39 1967)

Ammonium diamidopentasilphopyrophosphate, S[P(SNH₄)₂NH]₂

Very hygroscopic
Sol in cold H₂O with decomp (Stock, B 1906, 39 1978)

Indosulphurous acid**Ammonium imidosulphite, HN(SO₂NH₄)₂**

Somewhat deliquescent
Very unstable Easily sol in H₂O with decomp into thiosulphate and amidosulphate
Insol in alcohol (Divers and Ogawa, Chem Soc 1901, 79 1100)

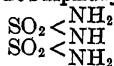
Ammonium barium imidosulphite, Ba(SO₂NH₄SO₂NH₄)₂

H₂O (Divers, Chem Soc 1901,

Potassium imidosulphite, NH(SO₂K)₂

(Divers and Owaga, Proc Chem Soc 1900, 16 113)

Very sol in H₂O (Divers, Chem Soc 1901, 79 1101)

Imidosulphuryl amide, S₂O₄N₂H₅ =

Sol in NH₄OH + Aq Decomp by conc HCl Insol in alcohol sat with NH₃ (Mente, A 248 265)

Indic acid**Magnesium indate, MgIn₂O₄ + 3H₂O**

Ppt Insol in H₂O Sol in HCl + Aq (Renz, B 1901, 34 2764)

Indium, In

Does not decomp hot H₂O
Sol in dil HCl, and H₂SO₄ + Aq Decomp by conc H₂SO₄ Easily sol in HNO₃ + Aq Insol in acetic acid Insol in KOH + Aq (Winkler, J pr 102 273)

Insol in liquid NH₃ (Gore, Am Ch J 1898, 20 830)

½ ccm oleic acid dissolves 0.0039 g In in 6 days (Gates, J phys Chem 1911, 15 143)

Indium monobromide, InBr

Decomp by hot H₂O Easily sol in acids Easily sol in cold conc HCl (Thiel, Z anorg 1904, 40 328)

Indium dibromide, InBr₂

Decomp by hot H₂O Easily sol in acids (Thiel, Z anorg 1904, 40 329)

Indium tribromide, InBr₃

Deliquescent Very sol in H₂O

Indium monochloride, InCl

Deliquescent Decomp by H₂O into InCl₃ and In (Nilson and Pettersson, Chem Soc 43 820)

Indium dichloride, InCl₂

Deliquescent in moist air, decomp by H₂O into InCl₃ and In (Nilson and Pettersson, Chem Soc 43 818)

Indium trichloride, InCl₃

Very deliquescent, sol in H₂O with hissing and great evolution of heat

Indium lithium chloride

Extremely deliquescent Sol in H₂O (Meyer, A 150 144)

Indium potassium chloride, 3KCl, InCl₃ + 1½H₂O

Easily sol in H₂O (Meyer)

Indium trifluoride, InF₃ + 3H₂O

Sol in H₂O, readily decomp (Thiel, B 1904, 37 175)

1 l H₂O dissolves 86.4 g at 25° Decomp on boiling (Thiel, Z anorg 1904, 40 331)

+ 9H₂O Sl sol in cold H₂O
Sol in HCl and in HNO₃
Insol in alcohol and ether (Chabré, C R 1905, 140 90)

Indium hydrosulphide

Decomp by acids (Meyer)

Indium hydroxide, In₂O₃H₂

Sol in acids, also in KOH, or NaOH + Aq but the solution clouds up on standing or boiling, with separation of In₂O₃H₂ Insol in NH₄OH, or NH₄Cl + Aq

Sl sol in NH₄OH + Aq (Renz, B 1904, 37 2110)

Sl sol in alkylamines but completely ppt by addition of the hydrochloride of the base (Renz, B 1903, 36 2754)

Indium moniodide, InI

Slowly decomp in moist air Not attacked by boiling H₂O

Sol in dil HNO₃ in presence of AgNO₃ Very slowly sol in cold, more rapidly sol in

hot acids with evolution of H_2 Very sol in sulphurous acid

Insol in alcohol ether and chloroform (Thiel, Z anorg 1910, 66 302)

Indium duodide, InI_2

(Thiel, Z anorg 1910, 66 302)

Indium triiodide, InI_3

Deliquescent (Meyer)

Sol in $CHCl_3$ Decomp by xylene (Thiel, Z anorg 1904, 40 330)

Indium nitride, InN

Decomp by heat (Franz Fischer, B 1910, 43 1469)

Indium monoxide, InO

Gradually sol in $HCl + Aq$ (Winkler, J pr 94 1)

Indium sesquioxide, In_2O_3

Slowly sol in cold, easily in hot acids

Four modifications

(1) Yellow Amorphous Sol in acids Its hydroxide is insol in ammonia and NH_4Cl

(2) White Amorphous Insol in acids

(3) White Amorphous Sol in acids Its hydroxide is sol in ammonia, but pptd by NH_4Cl

(4) Crystalline Crystalline modification is sol in acids (Renz, B 1904, 37 2112)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Indium oxide, $In_2O_3 = 3InO, 2In_2O_3 (?)$

(Winkler)

$In_4O_6 = 2InO, In_2O_3 (?)$ (Winkler)

Indium oxybromide (?)

Not decomp by hot acids or alkalis (Meyer, A 150 137)

Indium oxychloride, $InOCl$

Very sl sol in H_2O (Thiel, B 1904, 37 176)

Very sl sol in cold or hot dil acids Quickly sol in hot conc acids (Thiel, Z anorg 1904, 40 327)

Indium triselenide, In_2Se_3

Sol in strong acids with evolution of H_2Se (Thiel, Z anorg 1910, 66 315)

Dysindium sulphide, In_2S

Sol in acids (Thiel, Z anorg 1904, 40 326)

Indium monosulphide, InS

Easily sol in HCl with evolution of H_2S Sol in HNO_3 with evolution of oxides of nitrogen (Thiel, Z anorg 1910, 66 314)

Indium sesquisulphide, In_2S_3

Partially sol in $(NH_4)_2S + Aq$

Indium potassium sulphide, In_2S_3, K_2S

Insol in H_2O , decomp by weak acids with separation of In_2S_3 , sol in conc acids (Schneider, J pr (2) 9 209)

Indium silver sulphide, In_2S_3, Ag_2S

Insol in H_2O (Schneider, l c)

Indium sodium sulphide, $In_2S_3, Na_2S + 2H_2O$

Insol in H_2O (Schneider, l c)

Indium monotelluride, $InTe$

Sol in HNO_3 , insol in $HCl + Aq$ (Thiel, Z anorg 1910, 66 318)

Infusible white precipitate

Duodamine, NHl_2

Decomp by H_2O

Iodammonium iodide, NH_4I

Decomp by H_2O , caustic alkalis, and acids Sol in $KI + Aq$, alcohol, ether CS_2 , $CHCl_3$ (Guthrie, Chem Soc (2) 1 239)

Iodauric acid, $HAuI_4 (?)$

Not known with certainty

Ammonium iodaureate

Deliquescent Decomp by H_2O (Johnston, Phil Mag (3) 9 266)

Barium iodaureate

Sol in $BaI_2 + Aq$

Cæsium iodaureate, $CsAuI_4$

(Gupta, J Am Chem Soc 1914, 36 748)

Ferrous iodaureate

Sol in H_2O (Johnston)

Potassium iodaureate, $KAuI_4$

Decomp by H_2O Sol in KI , and $HI + A$ (Johnston)

Sodium iodaureate

Very deliquescent (Johnston)

Iodauricyanhydric acid, $HAu(CN)_2I$

Known only in its salts

Barium iodauryanide, $Ba[Au(CN)_2I]_2 + 10H_2O$

Sl sol in cold, easily in hot H_2O Easily sol in alcohol (Lindbom, Lund Univ Arsk 12 No 6)

Calcium iodauryanide, $\text{Ca}[\text{Au}(\text{CN})_2\text{I}_2]_2 + 10\text{H}_2\text{O}$

Not stable (L)

Cobalt iodauryanide, $\text{Co}[\text{Au}(\text{CN})_2\text{I}_2]_2 + 10\text{H}_2\text{O}$

Most insol of all iodauryanides, and only sl sol in warm H_2O Easily sol in alcohol

Potassium iodauryanide, $\text{KAu}(\text{CN})_2\text{I}_2 + \text{H}_2\text{O}$

Sl sol in cold, easily sol in warm H_2O and alcohol (L)

Strontium iodauryanide, $\text{Sr}[\text{Au}(\text{CN})_2\text{I}_2]_2 + 10\text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O

Iodhydric Acid, HI

Very easily and quickly absorbed by H_2O , with evolution of much heat

Solution is decomp on exposure to the air
1 vol H_2O absorbs 450 vols HI at 10° (Thomson)

1 vol H_2O absorbs 425 vols HI at 10° (Berthelot, C R 76 679)

Weak or strong solutions when boiled in an atmosphere of H leave a residue of constant composition, which distils unchanged at 126° (de Luynes), at 127° (Roscoe, Chem Soc 13 146, Naumann, Topsoe), at 128° (Bineau, A ch (3) 7 266), and has a sp gr of 1.67 (Naumann), of 1.70 (Bineau, de Luynes), of 1.708 (Topsoe), and contains 56.26 % HI (Bineau), 57.0% HI (Roscoe), 57.75% HI (Topsoe).

By conducting dry H gas through the aqueous solution of HI, a constant residue is obtained, containing 60.3-60.7% HI if temp is $15-19^\circ$, and 58.2-58.5% HI if temp is 100° (Roscoe)

Solubility of HI in H_2O at t°

t	% HI	Solid Phase
-10	20.3	Ice
-20	29.3	
-30	35.1	
-40	39	
-50	42	
-60	44.4	Ice + HI, $4\text{H}_2\text{O}$
-70	46.2	
-80	47.9	HI, $4\text{H}_2\text{O}$
-60	52.6	
-40	59	"
-35.5	64	
-40	65.5	"
-49	66.3	
-48	70.3	HI, $4\text{H}_2\text{O}$ + HI, $3\text{H}_2\text{O}$
-56	73.5	HI, $3\text{H}_2\text{O}$ + HI, $2\text{H}_2\text{O}$
-52	74	HI, $2\text{H}_2\text{O}$

(Pickering, B 1893, 26 2307)

Solution in H_2O sat at 0° has sp gr = 1.99 (de Luynes, A ch (4) 2 385), 2.0 (Vigier)

Sp gr of HI + Aq

Sp gr	% HI	Temp
1.017	2.286	13.5°
1.0524	7.019	13.5
1.077	10.15	13.5
1.095	12.21	13
1.102	13.09	13.5
1.126	15.73	13.5
1.164	19.97	13.5
1.191	22.63	13.8
1.225	25.86	13.8
1.2535	28.41	13.5
1.274	30.20	13.5
1.309	33.07	13
1.347	36.07	13
1.382	38.68	13
1.413	40.45	13
1.451	43.39	13
1.4865	45.71	13
1.528	48.22	13
1.542	49.13	13.5
1.5727	50.75	13
1.603	52.43	12.5
1.630	53.93	14
1.674	56.15	13.7
1.696	57.28	13
1.703	57.42	12.5
1.706	57.64	13.7
1.708	57.74	12

(Topsoe, B 3 403)

Sp gr of HI + Aq at 15°

% HI	Sp gr	% HI	Sp gr	% HI	Sp gr
1	1.008	21	1.175	41	1.414
2	1.015	22	1.185	42	1.429
3	1.022	23	1.195	43	1.444
4	1.029	24	1.205	44	1.459
5	1.037	25	1.216	45	1.475
6	1.045	26	1.227	46	1.491
7	1.053	27	1.238	47	1.508
8	1.061	28	1.249	48	1.525
9	1.069	29	1.260	49	1.543
10	1.077	30	1.271	50	1.561
11	1.085	31	1.283	51	1.579
12	1.093	32	1.295	52	1.597
13	1.102	33	1.307	53	1.615
14	1.110	34	1.320	54	1.634
15	1.118	35	1.333	55	1.654
16	1.127	36	1.346	56	1.674
17	1.137	37	1.359	57	1.694
18	1.146	38	1.372	58	1.713
19	1.155	39	1.386		
20	1.165	40	1.400		

(Topsoe, calculated by Gerlach, Z anal 27 316)

Sp gr of HI+Aq at 15°

% HI	Sp gr	% HI	Sp gr	% HI	Sp gr
5	1 045	25	1 239	45	1 533
10	1 091	30	1 296	50	1 650
15	1 138	35	1 361	52	1 700
20	1 187	40	1 438		

Only a "moderate degree of accuracy" is claimed for this table (Wright, C N 23 253)

+2H₂O Mpt—43° (Pickering, B 1893, 26 2308)
 +3H₂O Mpt—48° (Pickering)
 +4H₂O Mpt—36 5° (Pickering)

Iodic acid, HIO₃

Very sol in H₂O and alcohol
 100 g H₂O dissolve 286 1 g HIO₃ at 13 5°
 Sp gr of HIO₃+Aq = 2 4256
 100 g H₂O dissolve 293 g HIO₃ at 18°
 Sp gr of HIO₃+Aq = 2 4711
 (Groschuff, Z anorg 1905, 47 337)

Solubility of HIO₃ in H₂O at t°

Solid phase	t°	G HIO ₃ in 100 g of the solution	G I ₂ O ₅ in 100 g of the solution
ice	— 0 30	1 78	1 69
"	— 0 67	4 35	4 13
"	— 1 01	7 17	6 81
"	— 1 90	17 66	16 75
"	— 2 38	27 65	26 22
"	— 4 72	54 19	51 42
"	— 6 32	60 72	57 61
"	—12 25	71 04	67 40
"	—13 5	72 2	68 5
"	—15	73 8	70 0
"	—19	76 2	72 3
ice+HIO ₃	—14	72 8	69 1
HIO ₃	0	74 1	70 3
"	+16	75 6	71 7
"	40	77 7	73 7
"	60	80 0	75 9
"	50	82 5	78 3
"	55	83 0	78 7
"	101	85 2	80 8
HIO ₃ +HI ₃ O ₈	110	86 5	82 1
HI ₃ O ₈	125	87 2	82 7
"	140	88 3	83 8
"	160	90 5	85 9

(Groschuff, Z anorg 1905, 47 343)

Sat solution has sp gr 2 842 at 12 5°, and boils at 104° (Ditte, B 6 1533) Sat solution has sp gr 2 1629 (1 874 pts I₂O₅ in 1 pt H₂O) at 13°, and boils at 100° (Kammerer, Pogg 138 400)

Sp gr of HIO₃+Aq at 15°

% I ₂ O ₅	Sp gr	% I ₂ O ₅	Sp gr
1	1 0053	35	1 4428
5	1 0263	40	1 5371
10	1 0525	45	1 6315
15	1 1223	50	1 7356
20	1 2093	55	1 8689
25	1 2773	60	1 9954
30	1 3484	65	2 1269

(Kammerer)

According to Thomsen (B 7 71) solutions of HIO₃ have sp gr —

HIO₃+ 10H₂O = 1 6609
 HIO₃+ 20H₂O = 1 3660
 HIO₃+ 40H₂O = 1 1945
 HIO₃+ 80H₂O = 1 1004
 HIO₃+160H₂O = 1 0512
 HIO₃+320H₂O = 1 0258

H₂SO₄ at nearly boiling temp dissolves 1/3 its weight of iodic acid (Millon)

Solubility in HNO₃ containing 27 73% HNO₃

100 g of the sat solution contain at
 0° 20° 40° 60°
 18 21 27 38 g HIO₃

Solubility in HNO₃ containing 40 88% HNO₃

100 g of the sat solution contain at
 0° 20° 40° 60°
 9 10 14 18 g HIO₃

(Groschuff, Z anorg 1905, 47 344)

Less sol in HNO₃ than H₂O, nearly insol in anhydrous HNO₃ (Groschuff, Z anorg 1905, 47 347)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 830)

Unattacked and undissolved by liquid NO₂ (Frankland, Chem Soc 1901, 79 1362)

Insol in absolute alcohol Alcohol of 35° B dissolves half its weight in HIO₃ (Kammerer)

+4 1/2 H₂O
 HIO₃, I O₂ (Groschuff, Z anorg 1905, 47 343)

Iodates

The alkali iodates are sol in H₂O, the others not sol or insol therein

Aluminum iodate, Al(IO₃)₃ (?)

Deliquescent (Berzelius)

Ammonium iodate, NH₄IO₃

Sl sol in H₂O Sol in 38 5 pts H₂O at 15°, 6 9 pts at 100° (Rammelsberg, Pogg 44 555)

IODATE, AMMONIUM

of NH_4IO_3 in $\text{HIO}_3 + \text{Aq}$ at 30°

NH_4IO_3 in the solution	Solid phase
20	NH_4IO_3
89	"
83	$\text{NH}_4\text{IO}_3 + \text{NH}_4\text{IO}_3 \cdot 2\text{HIO}_3$
86	"
75	"
53	$\text{NH}_4\text{IO}_3 \cdot 2\text{HIO}_3$
94	"
09	"
89	"
62	"
41	"
39	"
37	"
31	$\text{NH}_4\text{IO}_3 \cdot 2\text{HIO}_3 + \text{HIO}_3$ HIO_3

urg, Z anorg 1905, **45** 341)

Ditte, A ch (6) **21** 146)

iodate, $\text{NH}_4\text{H}(\text{IO}_3)_2$
old H_2O (Ditte, A ch (6) **21**

iodate, $\text{NH}_4\text{H}_2(\text{IO}_3)_3$
O (Blomstrand, J pr (2) **42**

solubility in HIO_3 , under Am-
te (Meerburg)

obalt iodate
by H_2O Insol in alcohol
(g)

manganic iodate, $\text{Mn}(\text{IO}_3)_4$

l in H_2O Insol in HIO_3 (Berg,
28 675)

oxydmercuriammonium iodate
mercuriammonium ammonium

ellurium iodate
llurate, ammonium

odate selenate
lenate, ammonium

e, $\text{Ba}(\text{IO}_3)_2$
salt is sol in 1746 pts H_2O at
pts H_2O at 100° (Rammelsberg,
) , in 3018 pts H_2O at 13.5° , and
) at 100° (Kremers, Pogg **84**

Solubility of $\text{Ba}(\text{IO}_3)_2$ in H_2O 100 g sat
 $\text{Ba}(\text{IO}_3)_2 + \text{Aq}$ at t° contain g anhydrous
 $\text{Ba}(\text{IO}_3)_2$

t°	Grams $\text{Ba}(\text{IO}_3)_2$	t°	Grams $\text{Ba}(\text{IO}_3)_2$	t°	Grams $\text{Ba}(\text{IO}_3)_2$
Eutectic point $-0.046^\circ \pm 0.002^\circ$	0.008	30°	0.031	70°	0.093
$+10^\circ$	0.014	40°	0.041	80°	0.115
20°	0.022	50°	0.056	90°	0.141
25°	0.028	60°	0.074	$*99.2^\circ$	0.197

*Bpt at 735 mm pressure = about 100° at
760 mm pressure

(Anschutz, Z phys Ch 1906, **56** 241)

1 l sat aq solution contains 0.284 g
 $\text{Ba}(\text{IO}_3)_2$ at room temp (Hill and Zink, J
Am Chem Soc 1909, **31** 44)

1 l H_2O dissolves 0.3845 g $\text{Ba}(\text{IO}_3)_2$ at
 25° (Harkins and Winninghof, J Am
Chem Soc 1911, **33** 1828)

Easily sol in cold $\text{HCl} + \text{Aq}$, difficultly sol
in warm $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)

Insol in H_2SO_4 (Ditte)
100 cc $\text{NH}_4\text{OH} + \text{Aq}$ (sp gr = 0.90) dis-
solve 0.0199 g $\text{Ba}(\text{IO}_3)_2$ (Hill and Zink)

Solubility in salts + Aq at 25°

C = concentration of salt in salt solution
expressed in equivalents per l

S = solubility of $\text{Ba}(\text{IO}_3)_2$ in salts + Aq ex-
pressed in equivalents per l

Salt	C	S
$\text{Ba}(\text{NO}_3)_2$	0.001	0.001362
	0.002	0.001212
	0.005	0.0009753
	0.020	0.0006744
	0.050	0.0006131
	0.100	0.0005659
	0.200	0.0005580
KNO_3	0.002	0.001624
	0.010	0.001820
	0.050	0.002640
	0.200	0.003190
KIO_3	0.00010608	0.001510
	0.0005304	0.001242
	0.0010608	0.0009418

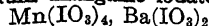
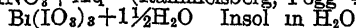
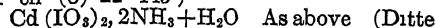
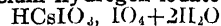
(Harkins and Winninghof, J Am Chem Soc
1911, **33** 1829)

Insol in alcohol
100 cc 95% alcohol dissolve 0.0011 g
 $\text{Ba}(\text{IO}_3)_2$ at room temp (Hill and Zink)

Insol in acetone (Eidmann, C C **1899**,
II 1014)

+ H_2O Sol in 3333 pts H_2O at 18° , and
625 pts H_2O at 100° (Gay-Lussac, A ch
91 5)

Insol in acetone (Naumann, B 1904,
37 4329)

Barium manganic iodate,Insol in H_2O Insol in HIO_3 (Berg, C R 1899, 128 675)**Bismuth iodate, basic**Insol in H_2O Very difficultly sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 44 568)**Cadmium iodate, $\text{Cd}(\text{IO}_3)_2$** Very sl sol in H_2O Easily sol in HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{Cd}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (Rammelsberg, Pogg 44 566) $+ \text{H}_2\text{O}$ Sl sol in H_2O Very sol in dil $\text{HNO}_3 + \text{Aq}$ (Ditte, A ch (6) 21 145)**Cadmium iodate ammonia, $\text{Cd}(\text{IO}_3)_2, 2\text{NH}_3$** Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Ditte) A ch (6) 21 145)**Cæsium iodate, CsIO_3** 100 pts H_2O dissolve 2.6 pts CsIO_3 at 24° Insol in alcohol (Wheeler, Sill Am J 144 123) $2\text{CsIO}_3, \text{I}_2\text{O}_5$ 100 pts H_2O dissolve 2.5 pts at 21° Not decomp by hot H_2O (Wheeler) $2\text{CsIO}_3, \text{I}_2\text{O}_5, 2\text{HIO}_3$ Sl sol in cold H_2O and decomp thereby into $2\text{CsIO}_3, \text{I}_2\text{O}_5$ (Wheeler)**Cæsium iodate chloride, $\text{CsCl}, \text{HIO}_3$** Decomp by H_2O into $2\text{CsIO}_3, \text{I}_2\text{O}_5$ (Wheeler)**Cæsium hydrogen iodate periodate,**Ppt Sol in dil HNO_3 (Wells, Am Ch J 1901, 26 250)**Calcium iodate, $\text{Ca}(\text{IO}_3)_2$** 100 pts dissolve 0.22 pt at 18° , and 0.986 pt at 100° (Gray-Iussac) Sol in conc $\text{HCl} + \text{Aq}$ (Ethol) Much more sol in $\text{HNO}_3 + \text{Aq}$ than in H_2O (Rammelsberg) Insol in H_2SO_4 (Ditte) Scarcely sol in sat $\text{KIO}_3 + \text{Aq}$ (Sonstadt, C N 29 209) $+ \text{H}_2\text{O}$ Sat solution contains at

	21°	35°	40°	45°
	0.37	0.48	0.52	0.54%

	50°	60°	80°	100°
	0.59	0.65	0.79	0.94%

(Mylius and Funk, B 1897, 30 1724)

 $+ 6\text{H}_2\text{O}$ EfflorescentSol in 253 pts H_2O at 15° , and 75 pts at 100° (Rammelsberg)

Sat solution contains at

	0°	10°	18°	30°
	0.1	0.17	0.25	0.42%
	40°	50°	54°	60°
	0.61	0.89	0.14	1.36%

(Mylius and Funk, B 1897, 30 1724)

Much more sol in $\text{HNO}_3 + \text{Aq}$ Pptd by alcohol from $\text{Ca}(\text{IO}_3)_2 + \text{Aq}$ Insol in H_2SO_4 (Ditte)

Pptd by alcohol from aqueous solution (Henry)

Cerous iodate, $\text{Ce}(\text{IO}_3)_3 + 2\text{H}_2\text{O}$ Sl sol in cold, easily sol in hot H_2O and in acids (Holzmann, J pr 75 321)Solubility in H_2O 100 cc of the sat solution contain 0.1456 g at 25° (Rimbach, Z phys Ch 1909, 67 199)Calc from electrical conductivity of $\text{Ce}(\text{IO}_3)_3 + \text{Aq}$, 100 cc of the sat solution contain 0.1636 g $\text{Ce}(\text{IO}_3)_3$ at 25° (Rimbach, Z phys Ch 1909, 67 199)**Ceric iodate, $\text{Ce}(\text{IO}_3)_4$** Slightly hydrolyzed by H_2O 0.34 g is sol in 100 cc hot conc HNO_3 (Barbieri, Chem Soc 1907, 92 (2) 467)**Cobaltous iodate, $\text{Co}(\text{IO}_3)_2$** *Anhydrous* Sol in warm dil H_3PO_4 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Ditte, A ch (6) 21 14)Solubility in H_2O

Form	Temp	% $\text{Co}(\text{IO}_3)_2$	Mols of water free salt to 100 mols H_2O
$\text{Co}(\text{IO}_3)_2 + 4\text{H}_2\text{O}$	0°	0.54	0.028
"	18°	0.83	0.038
"	30°	1.03	0.046
"	50°	1.46	0.065
"	60°	1.86	0.084
"	65°	2.17	0.098
$\text{Co}(\text{IO}_3)_2 + 2\text{H}_2\text{O}$	0°	0.32	0.014
"	18°	0.45	0.020
"	30°	0.52	0.023
"	50°	0.67	0.030
"	75°	0.84	0.038
"	100°	1.02	0.045
$\text{Co}(\text{IO}_3)_2$	18°	1.03	0.046
"	30°	0.89	0.040
"	50°	0.85	0.036
"	75°	0.75	0.033
"	100°	0.69	0.031

(Meusser, B 1901, 34 2435)

 $+ \text{H}_2\text{O}$ Sol in 148 pts H_2O at 15° and 90 pts at 100° Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 44 561)

Does not exist (Meusser, B 1901, 34 2434)

 $+ 2\text{H}_2\text{O}$ (Meusser) $+ 4\text{H}_2\text{O}$ (Meusser)

Cupric iodate, basic, 6CuO , $3\text{I}_2\text{O}_5 + 2\text{H}_2\text{O}$
 Insol in H_2O (Millon, A ch (3) 9 400)
 Mixture of CuO and $\text{Cu}(\text{IO}_3)_2$ (Ditte, A ch (6) 21 175)
 2CuO , $\text{I}_2\text{O}_5 + \text{H}_2\text{O}$ Slowly sol in dil H_2SO_4 (Granger and de Schulten, Bull Soc 1904, (3) 31 1027)

Cupric iodate, $\text{Cu}(\text{IO}_3)_2$

1 l H_2O dissolves 3.32×10^{-3} mol $\text{Cu}(\text{IO}_3)_2$ at 25° (Spencer, Z phys Ch 1913, 83 295)

Solubility in $\text{CuSO}_4 + \text{Aq} = 3.28 \times 10^{-3}$ mol per l at 25°

Solubility in $\text{KIO}_3 + \text{Aq} = 3.29 \times 10^{-3}$ mol per l at 25° (Spencer)

+ H_2O (Ditte)
 + $2\text{H}_2\text{O}$ Sol in 302 pts H_2O at 15° , and 154 pts at 100° Sol in $\text{HCl} + \text{Aq}$ or $\text{NH}_4\text{OH} + \text{Aq}$ (Millon)

Cupric iodate ammonia, $\text{Cu}(\text{IO}_3)_2 \cdot 2\text{NH}_3 + \text{H}_2\text{O}$

Insol in H_2O (Ditte, A ch (6) 21 145)
 $\text{Cu}(\text{IO}_3)_2 \cdot 4\text{NH}_3 + 2\text{H}_2\text{O}$ Ppt (Ephraim, B 1915, 48 52)

+ $3\text{H}_2\text{O}$ Partially sol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Insol in alcohol (Rammels-

$\text{IO}_3)_2 \cdot 5\text{NH}_3$ (Ephraim)

$\text{IO}_3)_2 \cdot 8\text{NH}_3 + 4\text{H}_2\text{O}$ Sol in H_2O Sol in $\text{OH} + \text{Aq}$ Insol in alcohol (Ditte, A ch (6) 21 145)

Decupium iodate, $\text{Dp}(\text{IO}_3)_3 + 3\text{H}_2\text{O} (?)$

Precipitate, scarcely sol in H_2O (Dela-fontaine)

Didymium iodate, $\text{Di}(\text{IO}_3)_3 + 2\text{H}_2\text{O}$

Ppt (Cleve)

Erbium iodate, $\text{Er}(\text{IO}_3)_3 + 3\text{H}_2\text{O}$

Very sl sol in H_2O (Hoglund)

Glucinum iodate

Deliquescent

Indrium iodate, $\text{In}(\text{IO}_3)_3$

1 pt is sol in 1500 pts H_2O at 20°
 1 pt is sol in 150 pts HNO_3 (1 5) at 80°
 Sol in HCl with decomp Sol in dil H_2SO_4 (Mathers, J Am Chem Soc 1908, 30 213)

Iodine iodate, $\text{I}(\text{IO}_3)_3$

Decomp by H_2O or by alcohol (Fichter, Z anorg 1915, 91 142)

Iron (ferrous) iodate

Ppt Sl sol in H_2O , more sol in $\text{FeSO}_4 + \text{Aq}$ (Geiger, Mag Pharm 29 252)

Iron (ferric) iodate, $\text{Fe}_2\text{O}_3 \cdot \text{I}_2\text{O}_5$

Insol in acids (Ditte, A ch (6) 21 145)
 $\text{Fe}_2\text{O}_3 \cdot 2\text{I}_2\text{O}_5 + 8\text{H}_2\text{O}$ Sol in 500 pts H_2O
 Difficultly sol in $\text{HNO}_3 + \text{Aq}$ Sol in $\text{FeCl}_3 + \text{Aq}$ (Geiger)

$3\text{Fe}_2\text{O}_3 \cdot 5\text{I}_2\text{O}_5 + 15\text{H}_2\text{O}$ Sol in HCl , or $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)

Lanthanum iodate, $\text{La}(\text{IO}_3)_3 + 1\frac{1}{2}\text{H}_2\text{O}$

Sl sol in cold, easily sol in hot H_2O
 Very sol in warm $\text{HCl} + \text{Aq}$ (Holzmann, J pr 75 349)

100 cc of the sat solution in H_2O contain 0.1681 g at 25° (Rumbach, Z phys Ch 1909, 67 199)

Calc from electrical conductivity of $\text{La}(\text{IO}_3)_3 + \text{Aq}$, 100 cc of the sat solution contain 0.1871 g $\text{La}(\text{IO}_3)_3$ at 25° (Rumbach)

Lead iodate, basic, 3PbO , $\text{Pb}(\text{IO}_3)_2 + 2\text{H}_2\text{O}$

Ppt (Strömholm, Z anorg 1904, 38 442)

Lead iodate, $\text{Pb}(\text{IO}_3)_2$

Very sl sol in H_2O (Pleschl), and difficultly sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)

Insol in H_2O and $\text{H}_2\text{SO}_4 + \text{Aq}$ Very sl sol in $\text{HNO}_3 + \text{Aq}$, and wholly insol therein after being heated to 100° (Ditte, A ch (6) 21 169)

Sl sol in H_2O 1.83×10^{-2} are dissolved in 1 liter of sat solution at 20° (Böttger, Z phys Ch 1903, 46 603)

1 l H_2O dissolves 19 mg $\text{Pb}(\text{IO}_3)_2$ at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

178 mg are dissolved in 1 l sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

1 l H_2O dissolves 0.0307 g $\text{Pb}(\text{IO}_3)_2$ at 25° (Harkins, J Am Chem Soc 1911, 33 1830)

Solubility of $\text{Pb}(\text{IO}_3)_2$ in salts + Aq at 25°

C = concentration of salt in salt solution expressed in equivalents per l

S = solubility of $\text{Pb}(\text{IO}_3)_2$ in salt solution expressed in equivalents per l

Salt	C	S
$\text{Pb}(\text{NO}_3)_2$	0.0001	0.0000870
	0.001	0.0000411
	0.010	0.0000185
	0.100	0.000016
	0.500	0.000028
	3.0	0.000015
KNO_3	0.002	0.0001141
	0.010	0.0001334
	0.050	0.0002037
	0.200	0.0002544
KIO_3	0.00005304	0.0000697
	0.0001061	0.0000437

(Harkins and Winnigohof, J Am Chem Soc 1911, 33 1830)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Lithium iodate, $\text{LiIO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Deliquescent, and very sol in H_2O
Sol in 2 pts cold, and not much less hot H_2O Insol in alcohol (Rammelsberg, Pogg 44 555)

Sp gr of solution sat at $18^\circ = 1.568$, containing 44.6% LiIO_3 100 g H_2O dissolve 80.3 pts LiIO_3 (Mylus and Funk, B 1897, 30 1718)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ H_2O Very deliquescent (Ditte, A ch (6) 21 145)

Magnesium iodate, $\text{Mg}(\text{IO}_3)_2$

Anhydrous Insol in H_2O (Millon, A ch (3) 9 422)

+ $4\text{H}_2\text{O}$ Very sol in H_2O (Ditte)
Sol in 9.43 pts H_2O at 15° , and 3.04 pts at 100° (Berzelius) Very sl sol in H_2O (Serullas, A ch 45 279) Easily sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Ditte)

Sat solution contains at

0°	10°	20°
6.8	6.4	7.7%
		$\text{Mg}(\text{IO}_3)_2$
35°	63°	100°
8.9	12.6	19.3%
		$\text{Mg}(\text{IO}_3)_2$

(Mylus and Funk, B 1897, 30 1722)

Sat aq solution at 18° contains 6.44% $\text{Mg}(\text{IO}_3)_2$, or 6.88 g arc sol in 100 g H_2O
Sp gr of sat solution = 1.078 (Mylus and Funk, B 1897, 30 1718)

+ $10\text{H}_2\text{O}$ Sat aq solution contains at

0°	20°	30°	35°	50°
3.1	10.2	17.4	21.9	67.5%
				$\text{Mg}(\text{IO}_3)_2$

(Mylus and Funk, B 1897, 30 1723)

Manganous iodate, $\text{Mn}(\text{IO}_3)_2 + \text{H}_2\text{O}$

Sol in about 200 pts H_2O (Rammelsberg)

Insol in H_2O and $\text{HNO}_3 + \text{Aq}$, even on boiling Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Ditte)

Manganous manganic iodate,

$\text{Mn}(\text{IO}_3)_4 \cdot \text{Mn}(\text{IO}_3)_2$

Insol in H_2O (Berg, C R 1899, 128 675)

Manganic potassium iodate,

$\text{Mn}(\text{IO}_3)_4 \cdot 2\text{KIO}_3$

Insol in and only sl attacked by H_2O
Insol in HIO_3 (Berg, C R 1899, 128 674)

Mercurous iodate, $\text{Hg}_2(\text{IO}_3)_2$

Insol in boiling H_2O , or cold $\text{HNO}_3 + \text{Aq}$
Easily sol in dil $\text{HCl} + \text{Aq}$ Sol in very

conc $\text{HIO}_3 + \text{Aq}$ (Lefort, J Pharm 1845 5)

Mercuric iodate, $\text{Hg}(\text{IO}_3)_2$

Insol in H_2O or alcohol (Millon, A ch (3) 18 367) Sol in H_2O (Berzelius) Sol in dil $\text{HCl} + \text{Aq}$ (Rammelsberg)

Nearly insol in H_2O Easily sol in HCl , HBr , or $\text{HI} + \text{Aq}$, very sl sol in $\text{HNO}_3 + \text{Aq}$, insol in HF , H_2SiF_6 , or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in alkali chlorides, bromides, iodides, cyanides, and cyanates + Aq , also in $\text{Na}_2\text{S}_2\text{O}_3$, dil MnCl_2 , and $\text{ZnCl}_2 + \text{Aq}$ Insol in KOH , NaOH , NH_4OH , Na_2S , $\text{Na}_2\text{B}_4\text{O}_7$, Na_2HPO_4 , and the alkali chlorates, bromates, and iodates + Aq (Cameron, C N 33 253)

Nickel iodate, $\text{Ni}(\text{IO}_3)_2$

Solubility in H_2O

Form	Temp	Percent of $\text{Ni}(\text{IO}_3)_2$ in solution	Mols water free salt to 100 mols H_2O
$\text{Ni}(\text{IO}_3)_2 + 4\text{H}_2\text{O}$	0°	0.73	0.033
"	18°	1.01	0.045
"	30°	1.41	0.063
$\alpha\text{Ni}(\text{IO}_3)_2 + 2\text{H}_2\text{O}$	0°	0.53	0.023
"	18°	0.68	0.030
"	30°	0.86	0.039
"	50°	1.78	0.080
$\beta\text{Ni}(\text{IO}_3)_2 + 2\text{H}_2\text{O}$	8°	0.52	0.023
"	18°	0.55	0.0245
"	50°	0.81	0.035
"	75°	1.03	0.045
"	100°	1.12	0.049
$\text{Ni}(\text{IO}_3)_2$	30°	1.135	0.050
"	50°	1.07	0.046
"	75°	1.02	0.045
"	100°	0.988	0.044

(Meusser, B 1901, 34 2440)

+ H_2O Sol in 120.3 pts H_2O at 15° , and 77.35 pts at 100° (Rammelsberg, Pogg 44 562)

Sol in HNO_3 , and dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Ditte)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Does not exist (Meusser)

+ $2\text{H}_2\text{O}$ See Meusser above

+ $3\text{H}_2\text{O}$ Insol in H_2O Sol in HNO_3 (Ditte, A ch 1890, (6) 21 160)

+ $4\text{H}_2\text{O}$ See Meusser above

Nickel iodate ammonia, $\text{Ni}(\text{IO}_3)_2 \cdot 4\text{NH}_3$

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Insol in alcohol (Rammelsberg, Pogg 44 562)

$\text{Ni}(\text{IO}_3)_2 \cdot 5\text{NH}_3$ Ppt (Ephraim, B 1915, 48 53)

+ $3\text{H}_2\text{O}$ (Ephraim)

Potassium iodate, KIO_3

1 pt KIO_3 dissolves in 13 pts H_2O at 14° (Gay-Lussac)

1 pt KIO_3 dissolves at
 0° in 21 11 pts H_2O
 20° " 12 29 "
 40° " 7 76 "
 60° " 5 40 "
 80° " 4 02 "
 100° " 3 10 "

Sat solution boils at 102° (Kremers, Pogg 97 5)

Sp gr of $\text{KIO}_3 + \text{Aq}$ containing
 1 2 3 4 5 % KIO_3
 1 010 1 019 1 027 1 035 1 044
 6 7 8 9 10 % KIO_3
 1 052 1 061 1 071 1 080 1 090
 (Kremers, Pogg 96 62)

Stable at 10° in H_2O or potassium acetate
 + Aq (Eakle, C C 1896, II 649)

Solubility of KIO_3 in $\text{HIO}_3 + \text{Aq}$ at 30°

% HIO_3 in the solution	% KIO_3 in the solution	Solid phase
0	9 51	KIO_3
0 64	9 48	$\text{KIO}_3 + \text{KIO}_3, \text{HIO}_3$
0 66	9 52	"
0 65	9 46	"
0 65	8 90	$\text{KIO}_3, \text{HIO}_3$
0 67	6 6	"
1 14	4 57	"
1 69	3 63	"
2 02	3 10	"
3 34	2 14	"
5 00	1 32	"
7 09	1 0	"
8 04	0 85	$\text{KIO}_3, \text{HIO}_3 + \text{KIO}_3, 2\text{HIO}_3$
3 47	3 57	$\text{KIO}_3, 2\text{HIO}_3$ (labile)
4 80	2 90	"
6 45	1 35	"
9 35	0 64	$\text{KIO}_3, 2\text{HIO}_3$
12 04	0 44	"
17 50	0 30	"
31 20	0 52	"
53 64	0 68	"
62 52	0 72	"
76 40	0 80	$\text{KIO}_3, 2\text{HIO}_3 + \text{HIO}_3$
76 70	0	HIO_3

(Meerburg, Z anorg 1905, 45 330)

More sol in $\text{KI} + \text{Aq}$ than in H_2O Sol in
 warm $\text{H}_2\text{SO}_4 + \text{Aq}$

Insol in liquid NH_3 (Franklin, Am Ch
 J 1898, 20 829)

Insol in alcohol

Insol in methyl acetate (Naumann, B
 1909, 42 3790), ethyl acetate (Naumann,
 B 1910, 43 314)

+ $\frac{1}{2}\text{H}_2\text{O}$ (Ditte, C R 70 621)

Potassium hydrogen iodate, $\text{KH}(\text{IO}_3)_2$

Sol in 18 65 pts H_2O at 17° (Meineke, A
 261 360)

Sol in 75 pts H_2O at 15° Insol in
 alcohol (Serullas, A ch 22 181)
 See also Meerburg under KIO_3

Potassium dihydrogen iodate, $\text{KH}_2(\text{IO}_3)_2$
 Sol in 25 pts H_2O at 15° (Serullas, A ch
 43 117)

See also Meerburg under KIO_3

Potassium tellurium iodate

See Iodotellurate, potassium

Potassium uranyl iodate,

$\text{KUO}_2(\text{IO}_3)_3 + 3\text{H}_2\text{O}$

Decomp by H_2O , dil salt solutions and
 $\text{UO}_2(\text{NO}_3)_2 + \text{Aq}$ (Artmann, Z anorg 1913,
 79 340)

Potassium iodate chloride, $\text{KH}(\text{IO}_3)_2, 2\text{KCl}$

Sol in 19 pts H_2O at 15° with decomp
 Cold alcohol dissolves out KCl

Potassium iodate molybdate, $\text{KIO}_3, \text{MoO}_3 +$
 $2\text{H}_2\text{O}$

See Molybdatiodate, potassium

Potassium iodate selenate

See Iodoselenate, potassium

Potassium iodate sulphate, $\text{KIO}_3, \text{KHSO}_4$

Decomp by H_2O (Maignac, J B 1856
 299)

$\text{KHIO}_3, \text{KHSO}_4$ More sol in H_2O than
 KHIO_3 (Serullas)

Potassium iodate tungstate

See Tungstiodate, potassium

Rubidium iodate, RbIO_3

100 pts H_2O dissolve 2 1 pts RbIO_3 at
 23° Easily sol in cold $\text{HCl} + \text{Aq}$ (Wheeler
 Sill Am J 144 123)

Rubidium hydrogen iodate, $\text{RbH}(\text{IO}_3)_2$

Sl sol in cold, more readily in hot H_2O ,
 RbIO_3 separating on cooling Insol in alco-
 hol (Wheeler)

$\text{RbH}_2(\text{IO}_3)_3$ As above (Wheeler)

Rubidium iodate chloride, $\text{RbIO}_3, \text{HCl}$, or
 $\text{HIO}_3, \text{RbCl}$

Decomp by cold H_2O (Wheeler)

$3\text{RbCl}, 2\text{HIO}_3$ Sol in H_2O , from which
 RbIO_3 separates (Wheeler)

Rubidium iodate selenate

See Iodoselenate, rubidium

Samarium iodate, $\text{Sm}(\text{IO}_3)_3 + 6\text{H}_2\text{O}$

Precipitate (Cleve)

Scandium iodate, $\text{Sc}(\text{IO}_3)_3$ +10, 13, 15, and $18\text{H}_2\text{O}$

Nearly insol in H_2O (Crookes, Phil Trans 1910, 210 A, 361)

Silver iodate, AgIO_3

1.89×10^{-4} moles or 5.36×10^{-2} g AgIO_3 are sol in 1 liter H_2O at 25° (Noyes and Kohr, Z phys Ch 1903, 42 338)

Sl sol in H_2O 4.35×10^{-2} g are dissolved in 1 liter of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

1 l H_2O dissolves 40 mg AgIO_3 at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

1 l H_2O dissolves 0.0275 g AgIO_3 at 9.43° , 0.039 g at 18.4° , 0.0539 g at 26.6° Solubility increases rapidly with temp (Kohlrausch, Z phys Ch 1908, 64 168)

1 l H_2O dissolves 0.039 g AgIO_3 at 20° (Whitby, Z anorg 1910, 67 108)

Not completely insol in H_2O (Rose) Sol in $\text{NH}_4\text{OH} + \text{Aq}$, sol in $\text{HNO}_3 + \text{Aq}$ (Naquet, J B 1860 201) Sol in conc $\text{KI} + \text{Aq}$ (Ladenburg, A 135 1)

Sol in 27,700 pts H_2O at 25° , in 42.4 pts 5% $\text{NH}_4\text{OH} + \text{Aq}$ at 25° , in 2.1 pts 10% $\text{NH}_4\text{OH} + \text{Aq}$ at 25° , in 1044.3 pts 35% $\text{HNO}_3 + \text{Aq}$ (sp gr 1.21) at 25° (Longi, Gazz ch it 13 87)

Solubility in $\text{HNO}_3 + \text{Aq}$ at 25°

Normality HNO_3	G AgIO_3 dissolved per l
0.000	0.0503
0.125	0.0864
0.250	0.1075
0.500	0.1414
1.00	0.2067
2.00	0.3319
4.00	0.6985
8.00	1.5875

(Hill and Simmons, Z phys Ch 1909, 67 602)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Insol in methyl acetate (Bezold, Dissert 1906, Naumann, B 1909, 42 3790), ethyl acetate (Humeis, Dissert 1906, Naumann, B 1910, 43 314)

Silver iodate ammonia, $2\text{AgIO}_3 \cdot 3\text{NH}_3 + 1\frac{1}{2}\text{H}_2\text{O}$

Very sol in cold H_2O (Ditte, A ch (6) 21 145)

$\text{AgIO}_3 \cdot 2\text{NH}_3$

Sl sol in conc $\text{NH}_4\text{OH} + \text{Aq}$ (Rosenheim, A 1899, 308 52)

Sodium iodate, NaIO_3

100 pts H_2O dissolve 7.25 pts NaIO_3 at 14.5° (Gay-Lussac) 100 pts H_2O dissolve 2.52 pts at 0° , 9.07 pts at 20° , 14.39 pts at 60° , 27.7 pts at 80° , 33.9 pts at 100° (Krem-

ers, Pogg 97 5) Sat solution boils at 102° (Kremers), 105° (Ditte)

Sol in warm $\text{H}_2\text{SO}_4 + \text{Aq}$ diluted with $\frac{1}{2}$ vol H_2O Crystallizes out on standing over H_2SO_4 (Ditte)

Solubility of NaIO_3 in $\text{HIO}_3 + \text{Aq}$ at 30°

% HIO_3 in the solution	% NaIO_3 in the solution	Solid phase
0	9.36	$\text{NaIO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$
1.98	9.52	"
4.86	10.22	"
5.86	11.04	"
7.40	11.60	"
9.73	14.73	" } labile
6.76	11.18	$\text{NaIO}_3 + 1\frac{1}{2}\text{H}_2\text{O} + \text{Na}_2\text{O}, 2\text{H}_2\text{O}$
6.66	11.28	"
7.80	10.30	$\text{Na}_2\text{O}, 2\text{H}_2\text{O}$
9.15	9.00	"
9.93	8.71	"
11.20	7.54	"
11.89	7.21	$\text{Na}_2\text{O}, 2\text{H}_2\text{O} + \text{NaIO}_3, 2\text{HIO}_3$
11.75	7.18	"
14.62	5.65	$\text{NaIO}_3, 2\text{HIO}_3$
23.23	3.69	"
32.68	2.91	"
40.91	2.64	"
46.62	2.67	"
55.48	2.12	"
65.47	1.83	"
76.19	1.42	$\text{NaIO}_3, 2\text{HIO}_3 + \text{HIO}_3$
76.70	0	HIO_3

(Meerburg, Z anorg 1905, 45 334)

Insol in alcohol Sol in dil $\text{HCl} \cdot \text{H}_2\text{O} + \text{Aq}$

Insol in methyl acetate (Naumann, B 1909, 42 3790) $+ 1\frac{1}{2}\text{H}_2\text{O}$ See Meerburg above

Sodium diiodate, $\text{Na}_2\text{O}, 2\text{H}_2\text{O}$

See Meerburg under NaIO_3

Sodium triiodate, $\text{NaIO}_3, 2\text{HIO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Very sol in H_2O (Blomstrand, J pr (2) 42 337)

See also Meerburg under NaIO_3

Sodium iodate bromide, $\text{NaIO}_3, 2\text{NaBr} + 9\text{H}_2\text{O}$

Sol in H_2O (Rammelsberg)

Sodium iodate chloride, $\text{NaIO}_3, \text{NaCl} + 4\text{H}_2\text{O}$, and $2\text{NaIO}_3, 3\text{NaCl} + 18\text{H}_2\text{O}$

Cold H_2O dissolves out NaCl

Sodium iodate iodide, $\text{NaIO}_3, \text{NaI}$

Hot H_2O or alcohol dissolves out $\text{NaI} + 8\text{H}_2\text{O}$

$+ 10\text{H}_2\text{O}$

$2\text{NaIO}_3, 3\text{NaI} + 20\text{H}_2\text{O}$ (Penny, A 37 202)

Stable in a solution of $\text{NaI} + \text{NaOH} + \text{Aq}$ (Eakle, C C 1896, II 650)

Strontium iodate, $\text{Sr}(\text{IO}_3)_2$

Anhydrous Insol in H_2SO_4 (Ditte), easily sol in cold $\text{HCl} + \text{Aq}$ (Rammelsberg, Pogg 44 575)

+ H_2O Difficultly sol in H_2O
+ $6\text{H}_2\text{O}$ Sol in 416 pts H_2O at 15° , and 138 pts at 100° (Gay-Lussac), 342 pts at 15° , and 110 pts at 100° Difficultly sol in warm $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 44 575)

Thallous iodate, TlIO_3

Difficultly sol in warm H_2O (Oettinger)
Insol in H_2O , difficultly sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)

Sl sol in H_2O
0.58 $\times 10^{-1}$ g are dissolved in 1 liter of sat solution at 20° (Böttger, Z phys Ch 1903, 46 603)

2.12 $\times 10^{-3}$ mols = 0.667 g are sol in 1 l H_2O at 25° (Spencer, Z phys Ch 1912, 80 707)

Sol in a little $\text{NH}_4\text{OH} + \text{Aq}$, also in boiling HNO_3 , H_2SO_4 , or $\text{HCl} + \text{Aq}$ Insol in alcohol (Oettinger)

+ $\frac{1}{2}\text{H}_2\text{O}$ Very sl sol in H_2O or dil boiling acids (Ditte, A ch (6) 21 145)

thallous iodate, basic, $\text{Tl}(\text{OH})(\text{IO}_3)_2 + \text{H}_2\text{O} = \text{Ti}_2\text{O}_3, 2\text{I}_2\text{O}_5 + 3\text{H}_2\text{O}$

Insol in H_2O , sol in cold $\text{HCl} + \text{Aq}$, and warm dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Ditte, A ch (6) 21 145)

Thallic iodate, $\text{Tl}(\text{IO}_3)_3 + 1\frac{1}{2} \text{H}_2\text{O}$

Insol in H_2O , sl sol in $\text{HNO}_3 + \text{Aq}$
Decomp by alkalis (Rammelsberg)

+ $12\text{H}_2\text{O}$ Difficultly sol in H_2O
Easily sol in dil acids (Gewecke, Z anorg 1912, 75, 275)

Thorium iodate, $\text{Th}(\text{IO}_3)_4$

Precipitate (Cleve)

Tin (stannous) iodate

Ppt Sol in $\text{SnCl}_2 + \text{Aq}$, insol in $\text{NaIO}_3 + \text{Aq}$

Tin (stannic) iodate

Ppt

Uranous iodate

Precipitate Very unstable (Rammelsberg)

Uranyl iodate, $\text{UO}_2(\text{IO}_3)_2$

Sol or insol in HNO_3 and $\text{H}_3\text{PO}_4 + \text{Aq}$, according to method of preparation (Ditte)

+ H_2O Sl sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)

Ytterbium iodate, $\text{Yb}(\text{IO}_3)_3 + 6\text{H}_2\text{O}$

Ppt (Cleve, Z anorg 1902, 32 136)

Yttrium iodate, $\text{Y}(\text{IO}_3)_3 + 3\text{H}_2\text{O}$

Sol in 190 pts H_2O (Berlin)

Zinc iodate, $\text{Zn}(\text{IO}_3)_2$

Anhydrous (Ditte, A ch (6) 21 145)
+ $2\text{H}_2\text{O}$ Sol in 114 pts cold, and 76 pts hot H_2O (Rammelsberg, Pogg 43 665)
Sol in HNO_3 , and $\text{NH}_4\text{OH} + \text{Aq}$
Exists also in a very sol modification (Myhus and Funk, B 1897, 30 1723)

Zinc iodate ammonia, $3\text{Zn}(\text{IO}_3)_2, 8\text{NH}_3$

Decomp by H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$, from which it is pptd by alcohol (Rammelsberg, Pogg 44 563)

$\text{Zn}(\text{IO}_3)_2, 2\text{NH}_3$ Insol in H_2O (Ditte, A ch (6) 21 145)

$\text{Zn}(\text{IO}_3)_2, 3\text{NH}_3 + \text{H}_2\text{O}$ Insol in H_2O (Ditte)

$\text{Zn}(\text{IO}_3)_2, 4\text{NH}_3$ (Ditte, A ch 1890, (6) 21 164) (Ephraim, B 1915, 48 53)

Periodic acid

See Periodic acid

Iodides

The iodides are in general easily sol in H_2O , exceptions are HgI_2 , PbI_2 , AgI , Cu_2I_2 , and BiI_3 , also the iodides of the Pt metals, all of which are insol SnI_4 , SbI_3 , and TlI_3 are decomp by H_2O Many iodides are more sol in solutions of salts than in H_2O , and several are sol in alcohol or ether

See under each element

Iodine, I_2

Sol in 5524 pts H_2O at $0\ 12^\circ$ (Wittstein J B 1857 123)

Sol in 7000 pts H_2O at 15°

Sol in 3800 pts H_2O at 15°

Sol in 500 pts H_2O (Jacquelin)

Sol in 7196 pts B_2O_3 at $18\ 75^\circ$ (Abl)

Pure H_2O dissolves 0.01519173 g I per litre, or I is sol in 6582 pts H_2O at $6\ 3^\circ$ (Dossius and Weith, Zeit Ch 12 378)

Sol in about 4500 pts H_2O (Hager, Comm 1883)

Sol in 7000 pts H_2O (Cap and Garot, J Pharm (3) 26 80)

1 l H_2O at 25° dissolves 0.3387 g I_2 (Jakowkin, Z phys Ch 1895, 18 590)

1 l H_2O dissolves 1.342 millimols of iodine at 25° (Noyes, Z phys Ch 1898, 27 359)

When iodine is shaken with H_2O at 15° , 1 pt dissolves in 3750 pts H_2O , when iodine and H_2O are heated together and then cooled to 15° , 1 pt iodine dissolves in 3500 pts H_2O

At 30° , 1 pt is sol in 2200 pts H_2O (Dietz, Chem Soc 1899, 76, (2) 150)

1 l H_2O dissolves 0.279 grams I_2 at 25° (McLauchlan, Z phys Ch 1903, 44 617)

Solubility of I_2 in H_2O at t°

t°	g I per l H_2O
18	0 2765
25	0 3395
35	0 4661
45	0 6474
55	0 9222

(Hartley, Chem Soc 1908, 93 744)

Solubility of I_2 in H_2O at t°

t°	g per l	milhat per l
0	0 1649	1 30
20	0 2941	2 30
40	0 5684	4 56

(Fedotieff, Z anorg 1910, 69 30)

1 32 millimol I_2 are sol in 1 l H_2O (Bray, J Am Chem Soc, 1910, 32 938)

Calculated from electrical conductivity of sat I_2 +Aq 1 l H_2O dissolves 0 0006383 mols I_2 at 0° (Jones, J Am Chem Soc 1915, 37 256)

Conc H_2SO_4 , HCl , HNO_3 , H_3PO_4 , $HC_2H_3O_2$, tartaric, or citric acids+Aq dissolve I_2 , but give it up to CS_2 on shaking therewith (Tessier, Z anal 11 313)

Sol in 150 pts H_2SO_4 on warming, but crystallizes out in part on cooling (Kraus)

Much more sol in HBr +Aq than in pure H_2O , HBr +Aq of sp gr 1 486 dissolves 3-4% (Bineau)

Sl sol in HCl +Aq Easily sol in even dil HI +Aq

1 l 0 001 N- HCl +Aq sat with I_2 contains 0 338 g I (Bray and Mackay, J Am Chem Soc 1910, 32 1919)

1 l 0 1 N- HNO_3 +Aq sat with I_2 contains 0 340 g I (Sunmet, Z phys Ch 1905, 53 644)

1 l 0 1 N- H_2SO_4 +Aq sat with I contains 0 341 g I_2 (Sunmet)

Sol in H_2SO_4 +Aq with decomp

1 l 0 9 N H_3BO_3 dissolves 0 300 g I_2 at 25° (McLauchlan, Z phys Ch 1903, 44 617)

100 cc of a 10% solution of $BaBr_2$ dissolve 0 231 g I_2 at 13.5° (Meyer, Z anorg 1902, 30 114)

100 cc of a 10% solution of $BaCl_2$ dissolve 0 067 g I_2 at 18.5° (Meyer)

100 cc of a 10% solution of BaI_2 dissolve 6 541 g I_2 at 13.5° (Meyer)

100 cc of a 10% solution of $CaBr_2$ dissolve 0 274 g I_2 at 13.5° (Meyer)

100 cc of a 10% solution of $CaCl_2$ dissolve 0 078 g I_2 at 18.5° (Meyer)

100 cc of a 10% solution of CaI_2 dissolve 8 062 g I_2 at 13.5° (Meyer)

Easily sol in boiling dil $HgCl_2$ +Aq (Selmi)

Solubility in $HgCl_2$ +Aq at 25°

10 ccm of the solution contain

millimols I_2	millimols Hg
0 0134	0
0 1294	0 9444
0 1460	1 2442
0 1806	1 9542
0 2543	3 3460

(Herz and Paul, Z anorg 1914, 85 214)

Sol in solutions of soluble iodides

100 pts KI +200 pts H_2O dissolve 153 pts I_2 , from this solution H_2O precipitates $\frac{1}{2}$ the dissolved I 100 pts KI +400 pts H_2O dissolve quickly 76 5 pts I If more water is present, the solution takes place more slowly (Baup)

CS_2 extracts the I from the above solutions

Solubility of I in KI +Aq at $7-7.3^\circ$

% KI in KI +Aq	Pts I dissolved	Sp gr of solution
1 802	1 173	1 0234
3 159	2 303	1 0433
4 628	3 643	1 0668
5 935	4 778	1 0881
7 201	6 037	1 1112
8 663	7 368	1 1382
10 036	8 877	1 1637
11 034	9 949	1 1893
11 893	11 182	1 2110
12 643	12 060	1 2293

(Dossius and Weith, Zeit Ch (2) 5 379)

Solubility of I_2 in KI +Aq at room temperature, 14.5° - 15.1°

% KI	% I	I/ KI
1 80	1 17	0 651
3 16	2 30	0 729
4 63	3 64	0 786
5 93	4 78	0 805
7 20	6 04	0 839
8 66	7 37	0 851
10 04	8 88	0 884
11 03	9 95	0 902
11 89	11 18	0 940
12 64	12 06	0 954

(Weith and Dossius, Z phys Ch 1898, 26 150)

Solubility of I_2 in KI+Aq at 15°

% KI	ccm 1/10 n iodine in 50mm of the solution	I/KI
10	35 0	35 0
8	27 1	33 9
6	19 7	32 8
4	12 7	31 8
2	6 25	31 2
1	3 04 *	30 4

* Obtained with 1/100-normal iodine
(Bruner, Z phys Ch 1898, 26 151)

Solubility of I_2 in KI+Aq at 25°

Millimols KI per liter	Millimols dissolved iodine per liter
106 3	55 28
53 15	28 03
26 57	14 68
13 29	8 003
6 643	4 667
3 322	3 052
1 661	2 235
0 8304	1 814

(Noyes and Seidenstricker, Z phys Ch 1898, 27 359)

Solubility in KI+Aq at 25°

KI mol/l	I G atoms/l
1 91	3 29
2 85	5 45
4 51	11 52
5 36	17 12
5 55	17 16

(Abegg, Z anorg 1906, 50 427)

Solubility of I_2 in KI+Aq at 25°

Millimol KI per l	Millimol I_2 dissolved
100	51 35
50	25 77
20	11 13
10	6 185
5	3 728
2	2 266
1	1 788

(Bray and MacKay, J Am Chem Soc 1910, 32 919)

Solubility in KI+Aq at 25°

Sp gr	Analysis of liquid phase		Analysis of solid phase together with adhering mother liquor	
	% KI	% I	% KI	% I

(a) In equilibrium with excess of KI

1 733	60 39	0 0		0 0
1 888	54 415	11 63	84 92	4 05
2 066	49 045	23 085	85 94	6 32
2 216	44 82	31 01	80 46	10 84
2 539	38 065	44 56	78 56	15 23
2 560	37 655	45 55	77 32	16 73
2 665	35 805	49 61		
3 232	29 71	62 81	39 99	56 10
3 246	27 92	66 45	38 78	56 27

(b) In equilibrium with excess of I

1 349	16 025	18 49	3 04	85 43
1 516	19 705	26 16	4 48	83 87
1 769	22 88	36 06	3 70	89 33
1 910	23 55	40 515	6 49	83 62
2 403	24 78	53 605	8 62	83 81
2 904	24 995	63 125	4 82	92 41
3 082	25 18	66 04	4 00	94 39

(c) Invariant point Excess of KI and I

3 316	26 05	68 06		
	25 96	68 01	16 14	83 77
	26 04	68 16		
	25 92	68 13	11 32	86 56

(Parsons and Whittemore, J Am Chem 1911, 33 1934)

Solubility in KI+Aq at 0°

KI+Aq		KI+Aq sat with I	
Wt norm	Sp gr 0/4°	G I_2 in 1 g of solution	Sp gr 0/4°
0 09871	(1 0123)	0 01199	(1 0219)
0 09861	1 01231	0 01199	1 02187
0 04969	(1 0061)	0 006094	(1 0109)
0 04966	1 00610	0 006083	1 01089
0 01992	1 00236	0 002535	1 00429
0 01983	(1 0024)	0 0025325	(1 0044)
0 00998	(1 0011)	0 0013532	(1 0020)
0 00992	(1 0011)	0 0013585	(1 0020)
0 004999	(1 0005)	0 0007609	(1 0010)
0 004991	(1 0005)	0 0007577	(1 0011)
0 002000	(1 0001)	0 0004137	(1 0004)
0 002000	(1 0001)	0 0004015	(1 0004)
0 000999	(0 9999)	0 0002839	(1 0002)
0 000992	(1 0000)	0 00028125	(1 0002)

Values in parentheses are found by interpolation

(Jones and Hartman, J Am Chem Soc 1915, 37 247)

1 mol KI in alcohol dissolves 2 atoms I, and the solution does not give up I to CS_2 (Jørgensen, J pr (2) 2 347)

Solubility in KI+60% alcohol at 25°

Sp gr	Analysis of liquid phase		Analysis of solid phase together with adhering mother liquor	
	% KI	% I	% I	% KI

(a) In equilibrium with excess KI

1 148	30 93	0 0	0 0	
1 191	29 87	4 51	89 13	0 71
1 285	28 39	12 48	86 60	2 27
1 368	28 00	18 60	87 30	3 21
1 427	27 60	21 80	85 75	4 25
1 533	27 00	28 00	84 39	6 05
1 776	25 90	40 52	81 05	10 30
2 250	24 90	52 42	76 21	16 73
2 507	24 40	58 93	73 20	21 04
2 845	22 49	65 75	71 66	24 15
	21 50	68 95	70 04	26 42

(b) In equilibrium with excess I

1 134	0 0	23 04	0 0	I
1 530	7 36	43 05	1 40	88 76
1 721	10 60	49 38	2 50	88 21
1 90	12 44	55 33	3 72	87 10
2 11	13 74	59 26	4 41	86 60
2 22	15 20	62 66	5 80	85 20
2 80	17 72	69 10	7 15	85 49
2 99	19 30	71 90	7 45	88 96

(c) Invariant point Excess KI and I

3 162	20 11	72 51		
	20 03	72 46	21 84	74 64
				KI+I
	20 05	72 54		
	19 98	72 44	7 40	89 81 I
	20 08	72 51	20 61	74 09
				KI+I
	20 06	72 44		
	20 05	72 48	33 46	63 19 KI

(Parsons and Corliss, J Am Chem Soc 1910, 32 1370)

Solubility in KI+40% alcohol at 25°

Sp gr	Analysis of liquid phase		Analysis of solid phase together with adhering mother liquor	
	% KI	% I	% KI	% I

(a) In equilibrium with excess KI

1 339	42 10	0 0	0 0	
1 377	40 83	3 76	89 21	0 70
1 455	38 94	10 09	85 80	1 90
1 532	37 41	15 71	88 19	3 02
1 605	36 25	20 52	87 04	4 21
1 655	35 38	24 44	86 08	5 11
1 847	33 26	33 62	83 61	8 41
2 024	31 71	39 99	82 06	10 76
2 169	30 59	44 76	80 80	12 35
2 558	28 56	55 30	75 90	18 63
2 784	26 95	60 27	74 77	20 86
	24 52	65 93	72 98	23 61
	23 04	69 93	72 45	25 04

Solubility in KI+40% alcohol at 25° —
Continued

Sp gr	Analysis of liquid phase		Analysis of solid phase together with adhering mother liquor	
	% KI	% I	% KI	% I

(b) In equilibrium with excess I

0 962	0 0	2 97	0 0	
1 292	8 45	28 70	1 85	84 51
1 581	12 56	40 63	3 41	84 02
	15 20	49 95	4 98	83 81
2 000	16 02	52 95	5 60	82 96
2 173	17 18	57 38	6 61	83 60
1 749	19 20	66 89	8 45	85 16
2 902	20 12	69 10	7 08	88 81

(c) Invariant point Excess KI and I

3 246	22 50	70 79	19 48	76 24
	22 43	70 88	69 37	26 14

(Parsons and Corliss, J Am Chem Soc 1910, 32 1372)

See also under KI

Sol in KI+nitrobenzene (Dawson, Chem Soc 1902, 81 529)

Solubility in KIO_3 +Aq is the same as in H_2O (Lam, C A 1909 1622)Solubility of I_2 in KBr +Aq at 25°

G KBr per l	G atoms I per l
60 6	0 0176
106 9	0 0278
175 9	0 0415
229 8	0 0532
281 9	0 0628
330 6	0 0717
377 1	0 0797
411 0	0 0864
461 7	0 0948
509 8	0 1006
548 0	0 1062
567 9 sat	0 1094

(Bell and Buckley, J Am Chem Soc 1912, 34 13)

Solubility in NaBr +Aq at 25°

G NaBr per l	G atoms I per l
96 4	0 0266
157 7	0 0425
271 8	0 0538
357 4	0 0598
422 4	0 0638
499 1	0 0648
569 9	0 0644
632 0	0 0622
679 7	0 0595
750 5	0 0551
756 1 sat	0 0550

(Bell and Buckley, J Am Chem Soc 1912, 34 13)

100 cc of a 10% solution of SrBr_2 dissolve
0 270 g I_2 at 13 5° (Meyer, Z anorg 1902,
30 114)

100 cc of a 10% solution of SrCl_2 dissolve
0 066 g I_2 at 13 5° (Meyer)

100 cc of a 10% solution of SrI_2 dissolve
6 616 g I_2 at 13 5° (Meyer)

Solubility in salts+Aq at 25°

Salt+Aq	Grams I_2 sol in 1 liter	Salt+Aq	Grams I_2 sol in 1 liter
$\frac{1}{2}$ -N Na_2SO_4	0 160	N NaCl	0 575
$\frac{1}{2}$ -N K_2SO_4	0 238	N KCl	0 658
$\frac{1}{2}$ -N $(\text{NH}_4)_2\text{SO}_4$	0 246	N NH_4Cl	0 735
N NaNO_3	0 257	N NaBr	3 29
N KNO_3	0 266	N KBr	3 801
N NH_4NO_3	0 375	N NH_4Br	4 003

(McLauchlan, Z phys Ch 1903, 44 617)

1 14 g are sol in 100 ccm liquid H_2S (Antony, Gazz ch it 1905, 35, (1) 206)

Sol in liquid NH_3 (Franklin, Am ch J 1898, 20 822)

Sl sol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

SO_2 (Sestini), and SO_2

as Cl_3 dissolve 8 42 pts I at 0°,

I at 15°, 36 89 pts I at 96°

(J 46 194)

in liquid SO_2 , AsCl_3 , SO_2Cl_2 , and
an aldehyde (Walden, Z phys Ch 1903,
43 407)

Very sol in liquid NO_2 (Frankland,
Chem Soc 1901, 79 1361)

Sol in 10-12 pts alcohol (Wittstein)

Sol in wood-spirit (Playfair)

Abundantly sol in amyl (Pelletan), and
hexyl alcohol (Bouis)

Iodine is sol in 20 pts alcohol, 110 pts oil,
7000 pts H_2O , 100 pts glycerine (Cap and
Garot, J Pharm (3) 26 80)

Solubility of I_2 in $\text{C}_2\text{H}_5\text{OH}$ +Aq at room
temperature (14 5°—15 1°)

Volumes of $\text{C}_2\text{H}_5\text{OH}$ in 100 volumes of $\text{C}_2\text{H}_5\text{OH}$ + H_2O	Ccm of 1/10 normal iodine in 5 cc of the solution
100	61 7
90	29 4
80	16 6
70	9 2
60	4 45
50	3 4
40	1 0
30	0 4
20	0 25
10	0 2
0	0 0

(Bruner, Z phys Ch 1898, 26 150)

Solubility of I_2 in $\text{C}_2\text{H}_5\text{OH}$ +Aq at room
temperature (14 5°—15 1°)

Volumes of $\text{C}_2\text{H}_5\text{OH}$ in 100 volumes of $\text{C}_2\text{H}_5\text{OH}$ + H_2O	Ccm of 1/10 normal iodine in 5 cc of the solution
100	58 8
90	36 0
80	23 6
70	16 1
60	10 7
50	6 4
40	3 7
30	1 56
20	0 42
10	0 19
0	

(Bruner, Z phys Ch 1898, 26 150)

Solubility in ethyl alcohol+Aq at 25°

Molecules of $\text{C}_2\text{H}_5\text{OH}$ in 100 molecules $\text{C}_2\text{H}_5\text{OH}+\text{H}_2\text{O}$	Molecules of H_2O in 100 molecules $\text{C}_2\text{H}_5\text{OH}+\text{H}_2\text{O}$	Normality of the iodine solution
0 0	100	0 0022
0 03	99 7(?)	0 0024
0 06	99 4(?)	0 0024
1 12	98 88	0 0023
1 83	98 27(?)	0 0025
9 40	90 60	0 0059
13 48	86 52	0 0111
23 80	76 20	0 0617
50 80	49 20	0 4326
100	0	1 590

(McLauchlan, Z phys Ch 1903, 44 627)

Solubility in acetic acid+Aq at 25°

Molecules of CH_3COOH in 100 molecules $\text{CH}_3\text{COOH}+\text{H}_2\text{O}$	Molecules of H_2O in 100 molecules $\text{CH}_3\text{COOH}+\text{H}_2\text{O}$	Normality of the iodine solution
0 0	100	0 0022
6 95	93 02	0 0049
16 40	83 60	0 0112
31 90	68 10	0 0331
55 70	44 30	0 0882
100	0	0 205

(McLauchlan, Z phys Ch 1903, 44 627)

Very sol in ether, chloroform, and bromo-
form

Solubility in ether

100 g of the sat solution contain at

—83° —90° —108°

15 39 14 58 15 09 g I_2

(Arctowski, Z anorg 1896, 11 276)

About as sol in all fatty oils as in CHCl_3 ,
etc (Gruel, Arch Pharm 223 431)

Sol in 56.6 pts chloroform at 10° (Duncan, Pharm J Trans 51 544)

Solubility in CHCl_3

100 g of the sat solution contain at
 —49° —55 5° —60° —69 5° —73 5°
 0 188 0 144 0 129 0 089 0 080 g I_2
 (Arctowski, Z anorg 1896, 11 276)

Very sol in methylene iodide (Retgers, Z anorg 3 343)

Solubility of I_2 in $\text{C}_6\text{H}_6 + \text{CHCl}_3$ at room temperature (14 5°—15 1°)

Volumes of C_6H_6 in 100 volumes of $\text{C}_6\text{H}_6 + \text{CHCl}_3$	Ccm of 1/10 normal iodine in 5 cc of the solution
100	41 05
90	38 8
80	34 6
70	30 5
60	27 4
50	24 4
40	21 0
30	19 2
20	17 8
10	16 0
0	14 3

(Bruner, Z phvs Ch 1898, 26 147)

Solubility of I_2 in $\text{CS}_2 + \text{CHCl}_3$ at room temperature (14 5°—15 1°)

Volumes of CS_2 in 100 volumes of $\text{CS}_2 + \text{CHCl}_3$	Ccm of 1/10 normal iodine in 5 cc of the solution
100	69 4
90	62 7
80	55 9
70	47 9
60	42 0
50	35 8
40	30 4
30	25 3
20	20 8
10	17 0
0	14 3

(Bruner)

Solubility of I in $\text{C}_6\text{H}_6 + \text{CCl}_4$ at room temperature (14 5°—15 1°)

Volumes of C_6H_6 in 100 volumes of $\text{C}_6\text{H}_6 + \text{CCl}_4$	Ccm of 1/10 normal iodine in 5 cc of the solution
100	41 05
90	37 2
80	33 6
70	29 6
60	26 1
50	22 4
40	19 25
30	16 1
20	13 4
10	10 75
0	8 1

(Bruner)

Solubility of I_2 in $\text{CS}_2 + \text{CCl}_4$ at room temperature (14 5°—15 1°)

Volumes of CS_2 in 100 volumes of $\text{CS}_2 + \text{CCl}_4$	Ccm of 1/10-normal iodine in 5 cc of the solution
100	69 1
90	56 9
80	48 6
70	40 7
60	33 9
50	26 9
40	21 8
30	17 7
20	13 25
10	10 2
0	8 1

(Bruner)

Solubility of I_2 in $\text{C}_2\text{H}_5\text{OH} + \text{CHCl}_3$ at room temperature (14 5°—15 1°)

Volumes of $\text{C}_2\text{H}_5\text{OH}$ in 100 volumes of $\text{C}_2\text{H}_5\text{OH} + \text{CHCl}_3$	Ccm of 1/10 normal iodine in 5 cc of the solution
100	61 7
90	37 1
80	34 2
70	30 7
60	27 9
50	26 1
40	24 6
30	22 7
20	19 9
10	17 1
0	14 25

(Bruner)

Solubility of I_2 in $\text{C}_2\text{H}_7\text{OH} + \text{CHCl}_3$ at room temperature (14 5°—15 1°)

Volumes of $\text{C}_2\text{H}_7\text{OH}$ in 100 volumes of $\text{C}_2\text{H}_7\text{OH} + \text{CHCl}_3$	Ccm of 1/10 normal iodine in 5 cc of the solution
100	58 8
90	51 9
80	44 2
70	35 4
60	31 8
50	30 8
40	27 9
30	25 3
20	21 8
10	17 8
0	14 25

(Bruner)

Sol in acetone (Naumann, B 1904, 37 4328), (Eidmann, C C 1999, II 1014)
 Sol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Sol in allyl mustard oil, phenyl mustard

oil, phenyl isocyanate, pyridine, and alcohol (Mathews, J phys Chem 1905, 9 649)

Solubility of I_2 in glycerine + Aq at 25°
 G = g glycerine in 100 g glycerine + Aq
 I_2 = g I_2 in 100 cc of the solution

G	I_2	Sp gr
0	0 0304	0 9979
7 15	0 0342	1 0198
20 44	0 0482	1 0471
31 55	0 0621	1 0750
40 95	0 0875	1 0995
48 7	0 135	1 1207
69 2	0 278	1 1765
100	1 223	1 2646

(Herz and Knoch, Z anorg 1905, 45 269)

1 l $N-NH_4C_2H_3O_2$ + Aq dissolves 0 440 g I_2 at 25°

1 l 0 7 N- $(NH_4)_2C_2O_4$ + Aq dissolves 0 980 g I_2 at 25° (McLauchlan, Z phys Ch 1903, 44 617)

Very sol in benzonitrile (Naumann, B 1914, 47 1369)

Solubility in CS_2 at t°

t°	Grams iodine in 100 g of sat solution
—100	0 32
— 95	0 37
— 90	0 41
— 85	0 46
— 80	0 51
— 75	0 55
— 25	3 47
— 20	4 14
— 15	4 82
— 10	5 52
— 5	6 58
0	7 89
+ 5	9 21
10	10 51
15	12 35
20	14 62
25	16 92
30	19 26
36	22 67
40	25 22
42	26 75

(Arctowski, Z anorg 1894, 6 404)

1 l CS_2 dissolves 230 g I_2 at 25°

1 l $CHBr_3$ dissolves 189 55 g I_2 at 25°

1 l CCl_4 dissolves 30 33 g I_2 at 25° (Jakowkin, Z phys Ch 1895, 18 590)

Solubility in CS_2

100 g of the sat solution contain at

—80°	—87°	—92 5°	—94°
0 509	0 440	0 391	0 378 g I_2

(Arctowski, Z anorg 1896, 11 274)

When an aqueous solution of I is shaken with CS_2 , 400 pts go into solution in CS_2 for 1 pt remaining in H_2O (Berthelot and Jungfleisch, C R 69 338)

Abundantly sol in methane (Villard, A ch 1897, (7) 10 387)

Easily sol in hot, less in cold naphtha (Pelletier and Walker)

Sol in about 8 pts hot petroleum from Amiano (de Saussure)

Sl sol in cold, more readily in hot benzene (Mansfield) Easily sol in benzene (Morde, A ch (3) 39 452)

Solubility in benzene

100 g of the sat solution contain at

4 7°	6 6°	10 5°	13 7°	16 3°
8 08	8 63	9 60	10 44	11 23 g I_2

(Arctowski, Z anorg 1896, 11 276)

1 l benzene sat with iodine at 25° contains 139 g iodine Abegg, Z anorg 1906, 50 409)

1 l nitrobenzene dissolves 50 62 g I_2 at 16–17° (Dawson and Gawler, Chem Soc 1902, 81 524)

Solubility of I_2 in nitrobenzene + iodides at room temp

Salt	G per l	
	Salt	I_2
KI	12 35	112 7
"	45 56	295 7
"	115 8	698 2
"	155 2	943 6
NaI	13 55	125
"	57 7	393
"	109 1	738
"	228	1251
RbI	85 4	421
"	217 5	1060
LiI	84 1	642
CsI	48 2	213
"	223	858
NH_4I	69 5	482
"	94 3	669
SrI	106 5	599
BaI_2	42 2	237
"	158 5	809
Aniline hydriodide	164	721
Dimethyl aniline hydriodide	160	626
Tetramethylammonium iodide	49 3	266
"	51 4	280

(Dawson and Goodson, Chem Soc 1904, 85 796)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Easily sol in oil of turpentine, but an explosion soon occurs (Walker)

Sol in oil of mandarin (Luca)

Sol in oil of arnica root (Zeller)

Very sol in CS_2 , lignone, furfurol, glycerine, aldehyde, chloral, warm retinole, toluene, salicylic acid, methyl nitrate, methyl salicylate, mercaptan, amyl carbamate, ethyl sulphhydrate, allyl iodide, ethyl disulphocarbonate, carbon chloride, SCl_2 , ICl_3 , H_2S_8 , chlorochromic acid, amyl valerianate, valerianic acid, warm butyric acid, creosote, aniline, quinoline, methylsalicylic acid. Quickly sol in oil of dill, peppermint, sassafras, and tansy. Slowly sol in oil of cloves, cinnamon, cajeput, and rue. Other essential oils decompose it (Various authorities)

Sol in potassium croconate + Aq (Gmelin)

Sol in potassium antimony tartrate + Aq
176 pts H_2O + 6 pts potassium antimony tartrate dissolve 2.75 pts I, 378 pts H_2O + 6 pts potassium antimony tartrate dissolve 4.12 pts I

More sol in tannic acid than in H_2O 1 pt I is sol in 450 pts H_2O with 3.3 pts tannic acid at 12° , 1 pt I is sol in 240 pts H_2O with 0.015 pt tannic acid at about 30° (Koller, Zeit Ch 1866 380)

200 g H_2O containing 0.3 g tannic acid dissolve 1.0 g I (Hager, Comm 1883)

Sol in considerable quantity, especially on warming, in resorcin, orcin, or phloroglucin + Aq, without coloration or formation of HI + Aq. These solutions withdraw I from CS_2 solution, and do not give it up on boiling, but on evaporation in vacuo the I is sublimed in a pure state (Hlasiwetz, Z anal 6 447)

Partition coefficient for iodine between CS_2 and Aq at 25°C

A = concentration of the water layer

C = concentration of the carbon bisulphide layer

A	C	$h = C/A$
0 2571	167 6	651 8
0 2195	140 2	638 7
0 1947	122 0	626 4
0 1743	108 3	620 0
0 1605	98 27	612 2
0 1229	73 23	595 8
0 1104	65 81	596 0
0 0939	55 29	590 5
0 0518	30 36	586 2

Partition coefficient for iodine between CHBr_3 and Aq at 25°C

A = concentration of the water layer

C = concentration of the CHBr_3 layer

A	C	$h = C/A$
0 2736	144 36	527 6
0 1752	85 11	485 7
0 1084	49 93	460 5
0 0757	32 65	431 7
0 0517	22 19	429 3

Partition coefficient for iodine between CCl_4 and Aq at 25°C

A = concentration of the water layer

C = concentration of the CCl_4 layer

A	C	$h = C/A$
0 2913	25 61	87 91
0 1934	16 54	85 51
0 1276	10 88	85 30
0 0818	6 966	85 13
0 0516	4 412	85 77

(Jakowkin, Z phys Ch 1895, 18 586-588)

G alcohol in 100 cc of mixture	$\frac{\text{C aq alcohol}}{\text{CCl}_2} \times 10^3$
30 5	1 29
26 7	0 76
22 9	0 49
19 1	0 34
16 3	0 28
11 4	0 23
7 6	0 20

(Osaka, Chem Soc 1905, 88 (2) 811)

Division of iodine between CS_2 and Na_2SO_4 + Aq at 25°

A = concentration of I in H_2O layer

C = concentration of I in CS_2 layer

Na_2SO_4 + Aq	A	C
1-N	0 1518	142 4
$1/2$ -N	0 1809	141 7
$1/4$ -N	0 2022	143 6
$1/8$ -N	0 2138	142 4

Division of iodine between CS_2 and NaNO_3 + Aq

NaNO_3 + Aq	A	C
1-N	0 1923	142 4
$1/2$ -N	0 2090	143 7
$1/4$ -N	0 2164	143 5

(Jakowkin, Z phys Ch 1896, 20 25)

Partition between CHCl_3 and glycerine

C = millimols iodine in 10 g CHCl_3 layer

W = millimols iodine in 10 g glycerine layer

C	W	C/W
0 564	0 244	2 31
0 919	0 397	2 32
0 151	0 500	2 30

(Herz, Z Elektrochem 1910, 16 870)

artition of I_2 between $CHCl_3$ and other solvents

C = millimols iodine in 10 ccm of the $CHCl_3$ layer

W = millimols iodine in 10 ccm of the other layer

Other Solvent	C	W	C/W
Water	0 338	0 0025	134 6
	1 546	0 0120	129 0
	2 318	0 0184	126 3
	3 207	0 0242	132 8
	3 439	0 0259	132 8
5% by vol H_2O + 25% by vol glycerine	1 217	0 0183	66 32
	1 893	0 0290	65 33
	2 434	0 0367	66 31
	3 219	0 0483	66 65
0% by vol H_2O + 50% by vol glycerine	1 217	0 0405	30 0
	1 835	0 0609	30 1
	2 376	0 0782	30 4
	3 294	0 1020	32 2
5% by vol H_2O + 75% by vol glycerine	1 188	0 116	10 25
	1 806	0 173	10 45
	2 656	0 249	10 66
	2 859	0 265	10 80
	3 400	0 312	10 93

(Herz, Z Elektrochem 1910, 16 870)

Distribution of I_2 between benzene and glycerine at t°

M_1 = concentration of I_2 in benzene layer expressed in g-mol per l

M_2 = concentration of I_2 in glycerine layer expressed in g-mol per l

t°	M_1	M_2
25°	0 00757	0 001604
	0 01610	0 002664
	0 02719	0 004115
	0 04024	0 005794
	0 06255	0 00834
	0 07923	0 01033
	0 10243	0 01324
	0 12201	0 01559
	0 13342	0 01668
	0 16734	0 02081
40°	0 008545	0 00181
	0 01544	0 002593
	0 04432	0 006242
	0 095004	0 012013
	0 13271	0 01632
	0 18508	0 02193
50°	0 00865	0 00184
	0 01523	0 00253
	0 02683	0 00390
	0 04413	0 00576
	0 0620	0 00744
	0 07832	0 00942
	0 10153	0 01214
	0 12166	0 0145
	0 13199	0 01560
	0 18438	0 02122

(Landau, Z phys Ch 1910, 73 202)

Distribution of I_2 between glycerine and CCl_4 at t°

M_1 = concentration of I_2 in CCl_4 layer expressed in g-mol per l

M_2 = concentration of I_2 in glycerine layer expressed in g-mol per l

t°	M_1	M_2
25°	0 002230	0 0014386
	0 0024113	0 0014595
	0 0048227	0 0027014
	0 010452	0 005581
	0 038973	0 019959
	0 04598	0 023948
	0 05820	0 030097
40°	0 00227	0 00127
	0 00239	0 00138
	0 00461	0 00272
	0 01092	0 00482
	0 02540	0 01116
	0 04091	0 01749
	0 06074	0 02701
50°	0 00257	0 00118
	0 00500	0 00225
	0 01363	0 00596
	0 02549	0 01050
	0 04167	0 01693
	0 06309	0 02502

(Landau, Z phys Ch 1910, 73 203)

Distribution of I_2 between ether and ethylene glycol at t°

M_1 = concentration of I_2 in ether layer, expressed in g-mol per l

M_2 = concentration of I_2 in $C_2H_4O_2$ layer, expressed in g-mol per l

t°	M_1	M_2
0°	0 00843	0 00571
	0 03082	0 01713
	0 06551	0 03736
	0 08105	0 04605
	0 12528	0 07148
	0 31511	0 17524
25°	0 00870	0 00571
	0 01677	0 01001
	0 02710	0 01586
	0 03046	0 01713
	0 06385	0 03594
	0 11951	0 06725
	0 30820	0 17524

(Landau, Z phys Ch 1910, 73 205)

Iodine monobromide, $I\text{Br}$

Slowly sol in H_2O with slight decomp
Sol in $CHCl_3$, CS_2 , ether, and alcohol

+5 H_2O (Lowig, Pogg 14 485) Does not exist (Bornemann, A 189 183)

Iodine pentabromide, $\text{IBr}_5(?)$

Sol in H_2O with separation of iodine (Lowig, Pogg 14 485)

Iodine monochloride, ICl

Decomp by H_2O , sol without decomp in alcohol, ether, and $\text{HCl} + \text{Aq}$
Sol in CS_2

Iodine hydrogen chloride, ICl , HCl

Unstable Sol in ether (Schutzenberger, C R 84 389)

Iodine trichloride, ICl_3

Deliquescent With H_2O , a part is dissolved without decomp, and the rest is decomp. The aqueous solution contains more unchanged ICl_3 , the more conc it is (Serullas). Precipitated from aqueous solution by H_2SO_4 . Sol in $\text{HCl} + \text{Aq}$. Sol in warm conc H_2SO_4 without decomp. Sol in alcohol, and benzene. Decomp by small amount of CS_2 (Christomanos, B 10 434). Ether does not remove it from aqueous solution (Serullas).

Iodine lithium chloride, ICl_3 , $\text{LiCl} + 4\text{H}_2\text{O}$

See Lithium chloroiodide

Iodine trichloride magnesium chloride, 2ICl_3 , $\text{MgCl}_2 + 5\text{H}_2\text{O}$

Very deliquescent and easily decomposed (Filhol, J Pharm 25 442)
 $+ 8\text{H}_2\text{O}$ Hydrosopic (Weinland, Z anorg 1902, 30 141)

Iodine trichloride manganous chloride, 2ICl_3 , $\text{MnCl}_2 + 8\text{H}_2\text{O}$

Hydrosopic (Weinland, Z anorg 1902, 30 139)

Iodine trichloride nickel chloride, 2ICl_3 , $\text{NiCl}_2 + 5\text{H}_2\text{O}$

If CCl_4 dissolves out ICl_3 (Weinland, Z anorg 1902, 30 138)

Iodine monochloride phosphorus pentachloride, ICl , PCl_5

Very deliquescent, decomp by H_2O

Iodine potassium chloride, ICl_3 , KCl

Sol in H_2O with decomp
Ether dissolves out ICl_3 (Filhol, J Pharm 25 433, 506)
See Potassium chloroiodide

Iodine sodium chloride, ICl_3 , $\text{NaCl} + 2\text{H}_2\text{O}$

See Sodium chloroiodide

Iodine trichloride strontium chloride, 2ICl_3 , $\text{SrCl}_2 + 8\text{H}_2\text{O}$

Hydrosopic (Weinland, Z anorg 1902, 30 142)

Iodine trichloride sulphur tetrachloride, ICl_3 , SCl_4

Very deliquescent in air, decomp by H_2O . Decomp with formation of clear solution by dil $\text{HNO}_3 + \text{Aq}$ (Weber, Pogg 128 459)
 SCl_2 , 2ICl_3 (Jallard, J B 1860 95)
Correct formula is as above (Weber, l c)
 2ICl_3 , SCl_4 Sol in SO_2Cl_2 , SOCl_2 , POCl_3 , warm SCl_2 , petroleum ether, ligroin, CHCl_3 , CCl_4 , CS_2 and abs ether (Ruff, B 1904, 37 4519)

Iodine trichloride zinc chloride, 2ICl_3 , $\text{ZnCl}_2 + 8\text{H}_2\text{O}$

Unstable Hydrosopic (Weinland, Z anorg 1902, 30 140)

Iodine pentafluoride, IF_5

Fumes in air, decomp with H_2O (Gore, C N 24 291)
Decomp by H_2O into iodic acid and HF . Decomp by solutions of the alkalis (Moissan, C R 1902, 135 564)

Iodine trioxide, I_2O_3

Decomp by H_2O (Ogier, C R 85 957, 86 722)
Probably a mixture

Iodine tetroxide, $\text{I}_2\text{O}_4(?)$

Insol in cold, decomp by hot H_2O , msol in alcohol. Decomp by $\text{HNO}_3 + \text{Aq}$. Sol in H_2SO_4 (Millon, J pr 34 319, 337)

Iodine pentoxide, I_2O_5

Very sol in H_2O , and in dil alcohol. Insol in absolute alcohol, ether, CS_2 , chloroform, and hydrocarbons.
Forms hydrates, iodic acid HIO_3 , and $3\text{I}_2\text{O}_5$, H_2O , insol in ordinary alcohol.
For sp gr of aqueous solution see iodic acid

Iodine oxides, $\text{I}_{10}\text{O}_{19}$, I_3O_{13}

The compounds $\text{I}_{10}\text{O}_{19}$ (Millon, J pr 34 336), and I_3O_{13} (Kimmerer, J pr 83 81), are probably mixtures.
Millon's oxides are impure I_2O_4 (Kappeler, B 1911, 44 3496)

Iodine sulphur oxide, $5\text{I}_2\text{O}_7$, SO_3

Decomp by H_2O (Kimmerer)
 I_2O_5 , 3SO_3 . Decomp by H_2O , sl sol in hot SO_4 (Weber, B 20 86)
 $= (\text{IO})_2(\text{SO}_4)_3$ Iodyl sulphate (?)

Iodine oxyfluoride, $\text{IOF}_3 + 5\text{H}_2\text{O}$

Fumes in the air (Weinland, Z anorg 1908, 60 163)

Iodine sulphide, S I_2

Sol in CS_2 (Linebarger, Am Ch J 1895, 17 57)

Iodine sulphoxide, I_2SO_3 (?)

Decomp by H_2O (Schultz-Sellack)
 $I_2(SO_3)_2$ (?) Decomp by H_2O (Weber, J pr (2) 25 224)
 $I_2(SO_3)_4$ (?) As above (Weber)
 See also Iodosulphuric anhydride

Iodiridic acid**Ammonium iodiridate, $(NH_4)_2IrI_6$**

Very easily sol in cold H_2O , decomp on warming Insol in alcohol (Oppler, J B 1857 263)

Potassium iodiridate, K_2IrI_6

Very easily sol in H_2O Insol in alcohol

Sodium iodiridate, Na_2IrI_6

Insol in cold, sl sol in hot H_2O Easily sol in acids (Oppler)

Iodiridous acid**Ammonium iodiridite, $(NH_4)_6Ir_2I_{12}+H_2O$**

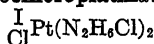
Very sol in H_2O , but decomp on warming (Oppler)

Potassium iodiridite, $K_6Ir_2I_{12}$

Insol in H_2O , or alcohol Slowly sol in acids, easily in warm alkalies + Aq

Silver iodiridite, $Ag_6Ir_2I_{12}$

Ppt

Iodochloroplatinodiamine chloride,

Sl sol in H_2O

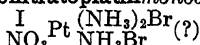
Iodochromic acid**Potassium iodochromate, $KCrO_3I$**

Decomp by boiling H_2O (Guyot, C R 73 46)

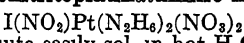
See also Chromiodic acid

Iodomolybdic acid

See Molybdoiodic acid

Iodonitratoplatinmonodiamine bromide,

Very sl sol in H_2O (Cleve)

Iodonitratoplatinodiamine nitrate,

Quite easily sol in hot H_2O (Cleve)

Iodopalladous acid**Potassium iodopalladite**

Deliquescent (Lassaigne)

Iodophosphoric acid

See Phosphoiodic acid

Iodoplatinamine iodide, $I_2Pt(NH_3)_2I_2$

Sol in H_2O , especially easily if boiled (Cleve)

Iodoplatinodiamine iodide, $I_2Pt(N_2H_5)_2I_2$

Sol in H_2O , especially when hot (Cleve)

— mercuric iodide, $I_2Pt(N_2H_5)_2, 2HgI_2$

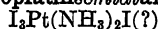
Extremely difficultly sol in cold H_2O , partly decomp by boiling (Jorgensen, Gr K 3 1214)

— nitrate, $I_2Pt(N_2H_5NO_3)_2$

More sol in hot than cold H_2O

— sulphate, $I_2Pt(N_2H_5)_2SO_4$

Very sl sol in H_2O (Jorgensen, J pr (15 429)

Iodoplatinsemidiamine iodide,

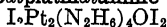
Sl sol in H_2O (Jorgensen, J pr (2) 1 345)

— periodide, $I_3Pt(NH_3)_2I, I_2$

Moderately sl sol in H_2O (Cleve)

Iododiplatinamine iodide, $I_2Pt_2(N_2H_5)_2I_4$

Insol in H_2O

Iododiplatinodiamine anhydroiodide,

Insol in NH_4OH + Aq

— anhydronitrate, $I_2Pt_2(N_2H_5)_4O(NO_3)_2$

Easily sol in warm H_2SO_3 + Aq (Cleve)

— iodide, $I_2Pt_2(N_2H_5)_4I_4$

Ppt

— nitrate, $I_2Pt_2(N_2H_5)_4(NO_3)_4+4H_2O$

Sl sol in cold, moderately sol in hot H_2O (Cleve)

— phosphate, $I_2Pt_2(N_2H_5)_4[O_3P(OH)]_2$

Nearly insol in H_2O

— sulphate, $I_2Pt_2(N_2H_5)_4(SO_4)_2$

Nearly insol in H_2O

— platodiamine sulphate, $I_2Pt_2(N_2H_5)_4SO_4Pt(NH_3)_2SO_4$

Very sl sol in H_2O (Carlgren Sv V A F 47 306)

Iodoplatinic acid, $H_2PtI_6+9H_2O$

Deliquescent Easily sol in H_2O , with decomp into PtI_4 and HI on standing or warming (Topsoe)

Ammonium iodoplatinate, $(\text{NH}_4)_2\text{PtI}_6$

Easily sol in H_2O (Topsoe)
 NH_4I , PtI_4 Sl sol in H_2O , insol in alcohol (Lassaigne, A ch (2) 51 128)

Barium iodoplatinate, BaPtI_6

Deliquescent, but less so than Na_2PtI_6 which it otherwise resembles (Lassaigne)

Calcium iodoplatinate, $\text{CaPtI}_6 \cdot 12\text{H}_2\text{O}$

Not so deliquescent as Na salt

Cobalt iodoplatinate, $\text{CoPtI}_6 \cdot 9\text{H}_2\text{O}$

Very deliquescent

Lead tetraiodoplatinate, $[\text{PtI}_4(\text{OH})_2]\text{Pb}(\text{OH})_2$

Ppt (Belluci, C C 1902, I 625)

Magnesium iodoplatinate, $\text{MgPtI}_6 \cdot 9\text{H}_2\text{O}$

Sol in H_2O

Manganese iodoplatinate, $\text{MnPtI}_6 \cdot 9\text{H}_2\text{O}$

Very deliquescent

Mercuric tetraiodoplatinate, $[\text{PtI}_4(\text{OH})_2]\text{Hg}$

Ppt (Belluci, C C 1902, I 625)

Nickel iodoplatinate, $\text{NiPtI}_6 \cdot 9\text{H}_2\text{O}$

Very deliquescent

Potassium iodoplatinate, K_2PtI_6

Easily sol in H_2O Insol in alcohol Not attacked by cold conc H_2SO_4

Silver tetraiodoplatinate, $[\text{PtI}_4(\text{OH})]\text{Ag}$

Ppt (Belluci, C C 1902, I 625)

Sodium iodoplatinate, $\text{Na}_2\text{PtI}_6 \cdot 6\text{H}_2\text{O}$

Not deliquescent, but easily sol in H_2O and alcohol (Vauquelin) Deliquescent (Lassaigne)

Thallium tetraiodoplatinate, $[\text{PtI}_4(\text{OH})]\text{Tl}$

Ppt (Belluci, C C 1902, I 625)

Zinc iodoplatinate, $\text{ZnPtI}_6 \cdot 9\text{H}_2\text{O}$

Easily sol in H_2O

Iodoplatinocyanhydric acid, $\text{H}_2\text{Pt}(\text{CN})_4\text{I}_2$

See Periodoplatinocyanhydric acid

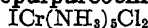
Silver iodoplatinocyanide, $\text{Ag}_2(\text{PtI}_4(\text{CN})_4)$

Ppt (Miolati, Gazz ch it 1900, 30 588)

Strontium iodoplatinocyanide platinumocyanide, $\text{SrPt}(\text{CN})_4\text{I}_2, 10\text{SrPt}(\text{CN})_4 + x\text{H}_2\text{O}$

(Holst)

Iodopurpleochromium chloride,



Quite sol in H_2O (Jorgensen, J pr (2) 25 83)

— **chloroplatinate, $\text{ICr}(\text{NH}_3)_5\text{PtCl}_6$**

Precipitate (Jorgensen, l c)

— **iodide, $\text{ICr}(\text{NH}_3)_5\text{I}_2$**

Difficultly sol in H_2O Insol in HI , or $\text{KI} + \text{Aq}$, insol in alcohol (Jorgensen, l c)

— **nitrate, $\text{ICr}(\text{NH}_3)_5(\text{NO}_3)_2$**

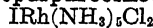
Much less sol in H_2O than the chloride (Jorgensen, l c)

Iodopurpleocobaltic iodide, $\text{CoI}(\text{NH}_3)_5\text{I}_2$

(Claudet)

Does not exist (Jorgensen, J pr (2) 25 94)

Iodopurpleorhodium chloride,



Relatively easily sol in H_2O , insol in $\text{HCl} + \text{Aq}$ and alcohol Insol in $\text{KI} + \text{Aq}$ (Jorgensen, J pr (2) 27 433)

— **fluosilicate, $\text{IRh}(\text{NH}_3)_5\text{SiF}_6$**

Nearly insol in cold H_2O

— **iodoplatinate, $\text{IRh}(\text{NH}_3)_5\text{PtI}_6$**

Ppt

— **iodide, $\text{IRh}(\text{NH}_3)_5\text{I}_2$**

Very sl sol in cold H_2O , more sol in hot H_2O , insol in dil $\text{HI} + \text{Aq}$, and alcohol (Jorgensen, J pr (2) 27 433)

— **nitrate, $\text{IRh}(\text{NH}_3)_5(\text{NO}_3)_2$**

Sl sol in H_2O , more easily sol in hot H_2O , insol in dil $\text{HNO}_3 + \text{Aq}$, and alcohol

— **sulphate, $\text{IRh}(\text{NH}_3)_5\text{SO}_4$, and $+3\text{H}_2\text{O}$**

Sl sol in even hot H_2O (Jorgensen)

Iodoselenic acid

Ammonium iodoselenate, $2(\text{NH}_4)_2\text{O}, \text{I O}_5, 2\text{SeO}_3 + \text{H O}$

Decomp by H_2O (Weinland, B 1903, 36 1400)

$2(\text{NH}_4)_2\text{O}, 3\text{I O}_5, 2\text{SeO}_3 + 5\text{H}_2\text{O}$ Sol in H_2O with decomp (?) (Weinland)

Potassium iodoselenate, $2\text{K}_2\text{O}, \text{I O}_5, 2\text{SeO}_3 + \text{H}_2\text{O}$

Decomp by H_2O (Weinland)

$2\text{K}_2\text{O}, 3\text{I O}_5, 2\text{SeO}_3 + 5\text{H}_2\text{O}$ Sol in H_2O with decomp (?) (Weinland)

Rubidium iodoseleate, $2\text{Rb}_2\text{O}$, $3\text{I}_2\text{O}_5$, 2SeO_3
 $+5\text{H}_2\text{O}$

Sol in H_2O (Weinland)

Iodostannous acid

Data concerning solubility of SnI_2 in $\text{HI} + \text{Aq}$ indicate formation of this compound (Young, J Am Chem Soc 1897, 19 853)

Iodosulphobismuthous acid

Cuprous iodosulphobismuthite, $2\text{Cu}_2\text{S}$, Bi_2S_3 , 2BiSI

Decomp by H_2O at ord temp Decomp by mineral acids with evolution of H_2S (Ducatte, C R 1902, 134 1213)

Lead iodosulphobismuthite, PbS , Bi_2S_3 , 2BiSI

Insol in H_2O Partially decomp by boiling H_2O Decomp by dil mineral acids with evolution of H_2S (Ducatte)

Iodosulphuric acid

Ammonium iodosulphate, $(\text{NH}_4)_2\text{SO}_3\text{I}_2(?)$

Very sol in H_2O (Zinno, N Rep Pharm 20 449)

Mercuric iodosulphate, $\text{Hg}_2(\text{SO}_4)\text{I}_2$

See Mercuric sulphate iodide

Potassium iodosulphate, $\text{K}_2\text{SO}_3\text{I}_2(?)$

Sol in 7.14 pts H_2O at 15° (Zinno, N Rep Pharm 20 449)

Sodium iodosulphate, $\text{Na SO}_3\text{I}_2 + 10\text{H}_2\text{O}$

Sol in 3.64 pts H_2O at 15° and in dil alcohol (Zinno, N Rep Pharm 20 449)

Does not exist (Michaelis and Koethe, B 6 999)

Iodosulphuric anhydride, ISO_3

Decomp very violently by H_2O (Weber, J pr (2) 25 224)

Duodosulphuric anhydride, I_2SO_3

Decomp with H_2O , but not so violently as ISO_3 (Weber, J pr (2) 25 224)

Iodotrisulphuric anhydride, $\text{I}(\text{SO}_3)_3$

Decomp by H_2O (Weber, J pr (2) 25 224)

Iodotelluric acid

Ammonium iodotellurate, $(\text{NH}_4)_2\text{O}$, I_2O_5 , $2\text{TeO}_3 + 6\text{H}_2\text{O}$

Sol in H_2O (Weinland, Z anorg 1901, 28 52)

$(\text{NH}_4)_2\text{O}$, I_2O_5 , $2\text{TeO}_3 + 8\text{H}_2\text{O}$ Sol in H_2O (Weinland, B 1900, 33 1017)

Cæsium iodotellurate, Cs_2TeI_4

Insol in CsI or $\text{HI} + \text{Aq}$ Decomp slowly by cold, rapidly by hot H_2O (Wheeler, Sil Am J 145 267)

Potassium iodotellurate, $\text{K}_2\text{TeI}_6 + 2\text{H}_2\text{O}$

Sl efflorescent Somewhat sol in $\text{KI} + \text{Ac}$ and dil $\text{HI} + \text{Aq}$ (Wheeler)

K_2O , I_2O_5 , $\text{TeO}_3 + 3\text{H}_2\text{O}$ Sol in H_2O Partially decomp on recryst from H_2C (Weinland, Z anorg 1901, 28 53)

K_2O , I_2O_5 , $2\text{TeO}_3 + 6\text{H}_2\text{O}$ Sol in H_2O without decomp (Weinland)

Rubidium iodotellurate, Rb_2TeI_6

Sl sol in HI , or $\text{RbI} + \text{Aq}$ Decomp b H_2O Somewhat sol in alcohol (Wheeler Rb_2O , I_2O_5 , $2\text{TeO}_3 + 6\text{H}_2\text{O}$ Sol in H_2O (Weinland))

Iodotetramine chromium iodide,

$\text{ICr}(\text{NH}_3)_4\text{I}_2 + \text{H}_2\text{O}$

Sol in H_2O Pptd by alcohol (Cleve)

Iodotetramine cobaltic sulphate,

$\text{ICo}(\text{NH}_3)_4\text{SO}_4$

(Vortmann and Blasberg, B 22 2652)

Iodotungstic acid

See Tungstioiodic acid

Iodous acid, I_2O_3

See Iodine trioxide

Iodovanadic acid, I_2O_5 , $\text{V}_2\text{O}_5 + 5\text{H}_2\text{O}$

Very easily sol in H_2O
 $2\text{V}_2\text{O}_5$, $3\text{I}_2\text{O}_5 + 18\text{H}_2\text{O}$ (Ditte, C R 102 757)

Ammonium iodovanadate, $3(\text{NH}_4)_2\text{O}$, $2\text{V}_2\text{O}_5$, $5\text{I}_2\text{O}_5 + 20\text{H}_2\text{O}$

Sol in H_2O (Ditte, C R 102 1019)

Irididamine compounds, $\text{Cl} \cdot \text{Ir}(\text{NH}_3)_4\text{X}_2$

See Chloriridamine compounds

Iridic acid

Potassium iridate (?)

Sol in H_2O and $\text{HCl} + \text{Aq}$

Iridicyanhydric acid, $\text{H}_3\text{Ir}(\text{CN})_6$

Easily sol in H_2O , still more easily in alcohol, less in ether (Martius, A 117 369)

Barium iridicyanide, $\text{Ba}_3[\text{Ir}(\text{CN})_6]_2 + 18\text{H}_2\text{O}$

Efflorescent Easily sol in hot or cold H_2O Nearly insol in alcohol Not decomp by acids

Cupric iridicyanide ammonia, $\text{Cu}_3\text{Ir}_2(\text{CN})_{12}$,
 $6\text{NH}_3 + 4\text{H}_2\text{O}$

Ppt Decomp in air (Rumbach, Z anorg
 1907, **52** 413)

Potassium iridicyanide, $\text{K}_3\text{Ir}(\text{CN})_6$
 Easily sol in H_2O

Silver iridicyanide ammonia, $\text{Ag}_3\text{Ir}(\text{CN})_6$,
 $2\text{NH}_3 + 3\text{H}_2\text{O}$

Ppt Decomp in the light (Rumbach, Z
 anorg 1907, **52** 414)

Iridium, Ir

Insol in all acids, including aqua regia,
 except when in finely divided state, as
 "iridium black," when it is sol in aqua regia
 (Claus, J pr **42** 251)

Iridium ammonia compounds

See—

Chlorirididamine comps, $\text{ClIr}(\text{NH}_3)_2\text{X}$

Iridotramine " $\text{Ir}(\text{NH}_3)_3\text{X}_3$

Iridopentamine " $\text{Ir}(\text{NH}_3)_5\text{X}_3$

Iridotetramine " $\text{Ir}(\text{NH}_3)_4\text{X}_2$

Iridoquoopentamine " $\text{Ir}(\text{NH}_3)_5(\text{OH}_2)\text{X}_3$

Iridosoamine " $\text{Ir}(\text{NH}_3)_2\text{X}_2$

Iridosodamine " $\text{Ir}(\text{NH}_3)_4\text{X}_2$

Iridium tribromide, $\text{IrBr}_3 + 4\text{H}_2\text{O}$

Easily sol in H_2O Insol in alcohol or
 ether (Birnbäum)

Iridium tetrabromide, IrBr_4 , or H_2IrBr_5

Deliquescent Sol in H_2O and alcohol
 (Birnbäum)

See Bromiridic acid

Iridium hydrogen sesquibromide, 3HBr , $\text{IrBr}_3 + \text{H}_2\text{O} = \text{H}_3\text{IrBr}_6 + 3\text{H}_2\text{O}$

See Bromiridous acid

Iridium sesquibromide with MBr

See Bromiridite, M

Iridium tetrabromide with MBr

See Bromiridate, M

Iridium phosphorous bromide, IrBr_3 , 3PBr_3

Partly decomp by H_2O into a sol, and
 insol modification Sol in PBr_3 (Geisen-
 heimer)

IrBr_3 , 2PBr_3 Not easily attacked by H_2O
 IrBr_4 , 2PCl_3

See Iridium phosphorus chlorobromide

Iridium carbide, $\text{IrC}_4(?)$

(Berzelius)

Stable toward H_2O , acids, and alcohol
 (Strecker, B 1909, **42** 1773)

Iridium monochloride, IrCl

Insol in acids and bases (Wohler, B
 1913, **46** 1584)

Iridium dichloride, IrCl_2

Insol in acids and bases (Wohler, B
 1913, **46** 1585)

Iridium trichloride, IrCl_3

Insol in acids or alkalis (Claus, C C
 1861 690)

Insol in H_2O , acids and alkalis, (Leadé,
 C R 1899, **129** 1251)

+ $4\text{H}_2\text{O}$ Sol in H_2O (Claus)

Iridium tetrachloride, IrCl_4 , or $\text{H}_2\text{IrCl}_6(?)$

Deliquescent, and easily sol in H_2O

Iridium trichloride with MCl

See Chloriridite, M

Iridium tetrachloride with MCl

See Chloriridate, M

Iridium chloride with potassium chloride and sulphite

See Chloriridosulphite, potassium

Iridium phosphorus chloride, IrP_2Cl_9

Insol in cold H_2O Sl decomp by hot
 H_2O (Geisenheimer, A ch (6) **23** 254)

$\text{IrP}_2\text{Cl}_{10}$ Very sol in chloroform (G)

$\text{IrP}_2\text{Cl}_{12}$ Easily sol in PCl_3 , or CHCl_3 ,
 also in CS_2 with gradual decomp Sl sol in
 cold H_2O Decomp by boiling into IrCl_3 ,
 $3\text{H}_3\text{PO}_4$ Sl sol in benzene, ligrom and CCl_4
 (Strecker, B 1909, **42** 1772)

+ H_2O Insol in PCl_3 at 100° Very
 slowly sol in boiling H_2O (Geisenheimer, A
 ch (6) **23** 266)

$\text{IrP}_3\text{Cl}_{15}$ Decomp by H_2O into 2IrCl_3 ,
 $3\text{H}_3\text{PO}_3$, $3\text{H}_3\text{PO}_4$ Violently decomp by
 alcohol Sl sol in cold, more in hot POCl_3 ,
 without decomp Very sol in PCl_3 with
 decomp into $\text{IrP}_3\text{Cl}_{12}$, similarly in PBr_3 Sol
 in AsCl_3 with combination Sol in CS_2 with
 decomp Sol in SCl_2 with combination
 Easily sol in cold C_6H_6 with decomp Insol
 in CCl_4 Sol in CHCl_3 with decomp (Gei-
 senheimer, A ch (6) **23** 254)

Iridium phosphorus arsenic chloride,

$2\text{IrP}_3\text{Cl}_{15}$, 5AsCl_3

Sol in H_2O with decomp into correspond-
 ing acid (Geisenheimer, C R **110** 1336)

IrCl_3 , 2PCl_3 , 2AsCl_3 Very sol in H_2O
 with decomp Sol in AsCl_3 , insol in CCl_4
 (Geisenheimer)

Iridium phosphorus sulphur chloride, IrCl_3 , 2PCl_3 , 2SCl_2

Very sol in sl amt H_2O , with decomp into
 an acid analogous to chlorophosphoridic acid
 Sol in SCl_2 (Geisenheimer)

Iridium phosphorus chlorobromide, $\text{IrBr}_4 \cdot 2\text{PCl}_3$
(Geisenheimer, C R 111 40)

Iridium dihydroxide, $\text{IrO}_2 \cdot 2\text{H}_2\text{O} = \text{IrO}_4\text{H}_4$
Insol in dil HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ Slowly but completely sol in $\text{HCl} + \text{Aq}$ Sol in KOH , and $\text{NaOH} + \text{Aq}$ (Claus, J pr 39 104)

Iridium sesquihydroxide, $\text{Ir}_2\text{O}_3\text{H}_6$
Not attacked by acids, except slightly by conc $\text{HCl} + \text{Aq}$ (Claus, C C 1861 690)

Iridium triiodide, IrI_3
Very sl sol in cold, somewhat more in hot H_2O Insol in alcohol (Oppler, J B 1857 263)

Iridium tetraiodide, IrI_4
Insol in H_2O or acids (Lassaigne)
Sol in solutions of iodides (Oppler)

Iridium triiodide with MI
See Iodiridite, M

Iridium tetraiodide with MI
See Iodiridate, M

Iridium dioxide, IrO_2
Very sl sol in acids
Freshly pptd Sol in conc H_2SO_4 , hot 2-N H_2SO_4 , HNO_3 , HCl Insol in 2-N KOH and sl sol in hot 1-N KOH
Dried in a desiccator Sol in HCl Insol in H_2SO_4 , HNO_3 and KOH
Dried at 100° Sol in hot conc HCl Insol in H_2SO_4 , HNO_3 and KOH (Wohler, Z anorg 1908, 57 334)
See also Iridium dihydroxide

Iridium trioxide, IrO_3
Unstable (Wohler, Z anorg 1908, 57 340)

Iridium sesquioxide, Ir_2O_3
Insol in acids
Sol in conc H_2SO_4 , and hot conc HCl Forms colloidal solution with dil HCl Conc HNO_3 converts it into the dioxide
Insol in $\text{KOH} + \text{Aq}$ (Wohler, Z anorg 1908, 57 339)

Iridium oxybromide, $\text{Ir}_2\text{Br}_3\text{O}_2 = 2\text{IrBr}_4 \cdot \text{IrO}_2$
Not decomp by H_2O (Geisenheimer, A ch (6) 23 286)

Iridium phosphide, Ir_2P
(Clarke and Joslin, Am Ch J 5 231)

Iridium sesquiseleide, Ir_2Se_3
Insol in HNO_3 , slowly sol in hot aqua regia (Chabré and Bouchonnet, C R 1903, 137 1060)

Iridium monosulphide, IrS
Insol in $\text{HNO}_3 + \text{Aq}$, and very sl sol if at all in aqua regia (Berzelius)
Sol in K_2S , and $\text{KSH} + \text{Aq}$
 $+ x\text{H}_2\text{O}$ Sl sol in H_2O , sol in cold $\text{HNO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ or dil acids More sol in $\text{K}_2\text{S} + \text{Aq}$ than PtS_2 (Berzelius)

Iridium disulphide, IrS_2
Not attacked by H_2O , but decomp when exposed moist in air Not attacked by sat $\text{HCl} + \text{Aq}$ or by conc $\text{HNO}_3 + \text{Aq}$, but is oxidised by fuming $\text{HNO}_3 + \text{Aq}$, and aqua regia Insol in NH_4 sulphides, or polysulphides + Aq Slowly sol in alkali polysulphides + Aq (Antony, Gazz ch it 23, 1 190)

Iridium sesquisulphide, Ir_2S_3
Sl sol in H_2O Sol in HNO_3 , or $\text{K}_2\text{S} + \text{Aq}$

Iridotriamine chloride, $\text{Ir}(\text{NH}_3)_3\text{Cl}_3$
Sl sol in H_2O Not attacked by boiling H_2SO_4 (Palmaer, B 22 15)

Iridotetraamine chloride, $\text{Ir}(\text{NH}_3)_4\text{Cl}_3$
Very sol in H_2O (Palmaer, B 22 15)

— chlorosulphate, $[\text{Ir}(\text{NH}_3)_4\text{Cl}_2]\text{SO}_4 + 4\text{H}_2\text{O}$
(Palmaer)

Iridopentamine bromide, $\text{Ir}(\text{NH}_3)_5\text{Br}_3$
Sol in 352 pts H_2O at 12.5° (Palmaer, B 23 3817)

— bromochloride, $\text{Ir}(\text{NH}_3)_5\text{ClBr}_2$
Sol in H_2O (Palmaer, B 24 2090)

— bromonitrite, $\text{Ir}(\text{NH}_3)_5\text{Br}(\text{NO}_2)_2$
Sol in 179 pts H_2O at 18° (Palmaer)

— bromosulphate, $\text{Ir}(\text{NH}_3)_5\text{BrSO}_4 + \text{H}_2\text{O}$
Sol in H_2O (Palmaer)

— carbonate, $[\text{Ir}(\text{NH}_3)_5]_2(\text{CO}_3)_3 + 3\text{H}_2\text{O}$
Sol in H_2O (Claus, J pr 63 99)

— trichloride, $\text{Ir}(\text{NH}_3)_3\text{Cl}_3$
Sol in 153.1 pts H_2O at 15.1° (Palmaer, B 23 3810)
Sol in hot H_2O containing HCl (Claus, J pr 69 30)

— chlorobromide, $\text{Ir}(\text{NH}_3)_5\text{ClBr}_2$
Sol in 213.6 pts H_2O at 15° (Palmaer)

— chloroiodide, $\text{Ir}(\text{NH}_3)_5\text{ClI}_2$
Sol in 104.5 pts H_2O at 15° (Palmaer)

— chlorooxalate, $\text{Ir}(\text{NH}_3)_5\text{ClC}_2\text{O}_4$
Sl sol in H_2O (Palmaer)

Iridopentamine chloronitrate,
 $\text{Ir}(\text{NH}_3)_5\text{Cl}_2(\text{NO}_3)_2$
 Sol in 51.54 pts H_2O at 15.4° (Palmaer)

— **chloronitrite**,
 $\text{Ir}(\text{NH}_3)_5\text{Cl}(\text{NO}_2)_2$
 Easily sol in H_2O (Palmaer)

— **chloroplatinate**, $\text{Ir}(\text{NH}_3)_5\text{Cl}_3$, PtCl_4
 Very sl sol in H_2O (Palmaer)

— **chlorosulphate**, $\text{Ir}(\text{NH}_3)_5\text{ClSO}_4 + 2\text{H}_2\text{O}$
 Sol in 134.5 pts H_2O at 15° (Palmaer)

— **hydroxide**, $\text{Ir}(\text{NH}_3)_5(\text{OH})_3$
 Known only in solution, which decomp on evaporation (Claus)

— **nitrate**, $\text{Ir}(\text{NH}_3)_5(\text{NO}_3)_3$
 Moderately sol in H_2O (Claus)
 Sol in 349 pts H_2O at 16° (Palmaer)

— **sulphate**, $[\text{Ir}(\text{NH}_3)_5]_2(\text{SO}_4)_3$
 Sol in H_2O (Claus)

Iridoaquopentamine bromide,
 $\text{Ir}(\text{NH}_3)_5(\text{OH}_2)\text{Br}_2$
 Sol in 4 pts H_2O Pptd from aqueous solution by $\text{HBr} + \text{Aq}$ (Palmaer, B 24 2090)

— **chloride**, $\text{Ir}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$
 Sol in 1.2 to 1.5 pts H_2O at ord temp
 Pptd by $\text{HCl} + \text{Aq}$ from aqueous solution (Palmaer, B 24 2090)

— **nitrate**, $\text{Ir}(\text{NH}_3)_5(\text{OH}_2)(\text{NO}_3)_3$
 Sol in about 10 pts H_2O at 17° Pptd from aqueous solution by $\text{HNO}_3 + \text{Aq}$ (Palmaer)

Iridonitrous acid, $\text{H}_6\text{Ir}_2(\text{NO}_2)_{12}$
 Easily sol in H_2O (Gibbs, B 4 281)

Ammonium iridonitrite, $(\text{NH}_4)_6\text{Ir}_2(\text{NO}_2)_{12}$
 Almost insol in cold H_2O , decomp by hot H_2O with evolution of N_2 . Decomp by hot conc H_2SO_4 or HCl . Insol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ (Leidich, C R 1902, 134 1583)

Barium iridonitrite iridochloride,
 $\text{Ba}_3\text{Ir}_2(\text{NO}_3)_{12}$, $\text{Ba}_3\text{Ir}_2\text{Cl}_{12}$
 Sol in H_2O (Lang)

Mercuric iridonitrite, $\text{Hg}_2\text{Ir}_2(\text{NO}_2)_{12}$
 Insol in H_2O (Gibbs, B 4 280)

Potassium iridonitrite, $\text{K}_6\text{Ir}_2(\text{NO}_2)_{12}$
 Sl sol in cold, more sol in boiling H_2O
 Decomp by hot HCl or H_2SO_4 . Insol in $\text{KCl} + \text{Aq}$ (Leidich, Bull Soc 1902, (3) 27 937)
 $+ 2\text{H}_2\text{O}$ Moderately sol in H_2O

Potassium iridonitrite iridochloride,
 $\text{K}_6\text{Ir}_2(\text{NO}_2)_{12}$, $\text{K}_6\text{Ir}_2\text{Cl}_{12}$
 Sol in H_2O

Silver iridonitrite, $\text{Ag}_6\text{Ir}_2(\text{NO}_2)_{12}$
 Difficultly sol in cold, more easily in hot H_2O

Sodium iridonitrite, $\text{Na}_6\text{Ir}_2(\text{NO}_2)_{12} + 2\text{H}_2\text{O}$
 Sl sol in H_2O Sol in cold H_2O Decomp by hot conc H_2SO_4 or HCl (Leidich, C R 1902, 134 1583)

Sodium iridonitrite iridochloride,
 $\text{Na}_4\text{Ir}_2\text{Cl}_2(\text{NO}_2)_8 + 2\text{H}_2\text{O}$
 Sl sol in H_2O (Gibbs)
 $\text{Na}_6\text{Ir}_2(\text{NO}_2)_{12}$, $\text{Na}_6\text{Ir}_2\text{Cl}_6$ Insol in cold, sl sol in hot H_2O (Lang)

Iridosamine chloride, $\text{Ir}(\text{NH}_3)_2\text{Cl}_2$
 Nearly insol in H_2O (Skoblikoff, A 84 275)

— **sulphate**, $\text{Ir}(\text{NH}_3)_2\text{SO}_4$
 Easily sol in H_2O (Skoblikoff)

Iridosodiamine chloride, $\text{Ir}(\text{N}_2\text{H}_5)_2\text{Cl}_2$
 Insol in cold, decomp by hot H_2O (Skoblikoff)

— **nitrate**, $\text{Ir}(\text{N}_2\text{H}_5)_2\text{NO}_3)_2$
 Easily sol in H_2O

— **sulphate**, $\text{Ir}(\text{N}_2\text{H}_5)_2\text{SO}_4$
 Sl sol in cold, easily in boiling H_2O Sl sol in alcohol

Iridosulphuric acid

Potassium iridosulphate, $\text{K}_6\text{Ir}_2(\text{SO}_4)_6$
 Sol in H_2O (de Boisbaudran, C R 96 1406)

Iridosulphurous acid

Ammonium iridosulphite, $(\text{NH}_4)_6\text{Ir}_2(\text{SO}_3)_6 + 6\text{H}_2\text{O}$
 Slightly sol in H_2O (Birnbbaum, A 136 179)

Potassium iridosulphite, $\text{K}_6\text{Ir}_2(\text{SO}_3)_6 + 6\text{H}_2\text{O}$
 Slightly sol in H_2O

Sodium iridosulphite, $\text{Na}_6\text{Ir}_2(\text{SO}_3)_6 + 8\text{H}_2\text{O}$
 Scarcely sol in H_2O

Iron, Fe

Permanent in dry air, oxidises only slowly in moist air, but rapidly when in contact with air and H_2O simultaneously
 Fe does not rust in contact with air and

H₂O containing alkalis even in very small amounts (Payen, A ch 50 305)

Not attacked at ord temp by H₂O free from air. More easily oxidised by NH₄ salts + Aq than by H₂O when exposed to air simultaneously (Persoz, A ch (3) 24 506)

Iron is slowly attacked by distilled H₂O in presence of air. 100 ccm distilled water removed 29 mg from 11.8 sq cm iron in one week, while air free from CO₂ was passed through the solution. In presence of CO₂, 54 mg were removed (Wagner, Dingl 221 260)

CO₂ acts as a catalyst for the solution of Fe by H₂O (Whitney, J Am Chem Soc 1903, 25 394)

Iron is most easily oxidised when it is exposed to air, and H₂O is deposited on it at the same time in liquid form

100 l sea water dissolve 27.37 g from 1 sq metre Fe, 29.16 g from 1 sq metre steel, 1.12 g from 1 sq metre galvanised Fe (Calvert and Johnson, C N 11) 171)

Readily sol in HCl, dil H₂SO₄ + Aq, and most other acids

Action of H₂SO₄ + Aq (1 12) is very much accelerated by a few drops of PtCl₄ + Aq, the addition of As₂O₃ arrests the action completely. Tartar emetic and HgCl₂ diminish the action, but do not arrest it. CuSO₄ + Aq strongly accelerates the action, and Ag₂SO₄ + Aq also to a less extent

In the case of HCl + Aq, the addition of small amts of metallic salts also influences the action. Weak HC₂H₃O₂ + Aq has but little action, and the addition of PtCl₄ increases it. As₂O₃ stops it, other solutions have no effect. With racemic and tartaric acids the phenomena are the same

With oxalic acid, PtCl₄ prevents the action. Saline solutions and even distilled H₂O, when mixed with PtCl₄, have slight solvent action (Millon, C R 21 45)

Above phenomena are due to galvanic action from metal deposited on the iron (Barreswill, C R 21 292)

H₂SO₄ has only sl action on cast-iron at ord temp with exclusion of air

Weak acids have a strong action at higher temperatures

Charcoal pig-iron, and case-hardened cast-iron are much less attacked by weak acids at b-pt than other sorts of Fe. Scotch pig-iron is most strongly attacked

99.8% H₂SO₄ has very sl action on iron at ord temp when air is excluded (Lunge, Dingl 261 131)

Resistance against dil H₂SO₄ + Aq is greatly increased by increase in amt of C if chemically combined, less so by P or Si (Ledebur, Dingl 223 326)

Passive Iron —When Fe is treated with pure conc HNO₃ + Aq of 1.512–1.419 sp gr, it soon becomes coated with a bluish or black coating, apparently FeO, and when thus

covered Fe is not attacked by HNO₃ + Aq of any strength at ord temp or at the temp of a freezing mixture, but action occurs on heating. Nor is Fe attacked at ord temp by acid of 1.401 sp gr or even somewhat weaker acid, though action begins at once on heating. Very dil HNO₃ + Aq attacks Fe at ord temp with formation of NH₄N and Fe(NO₃)₂. The action of HNO₃ + Aq influenced by PtCl₄. If acid containing 4 equivalents of H₂O is diluted with 2–3 vol H₂O, and then poured on Fe turnings, they dissolve at once with evolution of nitro fumes and formation of ferric salt, but if the acid one drop of PtCl₄ be added, on H gas is evolved, and NH₄NO₃ and Fe(NO₃)₃ are formed (Millon, C R 21 47)

The more H₂O the acid contains the lower will be the temp at which the Fe remains passive. Shaking the wire hastens the passivity. Contact with Pt, Au, or C does not prevent it. Fe wire becomes passive by remaining 10 min in HNO₃ vapour (Renard, C R 79 159)

Iron may be made passive by HClO, HBrO₃, HIO₃, H₂CrO₄, in the same way as by HNO₃.

Iron may also be made passive by moderate ignition

Passivity occurs with HNO₃ + Aq of 1.3 sp gr after a short time at 31°, but if temp 32°, passivity does not occur

Colourless HNO₃ + Aq of 1.42 sp gr produces passivity at 55° but not at 56°. Refuming HNO₃ + Aq of 1.42 sp gr produces passivity at 82° but not at 83° (Ordway, Sill Am J (2) 40 316)

The passivity of Fe is destroyed when it is placed in a magnetic field at a much lower temperature than when in normal condition (Nichols and Franklin, Sill Am J (3) 34 419)

Passivity depends on a coating of NO which hinders the action of the acid. All operation which removes this layer terminates the passivity, as shaking, rubbing, placing in vacuum, etc (Varenne, C R 89 783)

When Fe is plunged in HNO₃ + Aq of 1.4 sp gr there is a sudden evolution of gas which ceases after 3 to 20 seconds, and the surface becomes bright. The same phenomena take place with a more dilute acid, if of not less than 1.32 sp gr. In the latter case, there is an immediate evolution of gas, which suddenly ceases and the metal becomes bright but soon the acid begins to act again at single point, and the action gradually spreads over the whole surface, this, however, soon ceases again, and we have an "intermittent passivity"

If a part of a piece of iron is immersed in strong acid, the whole of it is made passive. This is explained by the NO spreading over the whole surface by capillarity

The passivity ceases when the Fe is placed in dil acid, after a longer or shorter time

according to the dilution of the acid,—when the acid has sp gr = 1.30, after 11 days
 “ “ “ 1.28 “ 5 “
 “ “ “ 1.26 “ 32 hours
 “ “ “ 1.16 “ 12 “

Iron may also be made passive by long standing in NO gas under pressure (Varenne, C R 90 998)

Fe is made passive by a coating of Fe_3O_4 , not by NO (Schonbein, Pogg 39 342) (Beetz, Pogg 67 236) (Ramann, B 14 1430)

Passivity may also be caused by NH_4NO_3 + Aq, ammoniacal AgNO_3 + Aq, $\text{Fe}(\text{NO}_3)_3$, $\text{Fe}(\text{NO}_3)_2$, $\text{Al}(\text{NO}_3)_3$, $\text{Co}(\text{NO}_3)_2$, $\text{Ni}(\text{NO}_3)_2$, etc + Aq instead of HNO_3 + Aq (Ramann, B 14 1933)

Hardly attacked by either dil or conc acids when they are under high pressure (Cailliet C R 68 395)

Iron is dissolved by HNO_3 + Aq, even when very conc, but no gas is evolved and the process is very slow

HNO_3 + Aq of the following sp gr dissolves the given amts from strips of pure Fe

Sp gr of acid	Diminution of weight in 24 hours
1.28	0.82%
1.34	0.75
1.38	0.29
1.48	0.34
1.53	5.80

(Gautier and Charpy, C R 113 1451)

Insol in liquid chlorine below 90° (Lange, Zeit angew Ch 1900, 13 686)

Insol in liquid NH_3 (Gore, Am ch J 1898, 20 828)

Not attacked by alkalis

Sol in NaOH + Aq (34%) when air is blown through the liquid (Zirnit, Ch Ztg 12 355)

NaOH + Aq attacks iron and steel (Venator, Dingl 261 133)

NaOH + Aq dissolves Fe between 15° and 100° (Dingl 261 131)

Presence of rusting material, and fats and oils greatly hinder it (Wagner)

Sol in alkali hydrogen carbonates + Aq (Berzelius)

Sat NaCl + Aq has sl but perceptible action on Fe. NH_4Cl + Aq has stronger action than NaCl + Aq (Lunge)

100 ccm H_2O containing 0.5 g NaCl or KCl removed 4.2 mg from 11.8 sq cm iron in one week, while air free from CO_2 was passed through the solution, and 72 mg in presence of CO_2

100 ccm H_2O containing 1 g NH_4Cl removed 45 mg, and 76 mg respectively under the above conditions

100 ccm H_2O containing 0.8 g MgCl_2 re-

moved 49 mg, and 65 mg respectively under the above conditions

Not attacked by 100 ccm H_2O containing 1 g Na_2CO_3 , or by CaO_2H_2 + Aq (Wagner, Dingl 221 260)

Action of KClO_3 + Aq KClO_3 + Aq (6.3% KClO_3) oxidised 11.21 g cast iron and 20.1 g pure iron from a surface of 1 sq metre in 7 hours, KClO_3 + Aq (25% KClO_3) oxidised 24.59 g cast, and 44.90 g pure Fe under above conditions, $\text{Ca}(\text{ClO}_3)_2$, CaCl_2 + Aq (20° Baume) obtained by passing Cl through CaO_2H_2 + Aq oxidised 85 g cast, and 95 g pure Fe under the above conditions (Lunge and Deggele, J Soc Chem Ind 4 32)

Easily sol in organic acids

Comparative action of oils on Fe

	Amount Fe dissolved
Neatsfoot oil	0.0875 grains
Colza	0.0800 “
Sperm	0.0460 “
Lard	0.0250 “
Olive	0.0062 “
Linseed	0.0050 “
Seal	0.0050 “
Castor	0.0048 “
Paraffine	0.0045 “
Almond	0.0040 “
“Lubricating” oil	0.0018 “

(Watson, C N 42 190)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0097 g Fe in 6 days (Gates, J phys Chem 1911, 15 143)

Fe dissolves in albumen solution to the extent of 1 to 2 per cent (Buchner, Arch Pharm (3) 20 417)

Attacked by sugar + Aq at 115 – 120° , also by inverted sugar or malt extract, not by glycerine or mannite + Aq (Klein and Berg, C R 102 1170)

Iron arsenide, FeAs_2

Min *Lollingite* Sol in HNO_3 + Aq with separation of As_2O_3

Fe_3As_4 Min *Leucopyrite*

Iron arsenide sulphide, FeAsS , FeS

Min *Arsenopyrite* Sol in HNO_3 + Aq with separation of S and As_2O_3 , wholly sol in aqua regia, not attacked by HCl + Aq

Iron boride, Fe_2B

Decomp by H_2O Sol in hot dil HCl or H_2SO_4 and in hot conc HCl or H_2SO_4 Sol in hot dil or cold conc HNO_3 (Jassonneux, C R 1907, 145 122)

FeB Sol in molten alkali carbonates, not sol in dil or conc H_2SO_4 in the cold, sol in boiling H_2SO_4 and in HNO_3 (Moissan, Bull Soc 1895, (3) 13 958)

Stable in dry air Decomp by aqua regia,

not readily sol in conc H_2SO_4 and HCl (Moissan, C R 1895, 120 176)

FeBr_2 Decomp by H_2O Sol in HNO_3 and in hot conc HCl (Jassonneux, C R 1907, 145 122)

Iron (ferrous) bromide, FeBr_2

Sol in H_2O Decomp by heating on air
Sat $\text{FeBr}_2 + \text{Aq}$ contains at

-21°	-7°	+10°	21°
47 0	48 3	52 3	53 7% FeBr_2 ,
37°	50°	65°	95°
56 0	58 0	59 4	63 3% FeBr_2

(Étard, A ch 1894, (7) 2 541)

+4 H_2O Very sol in H_2O , pptd from cooled aq solution (Volkman, C C 1894, I 611)

+6 H_2O Sol in H_2O (Löwig)

+9 H_2O (Volkman)

Ferric bromide, FeBr_3

Deliquescent Sol in H_2O , alcohol, and ether (Löwig)

Sl sol in liq NH_3 (Franklin, Am Ch 1898, 20 828)

+6 H_2O Sol in alcohol and ether (Bolchakoff, C C 1898, II 660)

Ferrous mercuric bromide

Deliquescent (v Bonsdorff)

Ferric rubidium bromide, $\text{Rb}_2\text{FeBr}_5 + \text{H}_2\text{O}$

Sol in H_2O (Walden, Z anorg 1894, 7 32)

Ferrous stannic bromide

See Bromostannate, ferrous

Ferrous bromide nitric oxide, $3\text{FeBr}_2, 2\text{NO}$

Sol in H_2O Not isolated (Thomas, C R 1896, 123 944)

Ferric bromochloride, FeCl_2Br

Very deliquescent, and sol in H_2O , alcohol, and ether. Notably sol in chloroform, benzene, and toluene Insol in CS_2 (Lenormand, C R 116 820)

Iron carbide, Fe_3C

(Gurtt, J B 1856, 781)

Mixture of Fe and FeC_4 (Tunmer, Polyt Zentralbl 1861 1227)

Fe_3C (Karsten, J pr 40 229)

Fe_3C Sol in hot conc HCl , oxidized slowly by moist air (Campbell, Am Ch J 1896, 18 840-841)

Fe_2C_2 (Rammelsberg, C C 1847 60)

Iron molybdenum carbide, $\text{Fe}_3\text{C}, \text{Mo}_2\text{C}$

Sol in hydracids, insol in HNO_3 (Williams, C R 1898, 127 484)

Iron tungsten carbide, $2\text{Fe}_3\text{C}, 3\text{W}_2\text{C}$

Insol in H_2O and hydracids, sol in HNO_3 and H_2SO_4 (Williams, C R 1898, 127 11)

Iron carbonyl, $\text{Fe}(\text{CO})_5$

Slowly decomp on air Not attacked by dil H_2SO_4 , HNO_3 , or $\text{HCl} + \text{Aq}$ Conc $\text{HNO}_3 + \text{Aq}$, or $\text{Br}_2 + \text{Aq}$ decomp easily Sol alcoholic solution of KOH or NaOH with subsequent decomp Sol in alcohol, ether, benzene, mineral oils, etc (Mond and Langer, Chem Soc 59 1090)

$\text{Fe}_2(\text{CO})_7$ Decomp on air Not attacked by H_2SO_4 or $\text{HCl} + \text{Aq}$ Sol in alcohol potash Very much less sol in organic solvents than $\text{Fe}(\text{CO})_5$ (Mond and Langer)

Ferrous chloride, FeCl_2

Deliquescent Easily sol in H_2O with evolution of heat, or in alcohol Insol in ether (Jahn)

Sol in 2 pts H_2O at 18 75° (Abl)

Sol in 1 pt strong alcohol (Wenzel)

Sp gr of $\text{FeCl}_2 = \text{Aq}$ at 15 5°

Sp gr	% FeCl_2	% $\text{FeCl}_2, 4\text{H}_2\text{O}$
1 05	5 40	8 45
1 06	6 43	10 09
1 07	7 47	11 69
1 08	8 48	13 29
1 09	9 49	14 86
1 10	10 47	16 41
1 11	11 45	17 86
1 12	12 42	19 46
1 13	13 37	20 96
1 14	14 31	22 41
1 15	15 24	23 87
1 16	16 15	25 31
1 17	17 05	26 73
1 18	17 94	28 13
1 19	18 83	29 51
1 20	19 68	30 85
1 21	20 50	32 14
1 22	21 39	33 53
1 23	22 24	34 84
1 24	23 05	36 11
1 25	23 86	37 38
1 26	24 68	38 67
1 27	25 44	39 87
1 28	26 19	41 04
1 29	26 98	42 29
1 30	27 75	43 49
1 31	28 49	44 65
1 32	29 23	45 81
1 33	29 96	46 94
1 34	30 68	48 08
1 35	31 39	49 18
1 36	32 10	50 30
1 37	32 79	51 39
1 38	33 47	52 46
1 39	34 14	53 50
1 40	34 80	54 55
1 41	35 46	55 57
1 42	36 09	56 56
1 43	36 73	57 55
1 44	37 33	58 51

(Dunn, J Soc Chem Ind 1902, 21 390)

Insol in liquid HF (Franklin, Z anorg 1905, 46 2)

Sol in acetone, insol in methylal (Eidmann, C C 1899, II 1014)

Sol in acetone (Naumann, B 1904, 37 4328)

Sl sol in methyl acetate (Naumann, B 1909, 42 3790)

Sol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in ethyl acetate (Naumann, B 1904, 37 3601)

Yellow modification is sol in benzonitrile (Naumann, B 1914, 47 1369)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 21)

+2H₂O (Jonas)

+4H₂O Deliquescent Easily sol in alcohol Sol in 0.68 pt cold H₂O (Reimann, Mag Pharm 17 215)

Sat aq solution contains at

16° 18° 25° 28° 43°
40 5 40 9 41 0 42 5 44 4% FeCl₂,

50° 53° 72° 89° 96° 118°
45 0 45 9 49 2 51 3 51 0 51 7% FeCl₂

(Étard, A ch 1894, (7) 2 537)

100 g FeCl₂, 4H₂O + Aq contain 17.54 g Fe at 22.8°, 18.59 g at 43.2° (Boecke, N Jahrb Min 1911, I, 61)

More sol in water containing NO than in pure H₂O (Gay, Bull Soc (2) 44 175)

Sol in hot HCl + Aq (Sabatier, Bull Soc 1895, (3) 13 599)

[Sabatier could not obtain FeCl₂ + 6H₂O of Lescœur]

Ferroferric chloride, Fe₃Cl₈ + 18H₂O

Deliquescent (Lefort, J Pharm (4) 10 85)

Ferric chloride, Fe₂Cl₆ or FeCl₃

Very deliquescent, and sol in H₂O with evolution of great heat

100 mols H₂O dissolve mols anhydrous Fe₂Cl₆ at t°

t°	Mols Fe ₂ Cl ₆	t°	Mols Fe ₂ Cl ₆
66	29 20	80	29 20
70	29 42	100	29 75
75	28 92		

(Roozeboom, Z phys Ch 10 477)

See also hydrated salts below

Solution in H₂O is decomp into colloidal Fe₂O₃, xH₂O and HCl, upon heating if conc, and on simple standing if dil

Krecke (J pr (2) 3 286) gives the following table

% Fe ₂ Cl ₆ in solution	Temp at which Craham's colloidal hydrate is formed	Temp at which Saint Gilles colloidal hydrate is formed	Temp at which oxychlorides are formed	Temp at which Fe ₂ O ₃ is formed
32	100-130°	100-130°	100°+	140°
16	100-120		"	120
8	100-110		"	110
4	90-100		90	
2	87		87	
1	83		"	
0.5	75		"	
0.25	64		"	
0.125	54		"	
0.0625	36		"	

Sp gr of Fe₂Cl₆ + Aq

% FeCl ₃	Sp gr at 4.5°	Sp gr at 9.7°	Sp gr at 14.6°	Sp gr at 19.7°
49.61	1.5609	1.5575	1.5540	1.5497
41.00	1.4413	1.4387	1.4361	1.4335
36.95		1.3847	1.3824	1.3800
33.25	1.3381	1.3359	1.3339	1.3317
24.60	1.2351	1.2334	1.2318	1.2298
22.54	1.2140	1.2129	1.2107	1.2090
16.79	1.1534	1.1521	1.1507	1.1491
10.45	1.0939	1.0930	1.0918	1.0901
4.65			1.0382	
2.70			1.0221	

Sp gr of Fe₂Cl₆ + Aq increases or diminishes between 8° and 24° for a decrease or increase of temp of 1° by the following amts

% Fe ₂ Cl ₆	Corr	% Fe ₂ Cl ₆	Corr
50-60	0.0008	30-39	0.0005
45-49	0.0007	20-29	0.0004
40-44	0.0006	10-19	0.0003

(Hager, l c)

(Schult, from Gerlach, Z anal 27 278)

Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$ — *Continued*

t°	Sat solution contains per 100 mols H_2O		Solid phase
	mols HCl	mols FeCl_3	
— 4 5	20 50	24 50	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 8\text{H}_2\text{O}$
“	20 66	25 74	
“	23 42	27 40	
— 6	29 10	24 73	
“	26 18	21 75	
“	24 41	21 50	
“	23 25	21 35	
“	21 73	21 84	
“	19 73	25 50	
“	24 42	28 45	
“	28 20	27 04	
— 10	20 48	20 54	
“	24 90	18 94	
“	28 75	20 34	
“	31 42	28 53	
“	28 25	30 25	
“	26 05	30 50	
— 15	24 50	15 83	
— 15	28 40	31 89	
— 20	19 44	12 10	
“	22 83	11 63	
“	25 20	11 60	
“	27 20	11 31	
“	31 08	11 51	
“	34 13	12 90	
“	33 93	31 77	
“	30 08	32 76	
“	28 70	32 88	
— 10	12 01	11 99	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 12\text{H}_2\text{O}$
“	19 78	14 02	
“	20 95	16 20	
“	20 25	20 20	
“	17 73	20 70	
“	15 44	19 65	
— 12 5	22 14	16 69	
— 15	21 30	9 65	
“	24 50	15 83	
— 20	9 96	9 94	
“	13 32	8 57	
“	16 90	7 35	
“	18 97	7 16	
“	20 56	7 08	
“	23 40	7 20	
“	24 85	9 88	
“	25 20	11 60	
“	25 40	12 37	
“	25 59	13 39	

(Roozeboom and Schreinemakers, Z phys Ch 1894, 15 633)

Solubility of $\text{Fe}_2\text{Cl}_6 + \text{NH}_4\text{Cl}$
See $\text{NH}_4\text{Cl} + \text{Fe}_2\text{Cl}_6$ under NH_4Cl

Solubility of Fe_2Cl_6 in CsCl
See $\text{CsCl} + \text{Fe}_2\text{Cl}_6$ under CsCl

Solubility of $\text{FeCl}_3 + \text{KCl}$ in H_2O at 21°

Substance added		Pts by weight sol in 100 pts of solution	
FeCl_3 grams	KCl grams	FeCl_3	KCl
0	25	0	34 97
13	28	13 44	24 45
18	21	23 18	16 54
3	18 5	28 05	11 69
28	16	35 72	11 68
31	10 5	36 62	11 19
36 2	9	37 35	13 67
41 5	8	42 03	7 88
46 5	6	51 69	7 54
52	0 5		
155	0	83 89	0

(Hinrichsen and Sachsel, Z phys Ch 1904, 50 95)

 $\text{FeCl}_3 + \text{NaCl}$ Solubility of $\text{FeCl}_3 + \text{NaCl}$ in H_2O at 21°

Substance added		Pts by weight sol in 100 pts of solution	
FeCl_3 grams	NaCl grams	FeCl_3	NaCl
0	3 6	0	36 10
1 8	3 0	24 27	9 10
3 6	2 5	25 40	8 45
5 5	2 0	26 40	5 25
7 2	1 5	38 15	3 90
9 0	1 0	43 38	2 45
10 8	0 5	46 75	2 11
10 8	0	83 39	0

(Hinrichsen and Sachsel, Z phys Ch 1904, 50 94)

Solubility of FeCl_3 in $\text{NaCl} + \text{Aq}$ at t°

t°	Substance added		$\sigma\%$ of Fe in the solution
	FeCl_3	NaCl	
10	40	20	15 2
10	60	20	15 2
10	100	20	15 16
20	60	20	16 2
20	80	20	16 18
20	100	20	16 2
30	70	30	17 7
30	90	30	17 6
30	110	30	17 67
50	30	20	23 5
50	45	20	23 9
40	35	30	25 4
40	50	30	25 5
30	30	20	23 8
30	45	20	24 0
17 6	30	20	24 47
17 6	50	20	24 5

(Hinrichsen and Sachsel, Z phys Ch 1904, 50 95)

Difficultly sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Attacked by liquid NO_2 in the presence of traces of moisture (Frankland, Chem Soc 1901, 79 1361)

Sol in liquid SO_2 (Walden, B 1899, 32 2864)

Sol in alcohol ether, acetic ether (Cann, C R 102 363), and acetone (Krug and M'Elroy, J anal Ch 6 184)

Sl sol in ethylamine (Shunn, J phys Chem 1907, 11 538)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

1 g FeCl_3 is sol in 1.59 g acetone at 18° Sp gr of sat solution $18^\circ/4^\circ = 1.160$ (Naumann, B 1904, 37 4333)

Sol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Sl sol in CS_2 (Arctowski, Z anorg 1894, 6 257)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 22)

Sublimed

Sol in AsCl_3 , POCl_3 , SO_2Cl_2 and PBr_3 , sl sol in PCl_3 (Walden, Z anorg 1900, 25 214)

The salts with different amts of crystal H_2O have different solubilities (Roozeboom $+4\text{H}_2\text{O}$ Melts in crystal H_2O at 73.5°)

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
50	19 96	69	21 53	72 5	26 15
55	20 32	72 5	23 35	70	27 90
60	20 70	73 5	25 00	66	29 20

(Roozeboom, Z phys Ch 10 477)

$+5\text{H}_2\text{O}$ Correct formula for $+6\text{H}_2\text{O}$ salt

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 5\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
12	12 87	30	15 12	55	19 15
20	13 95	35	15 64	56	20 00
27	14 85	50	17 50	55	20 32

(Roozeboom)

Melts in crystal H_2O at 31° (Engel, C R 104 1708), at 56° (Roozeboom)

$+6\text{H}_2\text{O}$ Very deliquescent Sol in alcohol Ether dissolves out Fe_2Cl_6

M-pt is 31° (Ordway) Contains only $5\text{H}_2\text{O}$ (Roozeboom)

$+7\text{H}_2\text{O}$ Melts in crystal H_2O at 32.5°

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 7\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
20	11 35	32	13 55	30	15 12
27 4	12 15	32 5	14 99	25	15 54

(Roozeboom)

$+12\text{H}_2\text{O}$ Less deliquescent than Fe_2Cl_6 or $\text{Fe}_2\text{Cl}_6 + 5\text{H}_2\text{O}$

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 12\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
-55	2 75	30	5 93	27 4	11 20
-41	2 81	35	6 78	20	12 15
-27	2 98	36 5	7 93	10	12 83
0	4 13	37	8 33	8	13 70
10	4 54	36	9 29		
20	5 10	30	10 45		

(Roozeboom)

Sol in alcohol Ether dissolves out Fe_2Cl_6 Melts in crystal H_2O at 37° (Roozeboom), at 35.5° (Ordway)

Ferric hydrogen chloride, FeCl_3 , $\text{HCl} + 2\text{H}_2\text{O}$ Decomp by H_2O (Sabatier, Bull Soc (2) 197)

More sol in H_2O than FeCl_3 (Engel, C R 104 1708)

For solubility, see $\text{FeCl}_3 + \text{HCl}$, under ferric chloride

$+6\text{H}_2\text{O}$ (Roozeboom and Schreinemakers)

For solubility, see $\text{FeCl}_3 + \text{HCl}$, under ferric chloride

Ferrous lithium chloride, FeCl_2 , $\text{LiCl} + 3\text{H}_2\text{O}$ (Chassevant, A ch (6) 30 17)

Ferric magnesium chloride, FeCl_3 , $\text{MgCl}_2 + \text{H}_2\text{O}$

Deliquescent (Neumann, B 18 2890)

Ferrous mercuric chloride, FeCl_2 , $\text{HgCl}_2 + 4\text{H}_2\text{O}$

Deliquescent (v Bonsdorff)

Ferric nitrosyl chloride, FeCl_3 , NOCl

Very deliquescent (Weber, Pogg 118 477)

Ferric phosphoric chloride, FeCl_3 , PCl_5

Decomp by H_2O (Baudrimont, A ch (4) 2 15)

Sp gr of $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at 17.5°						Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$			
% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr	t°	Sat solution contains per 100 mols H_2O		Solid phase
							mols HCl	mols FeCl_3	
1	1 0073	21	1 1644	41	1 3746	30	0	12 70	$\text{Fe}_2\text{Cl}_6 + 12\text{H}_2\text{O}$
2	1 0146	22	1 1746	42	1 3870		5 92	16 07	
3	1 0219	23	1 1848	43	1 3994		0	20 90	
4	1 0292	24	1 1950	44	1 4118	25	0	10 90	
5	1 0365	25	1 2052	45	1 4242		2 33	23 72	
6	1 0439	26	1 2155	46	1 4367		0	24 50	
7	1 0513	27	1 2258	47	1 4492	20	0	10 20	
8	1 0587	28	1 2365	48	1 4617		5 60	23 60	
9	1 0661	29	1 2464	49	1 4742		0	25 70	
10	1 0734	30	1 2568	50	1 4867	10	0	9 10	
11	1 0814	31	1 2673	51	1 5010		8 75	8 00	
12	1 0894	32	1 2778	52	1 5153		16 70	16 65	
13	1 0974	33	1 2883	53	1 5296	"	13 80	23 35	
14	1 1054	34	1 2988	54	1 5439		0	8 25	
15	1 1134	35	1 3093	55	1 5582		7 52	6 51	
16	1 1215	36	1 3199	56	1 5729	"	13 37	6 33	
17	1 1297	37	1 3305	57	1 5876		16 80	8 70	
18	1 1378	38	1 3411	58	1 6023		18 45	10 23	
18	1 1378	38	1 3411	58	1 6023	"	20 40	15 40	
19	1 1458	39	1 3517	59	1 6170		20 10	16 00	
20	1 1542	40	1 3622	60	1 6317				

(Franz, J pr (2) 5 283)

Sp gr of $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at 17.5°

% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr
1	1 008	21	1 191	41	1 428
2	1 016	22	1 202	42	1 441
3	1 025	23	1 212	43	1 454
4	1 033	24	1 223	44	1 469
5	1 042	25	1 234	45	1 481
6	1 051	26	1 245	46	1 494
7	1 060	27	1 256	47	1 507
8	1 069	28	1 268	48	1 520
9	1 078	29	1 280	49	1 533
10	1 087	30	1 292	50	1 547
11	1 095	31	1 304	51	1 560
12	1 104	32	1 316	52	1 573
13	1 113	33	1 328	53	1 587
14	1 123	34	1 340	54	1 600
15	1 131	35	1 352	55	1 612
16	1 140	36	1 364	56	1 624
17	1 150	37	1 376	57	1 636
18	1 160	38	1 390	58	1 648
19	1 170	39	1 403	59	1 659
20	1 180	40	1 415	60	1 670

(Hager, Comm 1883)

Sp gr of conc $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at $20-21^\circ$

% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr	% Fe_2Cl_6	Sp gr
60	1 669	65	1 715	70	1 758
61	1 679	66	1 724	71	1 766
62	1 688	67	1 733	72	1 774
63	1 697	68	1 742	73	1 782
64	1 706	69	1 750	74	1 790

(Hager, l c)

Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$ — Continued

t°	Sat solution contains per 100 mols H ₂ O		Solid phase	t°	Sat solution contains per 100 mols H ₂ O		Solid phase
	mols HCl	mols FeCl ₃			mols HCl	mols FeCl ₃	
50	0	35 00	Fe ₂ Cl ₆ +5H ₂ O	33	30 45	48 70	Fe ₂ Cl ₆ +4H ₂ O
"	3 25	39 95		30	17 15	36 75	
44	0	33 50		"	31 20	43 49	
"	3 04	33 80		"	33 80	47 80	
"	10 62	34 64		"	32 60	49 93	
"	11 50	35 60		25	19 50	35 25	
"	10 70	38 00		"	20 60	35 34	
40	0	32 40		"	31 34	41 58	
"	13 40	37 45		"	33 00	43 00	
33	0	31 00		"	34 65	44 80	
"	15 70	37 06		20	21 25	34 25	
30	0	30 24		"	28 81	37 57	
"	17 20	34 00		"	34 23	42 02	
"	17 15	36 75		"	35 40	43 16	
25	0	29 00		15	29 40	36 50	
"	7 50	29 75		"	33 60	40 03	
"	19 50	35 25		10	24 50	32 75	
20	0	27 90		"	35 04	39 95	
"	11 05	29 20		0	26 00	32 16	
"	15 80	30 68		"	34 60	38 11	
"	21 25	34 25		-10	27 30	32 05	
15	14 90	28 35	Fe ₂ Cl ₆ +4H ₂ O	"	33 56	36 25	
"	16 40	29 32		-20	30 08	32 76	
10	17 80	27 75		"	32 65	35 44	
"	18 80	28 70		45	0	58 00	
"	24 50	32 75		"	31 28	50 08	
0	24 12	30 04		"	40 65	48 60	
"	26 00	32 16		40	0	58 00	
-10	24 95	29 60		"	27 00	50 80	
"	26 05	30 50		"	42 01	48 64	
"	27 30	32 05		35	0	58 00	
70	0	44 0	Fe ₂ Cl ₆ +4H ₂ O	"	29 01	50 33	
"	6 75	50 00		"	37 04	49 20	
"	0	55 80		30	0	58 00	
65	0	42 50		"	32 60	49 93	
"	10 25	50 00		"	34 40	49 72	
"	3 75	57 25		40	42 50	47 52	
"	0	59 00		"	42 01	48 64	
60	0	41 40		35	39 47	46 57	
"	14 25	50 00		"	37 04	49 20	
"	10 70	55 25		30	40 21	42 54	
"	0	61 00	"	38 20	44 70		
55	0	40 64	Fe ₂ Cl ₆ +4H ₂ O	"	35 55	47 30	
"	19 00	50 72		"	34 40	49 72	
"	16 71	53 60		25	40 41	40 25	
"	0	62 00		"	39 03	41 38	
50	0	39 92		"	35 74	45 24	
"	3 25	39 95		20	39 50	39 25	
"	21 24	49 33		"	35 40	43 16	
"	20 04	52 50		10	38 62	37 48	
44	0	39 00		"	37 46	38 33	
"	10 70	38 00		"	36 30	38 70	
"	14 80	38 70	"	35 04	39 93		
"	24 14	50 10	0	37 27	36 60		
40	13 40	37 45	Fe ₂ Cl ₆ , 2HCl, 4H ₂ O	"	34 60	38 11	
"	27 00	50 80		-10	37 92	35 32	
33	15 70	37 06		"	34 54	36 00	
"	29 20	42 70		"	33 56	36 25	
"	31 08	46 85		-20	37 80	34 50	
"	30 81	47 65		"	34 10	34 84	
				"	32 56	35 44	

Sp gr of $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at 17.5°					
$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr
1	1 0073	21	1 1644	41	1 3746
2	1 0146	22	1 1746	42	1 3870
3	1 0219	23	1 1848	43	1 3994
4	1 0292	24	1 1950	44	1 4118
5	1 0365	25	1 2052	45	1 4242
6	1 0439	26	1 2155	46	1 4367
7	1 0513	27	1 2258	47	1 4492
8	1 0587	28	1 2365	48	1 4617
9	1 0661	29	1 2464	49	1 4742
10	1 0734	30	1 2568	50	1 4867
11	1 0814	31	1 2673	51	1 5010
12	1 0894	32	1 2778	52	1 5153
13	1 0974	33	1 2883	53	1 5296
14	1 1054	34	1 2988	54	1 5439
15	1 1134	35	1 3093	55	1 5582
16	1 1215	36	1 3199	56	1 5729
17	1 1297	37	1 3305	57	1 5876
18	1 1378	38	1 3411	58	1 6023
18	1 1378	38	1 3411	58	1 6023
19	1 1458	39	1 3517	59	1 6170
20	1 1542	40	1 3622	60	1 6317

(Franz, J pr (2) 5 283)

Sp gr of $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at 17.5°					
$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr
1	1 008	21	1 191	41	1 428
2	1 016	22	1 202	42	1 441
3	1 025	23	1 212	43	1 454
4	1 033	24	1 223	44	1 469
5	1 042	25	1 234	45	1 481
6	1 051	26	1 245	46	1 494
7	1 060	27	1 256	47	1 507
8	1 069	28	1 268	48	1 520
9	1 078	29	1 280	49	1 533
10	1 087	30	1 292	50	1 547
11	1 095	31	1 304	51	1 560
12	1 104	32	1 316	52	1 573
13	1 113	33	1 328	53	1 587
14	1 123	34	1 340	54	1 600
15	1 131	35	1 352	55	1 612
16	1 140	36	1 364	56	1 624
17	1 150	37	1 376	57	1 636
18	1 160	38	1 390	58	1 648
19	1 170	39	1 403	59	1 659
20	1 180	40	1 415	60	1 670

(Hager, Comm 1883)

Sp gr of conc $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ at $20-21^\circ$					
$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr	$\frac{\%}{\text{Fe}_2\text{Cl}_6}$	Sp gr
60	1 669	65	1 715	70	1 758
61	1 679	66	1 724	71	1 766
62	1 688	67	1 733	72	1 774
63	1 697	68	1 742	73	1 782
64	1 706	69	1 750	74	1 790

(Hager, l c)

Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$			
t°	Sat solution contains per 100 mols H_2O		Solid phase
	mols HCl	mols FeCl_3	
30	0	12 70	$\text{Fe}_2\text{Cl}_6 + 12\text{H}_2\text{O}$
"	5 92	16 07	
"	0	20 90	
25	0	10 90	
"	2 33	23 72	
"	0	24 50	
20	0	10 20	
"	5 60	23 60	
"	0	25 70	
10	0	9 10	
"	8 75	8 00	$\text{Fe}_2\text{Cl}_6 + 7\text{H}_2\text{O}$
"	16 70	16 65	
"	13 80	23 35	
0	0	8 25	
"	7 52	6 51	
"	13 37	6 33	
"	16 80	8 70	
"	18 45	10 23	
"	20 40	15 40	
"	20 10	16 00	
"	19 95	17 70	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
"	19 00	22 75	
"	18 05	23 40	
-10	0	7 40	
"	19 46	10 37	
"	20 48	20 54	
"	20 25	21 56	
-12 5	22 14	16 69	
-15	0	6 98	
"	21 30	9 65	
-20	0	6 56	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
"	7 50	4 90	
"	15 30	5 09	
"	20 56	7 08	
30	0	25 20	
"	4 25	27 80	
"	0	30 24	
25	0	23 50	
"	2 33	23 72	
"	7 50	29 75	
"	0	31 50	$\text{Fe}_2\text{Cl}_6 + 2\text{H}_2\text{O}$
20	0	22 50	
"	5 60	23 60	
"	11 05	29 20	
"	11 05	29 20	
"	0	32 00	
15	10 75	23 50	
"	14 90	28 35	
10	13 80	23 35	
"	17 80	27 75	
"	17 80	27 75	$\text{Fe}_2\text{Cl}_6 + 2\text{H}_2\text{O}$
0	18 05	23 40	
"	19 50	25 93	

Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$ — Continued

t°	Sat solution contains per 100 mols H_2O		Solid phase	t°	Sat solution contains per 100 mols H_2O		Solid phase
	mols HCl	mols FeCl_3			mols HCl	mols FeCl_3	
50	0	35 00	$\text{Fe}_2\text{Cl}_6 + 5\text{H}_2\text{O}$	33	30 45	48 70	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
"	3 25	39 95		30	17 15	36 75	
44	0	33 50		"	31 20	43 49	
"	3 04	33 80		"	33 80	47 80	
"	10 62	34 64		"	32 60	49 93	
"	11 50	35 60		25	19 50	35 25	
"	10 70	38 00		"	20 60	35 34	
40	0	32 40		"	31 34	41 58	
"	13 40	37 45		"	33 00	43 00	
33	0	31 00		"	34 65	44 80	
"	15 70	37 06	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$	20	21 25	34 25	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
30	0	30 24		"	28 81	37 57	
"	17 20	34 00		"	34 23	42 02	
"	17 15	36 75		"	35 40	43 16	
25	0	29 00		15	29 40	36 50	
"	7 50	29 75		"	33 60	40 03	
"	19 50	35 25		10	24 50	32 75	
20	0	27 90		"	35 04	39 95	
"	11 05	29 20		0	26 00	32 16	
"	15 80	30 68		"	34 60	38 11	
15	21 25	34 25	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$	-10	27 30	32 05	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
"	14 90	28 35		"	33 56	36 25	
10	16 40	29 32		-20	30 08	32 76	
"	17 80	27 75		"	32 65	35 44	
"	18 80	28 70		45	0	58 00	Fe_2Cl_6 anhydrous
"	24 50	32 75		"	31 28	50 08	
0	24 12	30 04		"	40 65	48 60	
"	26 00	32 16		40	0	58 00	
-10	24 95	29 60		"	27 00	50 80	
"	26 05	30 50		"	42 01	48 64	
"	27 30	32 05		35	0	58 00	
70	0	44 0	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$	"	29 01	50 33	
"	6 75	50 00		"	37 04	49 20	
"	0	55 80		30	0	58 00	
65	0	42 50		"	32 60	49 93	
"	10 25	50 00		"	34 40	49 72	
"	3 75	57 25		40	42 50	47 52	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 4\text{H}_2\text{O}$
"	0	59 00		"	42 01	48 64	
60	0	41 40		35	39 47	46 57	
"	14 25	50 00		"	37 04	49 20	
"	10 70	55 25		30	40 21	42 54	
"	0	61 00		"	38 20	44 70	
55	0	40 64		"	35 55	47 30	
"	19 00	50 72		"	34 40	49 72	
"	16 71	53 60		25	40 41	40 25	
50	0	62 00		"	39 03	41 38	
"	3 25	39 95	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$	"	35 74	45 24	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 4\text{H}_2\text{O}$
"	21 24	49 33		20	39 50	39 25	
"	20 04	52 50		"	35 40	43 16	
44	0	39 00		10	38 62	37 48	
"	10 70	38 00		"	37 46	38 33	
"	14 80	38 70		"	36 30	38 70	
40	13 40	37 45		"	35 04	39 93	
"	27 00	50 50		0	37 27	36 60	
33	15 70	37 06		"	34 60	38 11	
"	29 20	42 70		-10	37 92	35 32	
"	31 08	46 85	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$	"	34 54	36 00	$\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$
"	30 81	47 65		-20	37 80	34 50	
"				"	34 10	34 84	
"				"	32 56	35 44	

Solubility of Fe_2Cl_6 in $\text{HCl} + \text{Aq}$ — *Continued*

t°	Sat solution contains per 100 mols H_2O		Solid phase
	mols HCl	mols FeCl_3	
— 4 5	20 50	24 50	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 8\text{H}_2\text{O}$
“	20 66	25 74	
“	23 42	27 40	
— 6	29 10	24 73	
“	26 18	21 75	
“	24 41	21 50	
“	23 25	21 35	
“	21 73	21 84	
“	19 73	25 50	
“	24 42	28 45	
“	28 20	27 04	
— 10	20 48	20 54	
“	24 90	18 94	
“	28 75	20 34	
“	31 42	28 53	
“	28 25	30 25	
“	26 05	30 50	
— 15	24 50	15 83	
— 15	28 40	31 89	
— 20	19 44	12 10	
“	22 83	11 63	
“	25 20	11 60	
“	27 20	11 31	
“	31 08	11 51	
“	34 13	12 90	
“	33 93	31 77	
“	30 08	32 76	
“	28 70	32 88	
— 10	12 01	11 99	$\text{Fe}_2\text{Cl}_6, 2\text{HCl}, 12\text{H}_2\text{O}$
“	19 78	14 02	
“	20 95	16 20	
“	20 25	20 20	
“	17 73	20 70	
“	15 44	19 65	
— 12 5	22 14	16 69	
— 15	21 30	9 65	
“	24 50	15 83	
— 20	9 96	9 94	
“	13 32	8 57	
“	16 90	7 35	
“	18 97	7 16	
“	20 56	7 08	
“	23 40	7 20	
“	24 85	9 88	
“	25 20	11 60	
“	25 40	12 37	
“	25 59	13 39	

(Roozeboom and Schreinemakers, *Z phys Ch* 1894, 15 633)Solubility of $\text{Fe}_2\text{Cl}_6 + \text{NH}_4\text{Cl}$
See $\text{NH}_4\text{Cl} + \text{Fe}_2\text{Cl}_6$ under NH_4Cl Solubility of Fe_2Cl_6 in CsCl
See $\text{CsCl} + \text{Fe}_2\text{Cl}_6$ under CsCl Solubility of $\text{FeCl}_3 + \text{KCl}$ in H_2O at 2

Substance added		Pts by weight sol in pts of solution	
FeCl_3 grams	KCl grams	FeCl_3	KCl
0	25	0	34 4
13	28	13 44	24 4
18	21	23 18	16 5
3	18 5	28 05	11 6
28	16	35 72	11 6
31	10 5	36 62	11 1
36 2	9	37 35	13 6
41 5	8	42 03	7 8
46 5	6	51 69	7 5
52	0 5		
155	0	83 89	0

(Hinrichsen and Sachsel, *Z phys Ch* 1 14, 50 95) $\text{FeCl}_3 + \text{NaCl}$ Solubility of $\text{FeCl}_3 + \text{NaCl}$ in H_2O at 21

Substance added		Pts by weight sol in pts of solution	
FeCl_3 grams	NaCl grams	FeCl_3	NaCl
0	3 6	0	36 1
1 8	3 0	24 27	9 1
3 6	2 5	25 40	8 4
5 5	2 0	26 40	5 2
7 2	1 5	38 15	3 9
9 0	1 0	43 38	2 4
10 8	0 5	46 75	2 1
10 8	0	83 39	0

(Hinrichsen and Sachsel, *Z phys Ch* 1 14, 50 94)Solubility of FeCl_3 in $\text{NaCl} + \text{Aq}$ at t°

t°	Substance added		% of Fe thc solut
	FeCl_3	NaCl	
10	40	20	15 2
10	60	20	15 2
10	100	20	15 16
20	60	20	16 2
20	80	20	16 18
20	100	20	16 2
30	70	30	17 7
30	90	30	17 6
30	110	30	17 67
50	30	20	23 5
50	45	20	23 9
40	35	30	25 4
40	50	30	25 5
30	30	20	23 8
30	45	20	24 0
17 6	30	20	24 47
17 6	50	20	24 5

(Hinrichsen and Sachsel, *Z phys Ch* 1 14, 50 95)

Difficultly sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Attacked by liquid NO_2 in the presence of traces of moisture (Frankland, Chem Soc 1901, 79 1361)

Sol in liquid SO_2 (Walden, B 1899, 32 2864)

Sol in alcohol ether, acetic ether (Cann, C R 102 363), and acetone (Krug and M'Elroy, J anal Ch 6 184)

Sl sol in ethylamine (Shinn, J phys Chem 1907, 11 538)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

1 g FeCl_3 is sol in 1.59 g acetone at 18°
Sp gr of sat solution $18^\circ/4^\circ = 1.160$ (Naumann, B 1904, 37 4333)

Sol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Sl sol in CS_2 (Arctowski, Z anorg 1894, 6 257)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 22)

Sublimed

Sol in AsCl_3 , POCl_3 , SO_2Cl_2 and PBr_3 , sl sol in PCl_3 (Walden, Z anorg 1900, 25 214)

The salts with different amts of crystal H_2O have different solubilities (Roozeboom + $4\text{H}_2\text{O}$ Melts in crystal H_2O at 73.5°)

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 4\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
50	19 96	69	21 53	72 5	26 15
55	20 32	72 5	23 35	70	27 90
60	20 70	73 5	25 00	66	29 20

(Roozeboom, Z phys Ch 10 477)

+ $5\text{H}_2\text{O}$ Correct formula for + $6\text{H}_2\text{O}$ salt

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 5\text{H}_2\text{O}$ at t°

t	Mols Fe_2Cl_6	t	Mols Fe_2Cl_6	t	Mols Fe_2Cl_6
12	12 87	30	15 12	55	19 15
20	13 95	35	15 64	56	20 00
27	14 85	50	17 50	55	20 32

(Roozeboom)

Melts in crystal H_2O at 31° (Engel, C R 104 1708), at 56° (Roozeboom)

+ $6\text{H}_2\text{O}$ Very deliquescent Sol in alcohol Ether dissolves out Fe_2Cl_6

M-pt is 31° (Ordway) Contains only $5\text{H}_2\text{O}$ (Roozeboom)

+ $7\text{H}_2\text{O}$ Melts in crystal H_2O at 32.5°

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 7\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
20	11 35	32	13 55	30	15 12
27 4	12 15	32 5	14 99	25	15 54

(Roozeboom)

+ $12\text{H}_2\text{O}$ Less deliquescent than Fe_2Cl_6 or $\text{Fe}_2\text{Cl}_6 + 5\text{H}_2\text{O}$

100 mols H_2O dissolve mols Fe_2Cl_6 from $\text{Fe}_2\text{Cl}_6 + 12\text{H}_2\text{O}$ at t°

t°	Mols Fe_2Cl_6	t	Mols Fe_2Cl_6	t°	Mols Fe_2Cl_6
-55	2 75	30	5 93	27 4	11 20
-41	2 81	35	6 78	20	12 15
-27	2 98	36 5	7 93	10	12 83
0	4 13	37	8 33	8	13 70
10	4 54	36	9 29		
20	5 10	30	10 45		

(Roozeboom)

Sol in alcohol Ether dissolves out Fe_2Cl_6
Melts in crystal H_2O at 37° (Roozeboom), at 35.5° (Ordway)

Ferric hydrogen chloride, $\text{FeCl}_3 \cdot \text{HCl} + 2\text{H}_2\text{O}$
Decomp by H_2O (Sabatier, Bull Soc (2) 197)

More sol in H_2O than FeCl_3 (Engel, C R 104 1708)

For solubility, see $\text{FeCl}_3 + \text{HCl}$, under ferric chloride

+ $6\text{H}_2\text{O}$ (Roozeboom and Schreinemakers)

For solubility, see $\text{FeCl}_3 + \text{HCl}$, under ferric chloride

Ferrous lithium chloride, $\text{FeCl}_2 \cdot \text{LiCl} + 3\text{H}_2\text{O}$
(Chassevant, A ch (6) 30 17)

Ferric magnesium chloride, $\text{FeCl}_3 \cdot \text{MgCl}_2 + \text{H}_2\text{O}$

Deliquescent (Neumann, B 18 2890)

Ferrous mercuric chloride, $\text{FeCl}_2 \cdot \text{HgCl}_2 + 4\text{H}_2\text{O}$

Deliquescent (v Bonsdorff)

Ferric nitrosyl chloride, $\text{FeCl}_3 \cdot \text{NOCl}$

Very deliquescent (Weber, Pogg 118 477)

Ferric phosphoric chloride, $\text{FeCl}_3 \cdot \text{PCl}_3$

Decomp by H_2O (Baudrimont, A ch (4) 2 15)

Iron (ferrous) potassium chloride, FeCl_2 , $2\text{KCl} + 2\text{H}_2\text{O}$

Sol in H_2O (Berzelius)

Ferric potassium chloride, FeCl_3 , $2\text{KCl} + \text{H}_2\text{O}$

A little H_2O dissolves out FeCl_3 (Fritzsche J pr 18 483)

Sol in H_2O (Walden, Z anorg 1894, 71 332)

Ferric rubidium chloride, FeCl_3 , 3RbCl

Easily sol in H_2O Insol in $\text{HCl} + \text{Aq}$ (Godeffroy, Arch Pharm (3) 9 343)

FeCl_3 , $2\text{RbCl} + \text{H}_2\text{O}$ Decomp by H_2O (Neumann, A 244 329)

Sol in H_2O (Walden, Z anorg 1894, 7 332)

Ferric sulphur chloride, FeCl_3 , SCl_4

Very sensitive toward heat and moisture (Ruff, B 1904, 37 4518)

Ferric thallium chloride, FeCl_3 , 3TlCl

Decomp by H_2O Can be crystallised from $\text{HCl} + \text{Aq}$ (Wohler, A 144 250)

Ferrous chloride ammonia, 3FeCl_2 , 2NH_3

Decomp by H_2O (Rogstadus, J pr 86 310)

FeCl_2 , 6NH_3 Loses 4NH_3 at 100° (Miller, J, 17 577)

Decomp in the air (Miller)

Ferric chloride ammonia, FeCl_3 , NH_3

Slowly deliquescent Sol in H_2O with evolution of heat (Rose, Pogg, 24 302)

FeCl_3 , 6NH_3 Not deliquescent, not sol in H_2O , sol in HCl with decomp (Miller, Am Ch J 1895, 17 577)

Loses NH_3 to give FeCl_3 , 5NH_3 , and FeCl_3 , 4NH_3

Ferric chloride cyanhydric acid, FeCl_3 , 2HCN

Deliquescent (Klein, A 74 85)

Ferrous chloride nitric oxide, FeCl_2 , NO

Sol in H_2O without evolution of gas (Thomas, C R 1895, 121 204)

$+2\text{H}_2\text{O}$ Sol in cold H_2O without decomp (Thomas, C R 1895, 120 448)

2FeCl_2 , NO Very hygroscopic (Thomas, C R 1895, 121 129)

10FeCl_2 , NO Very hygroscopic (Thomas, C R 1895, 121 128)

Ferric chloride nitric oxide, Fe_2Cl_6 , NO

Very hygroscopic Loses NO when exposed to the air

$2\text{Fe}_2\text{Cl}_6$, NO Very hygroscopic In contact with H_2O gives off NO (Thomas, C R 1895, 120 447)

Iron (ferrous) fluoride, FeF_2

Sl sol in H_2O , insol in alcohol and ether Partly sol in hot $\text{HCl} + \text{Aq}$, slowly sol in cold, easily in hot HNO_3 , decomp by H_2SO_4 (Poulenc, C R 115 941)

$+8\text{H}_2\text{O}$ Difficultly sol in H_2O , more easily if it contains HF (Berzelius)

Ferroferric fluoride, FeF_3 , $\text{FeF}_2 + 7\text{H}_2\text{O}$

Sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 268)

Ferric fluoride, FeF_3

Sl sol in H_2O , insol in alcohol or ether Sl attacked by HNO_3 , HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Poulenc, C R 115 941)

$+4\frac{1}{2}\text{H}_2\text{O}$ More sol in hot than cold H_2O Insol in alcohol (Scheurer-Kestner, A ch (3) 68 472)

Ferric nickel fluoride, FeF_3 , $\text{NiF}_2 + 7\text{H}_2\text{O}$

Sl sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 268)

Ferrous potassium fluoride, FeF_2 , $\text{KF} + 2\text{H}_2\text{O}$

(Wagner, B 19 896)

FeF_2 , 2KF Sl sol in H_2O (Berzelius)

Ferric potassium fluoride, FeF_3 , 2KF

Somewhat sol in H_2O , especially if hot (Berzelius)

$+ \text{H}_2\text{O}$ (Christensen, J pr (2) 35 164)

FeF_3 , 3KF Properties as above (Berzelius)

Ferric sodium fluoride, FeF_3 , $2\text{NaF} + \frac{1}{2}\text{H}_2\text{O}$

Rather easily sol in H_2O Solution decomp on heating Very sol in $\text{FeCl}_3 + \text{Aq}$ (Nickles, J Pharm (4) 10 14)

FeF_3 , 3NaF (Wagner, B 19 896)

Ferric thalious fluoride, 2FeF_3 , 3TlF

Sol in hot H_2O , less sol in cold Sl sol in HF (Ephraim, Z anorg 1909, 61 239)

Ferrous titanium fluoride

See Fluotitanate, ferrous

Ferric zinc fluoride, FeF_3 , $\text{ZnF}_2 + 7\text{H}_2\text{O}$

Sl sol in dil $\text{HF} + \text{Aq}$ (Weinland, Z anorg 1899, 22 269)

Ferrous hydroxide, $\text{Fe}_2\text{O}_3\text{H}_2$

Sol in 150,000 pts H_2O (Bineau, C R 41 509)

Insol in KOH , or $\text{NaOH} + \text{Aq}$ Sol in NH_4 salts $+ \text{Aq}$ Sl sol in $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Mercer)

Not pptd in presence of Na citrate Insol in boiling cane sugar $+ \text{Aq}$, but sl sol when KOH has been added Not pptd in presence of much $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ (Rose)

Solubility in glycerine+Aq containing about 60% by vol of glycerine
100 ccm of the solution contain 10 g FeO
(Muller, Z anorg 1905, 43 322)

Iron (ferric) hydroxides, $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

Many indefinite compounds of Fe_2O_3 and H_2O are known, and uncertainty exists as to their composition

According to van Bemmelen (R t c 7 106) there are probably no true definite compounds of Fe_2O_3 and H_2O

According to Tommasi (B 12 1924, 2334), there are two series of Fe hydroxides, α , red hydroxides, and β , yellow hydroxides

α Hydroxides $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (unstable), $\text{Fe}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (loses H_2O at 50°), and $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (loses H_2O at 92°)

Sol in dil acids and in Fe_2Cl_6 +Aq, and pptd from the latter solution by Na_2SO_4 , or H_2SO_4 +Aq

β Hydroxides $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (stable below 70°), $\text{Fe}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (loses H_2O at 105°), $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ (loses H_2O at 150°)

Sl sol in acids, and insol in Fe_2Cl_6 +Aq (Tommasi)

The following more or less uncertain data are given

$2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ Sol in HCl+Aq Very sl sol in HNO_3 +Aq (Davies, Chem Soc (2) 4 69)

Min Turquoise

$\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ Insol in cold acids, difficultly sol in warm HCl and H_2SO_4 +Aq, and especially in warm HNO_3 +Aq (Schiff, A 114 199)

Min Goethite

$2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ Sl sol in tartaric, citric, or acetic acids, but easily sol in HCl+Aq (Wittstein)

Scarcely attacked by conc HNO_3 , or HCl+Aq Sol in acetic acid or dil HNO_3 , or HCl+Aq, from which solution it is pptd by trace of alkali salts (St Gilles)

Min Limonite

$3\text{Fe}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ (Muck)

$\text{Fe}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ Easily sol in HCl+Aq

Min Xanthosiderite

$\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ Sl sol in acetic acid of 1.03 sp gr, but easily sol if of 1.076 sp gr Sol in mineral acids (Lumberg, J B 1853 70)

Pptd $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O} = \text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ Insol in H₂O, or in solutions of the alkalis or NH_4 salts When recently pptd is easily sol in acids (Fresenius)

Sl sol in NH_4OH , and NH_4 salts+Aq (Odling)

Apparently insol in NH_4Cl , or $(\text{NH}_4)_2\text{CO}_3$ +Aq (Brett, 1837)

Sl sol in conc, but insol in dil KOH+Aq (Chodniew, J pr 28 221)

Sl sol in very conc KOH+Aq free from CO_2 (Volcker, A 59 34)

Not at all sol in pure conc KOH+Aq, solubility noticed by previous observers being caused by the presence of silicic acid (Sandrock)

Sl sol in conc alkali carbonates+Aq

When freshly pptd, it is not acted upon by conc K_2CO_3 +Aq (Grotthaus)

Readily sol in conc $(\text{NH}_4)_2\text{CO}_3$ +Aq, but pptd by addition of H_2O

Sol in excess of $(\text{NH}_4)_2\text{CO}_3$ +Aq when pptd by that reagent (Wohler)

Sl in solutions of the alkali bicarbonates (Berzelius)

Sol in aqueous solutions of water-glass (Ordway)

Immediately dissolved by H_2SO_4 +Aq

Sol in NH_4F +Aq (Helmholtz, Z anorg 3 124)

Sol in conc $\text{Al}_2(\text{SO}_4)_3$ +Aq (Schneider, B 23 1352)

Sl sol in a solution of MgCO_3 (?) (Bischhof)

Insol in ethylamine, or amylamine+Aq (Wurtz, A ch (3) 30 472)

Sol in boiling solution of $\text{Bi}(\text{NO}_3)_3$, with pptn of Bi_2O_3 (Persoz)

Sol in Cr_2Cl_6 +Aq, after 3 months 15 mols $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ were dissolved by 1 mol Cr_2Cl_6 (Béchamp, A ch (3) 57 296)

Insol in fumaric acid, even when freshly pptd

When recently pptd, it is easily sol in $\text{KHC}_4\text{H}_4\text{O}_6$ +Aq, but after drying it is difficultly sol therein

When moist easily sol in $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ +Aq, but after drying is scarcely sol therein when cold, and only sl sol when hot (Werther)

Easily sol in acetic, citric, and other acids (Wittstein)

Solubility in glycerine+Aq containing about 60% by vol of glycerine

100 ccm of the solution contain 0.8 g Fe_2O_3 (Muller, Z anorg 1905, 43 322)

Easily sol in aqueous solution of succates of Ca, Ba, Sr, K, Na (Hunton, 1837)

Unacted upon by cane sugar+Aq (Gladstone)

Sl sol in cane sugar+Aq, from which it is pptd by $(\text{NH}_4)_2\text{S}$ +Aq, but not by NH_4OH , or $\text{K}_4\text{FeC}_6\text{N}_6$ +Aq (Peschier)

Solubility of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ in sugar solutions 1 l of sugar solution of given strength dissolves mg of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$

% Sugar	$\text{Mg Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$		
	at 17°	at 40°	at 75°
10	3.4	3.4	6.1
30	2.3	2.7	3.8
50	2.3	1.9	3.4

(Stoll, Z Ver Zuckind 1900 50 340)

Not pptd from solutions by alkalis or alkali carbonates in presence of many organic substances, as tartaric acid, sugar, etc

Not pptd by NH_4OH from solutions containing $\text{Na}_2\text{P}_2\text{O}_7$ (Rose, Pogg 76 19)

Not pptd by NH_4OH in presence of Na citrate (Spiller)

Soluble (a) By dialysis Solutions containing 1% can be concentrated somewhat, whereupon they gelatinise. They also gelatinise by cold, or addition of traces of H_2SO_4 , alkalis, alkali carbonates or sulphates, or neutral salts, not, however, by HCl , HNO_3 , alcohol, or sugar (Graham, A 121 46)

When a dil solution of a solid organic acid, or an alkali, or salt is added to a dialysed solution of $\text{Fe}_2\text{O}_3\cdot\text{H}_2\text{O}$, a coagulum sol in H_2O is formed, but if the solutions are conc the separating coagulum is no longer sol in H_2O (Athenstadt, C C 1871 822)

(b) Pean St Gilles' hydroxide, or meta-iron hydroxide Sol in H_2O Pptd from solution by traces of H_2SO_4 , HCl , HNO_3 +Aq, and alkalis, the ppt is insol in cold acids, but sol in pure H_2O (Pean St Gilles, A ch (3) 46 47)

See also table by Krecke in the article on ferric chloride

Iron (Ferroferric) hydroxide, Fe_3O_4 , H_2O (?)

Sol in acids

Fe_3O_4 , $4\text{H}_2\text{O}$ (Lefort)

Ferrous iodide, FeI_2

Very deliquescent Sol in H_2O Solution decomp on evaporating

+ $4\text{H}_2\text{O}$ Very deliquescent, sl sol in H_2O , sol in ether (Jackson, Am Ch J 1900, 24 19)

+ $5\text{H}_2\text{O}$ Deliquescent Sol in alcohol Sol in sugar+Aq, and solution is much more stable than aqueous solution Easily sol in glycerine

Insol in methylene iodide (Retgers, Z anorg 3 343)

+ $4\text{H}_2\text{O}$, and + $9\text{H}_2\text{O}$ Very sol, pptd from aq solution (Volkman, C C 1894, II 611)

Ferric iodide, FeI_3

Has not been isolated Solution of I in FeI_2 +Aq in the molecular ratio of I FeI_2 probably contains FeI_3

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Ferrous mercuric iodide, FeI_2 , 2HgI_2 + $6\text{H}_2\text{O}$

As the corresponding Mg salt (Dubon, C R 1907, 145 714)

Ferrous iodide ammonia, FeI_2 , 6NH_3

Decomp by H_2O (Jackson, Am Ch J 1900, 24 27)

Ferrous mercuric iodide

Very deliquescent Decomp by H_2O , sol in $\text{HC}_2\text{H}_3\text{O}_2$ or alcohol

Iron molybdenide, FeMo_2

Attacked by HCl +Aq with difficulty Sol in hot conc H_2SO_4 (Steinacker)

Iron nitride

Easily decomp by H_2O when finely powdered (Rossel, C R 1895, 121 942)

Fe_3N Easily sol in HNO_3 , HCl , or H_2S +Aq Very slowly decomp by H_2O (Schmidt, Pogg 125 37)

Sol in HCl with decomp, decomp by steam and by H_2S at 200° (Fowler, C 1894, 68 152)

Fe_3N_2 Probably the same as the above compound (Rogstadius, J pr 86 307)

Iron nitrososulphantimonate, $\text{Fe}_4\text{S}(\text{NO})_6\text{Sb}_5$

(Low, C C 1865 948)

Does not exist, but was impure sodium ferrotetranitrososulphide (Pawel, B 15 266)

Iron nitrososulphides

See Ferrotetranitrososulphidic acid and

Ferroheptanitrososulphide, ammonium

$\text{Fe}_3\text{S}_2\text{H}_2(\text{NO})_4$ (Roussin, C R 46 224)

$\text{Fe}_3\text{S}_2(\text{NO})_4$ + $2\text{H}_2\text{O}$ (Porczynsky, A 1 302)

$\text{Fe}_3\text{S}_2(\text{NO})_{13}$ + $4\text{H}_2\text{O}$ (Rosenberg, B 312)

The compound to which the above formulae were given was impure, according to Pawel (12 1407 and 1949, 15 2600), and contained more or less Na or NH_4 . Pawel considers the substance as NH_4 salt of ferroheptanitrosulphidic acid, which see

$\text{Fe}_3\text{S}_2\text{N}_3\text{O}_8$ + $1\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O , alcohol, ether, CHCl_3 , acetone and ethyl acetate Insol in benzene and light petroleum (Mar, C R 1896, 122, 138)

Iron sodium nitrososulphide, $3\text{Na}_2\text{S}$, Fe_2 , 2NO

(Roussin)

$\text{Na}_3\text{FeS}_2(\text{NO})_{13}$ (Rosenberg)

Correct formula is $\text{Na}_2\text{S}_2(\text{NO})_4\text{Fe}_2$, sodium ferrotetranitrososulphide

Iron nitrososulphocarbonate, $\text{Fe}_4\text{S}(\text{NO})_6\text{CS}_2$, $3\text{H}_2\text{O}$

(Low, C C 1865 948)

Correct formula is $\text{Na}_3\text{S}_2(\text{NO})_7\text{Fe}_4$ + $2\text{H}_2\text{O}$ sodium ferroheptanitrososulphide (Pawel, B 15 2600)

Ferrous oxide, FeO

Insol in H_2O Sol in acids

Easily sol in HCl , and HNO_3 +Aq, near insol in H_2SO_4 , even when heated (Tissandier, C R 74 531)

Ferric oxide, Fe_2O_3

Attacked by acids with difficulty, the more the higher it has been heated HCl +A is the best solvent, in which it is more quickly sol by long digestion at a gentle heat than by boiling (Fresenius)

Most easily sol in 16 pts of a mixture of 8 pts H_2SO_4 and 3 pts H_2O (Mitscherlich, J pr 81 110)

Solubility of Fe_2O_3 in $\text{HF} + \text{Aq}$ at 25°

	Time	G Fe_2O_3 in 10 ccm of the solution
N-HF	4½ hrs	0 1581
	21¾ "	0 2235
	45¾ "	0 2279
0 5N-HF	2¾ "	0 0579
	8½ "	0 0884
	23½ "	0 1045
	56½ "	0 1162
0 25N-HF	2¼ "	0 0180
	8½ "	0 0345
	24¾ "	0 0475
	142½ "	0 0534
equal amts N-HF + N-HCl	2¾ "	0 1011
	8½ "	0 1611
	23¾ "	0 1976
	96 "	0 2223
	264 "	0 2297

(Deussen, Z anorg 1905, 44 414)

Solubility of Fe_2O_3 in $\text{HCl} + \text{Aq}$ at 25°

	Time	G Fe_2O_3 in 10 ccm of the solution
N-HCl	4¾ hrs	0 0409
	21½ "	0 1230
	45½ "	0 2125
0 5N-HCl	2¾ "	0 0126
	8½ "	0 0188
	23½ "	0 0382
	56½ "	0 0672
0 25N-HCl	2¼ "	0 0040
	8½ "	0 0054
	24¾ "	0 0120
	142½ "	0 0306
equal vol N-HCl + N-NaCl	2¾ "	0 0444
	8½ "	0 0640
	23¾ "	0 0743
	72¼ "	0 0757
	215 "	0 0766

(Deussen, l c)

Solubility of Fe_2O_3 in N-oxalic acid at 25°

Time	G Fe_2O_3 in 10 ccm of the solution
1¾ hrs	0 0310
6¾ "	0 0790
22 "	0 1960
94 "	0 2326

(Deussen)

Absolutely insol in $\text{Br}_2 + \text{Aq}$ (Balard)
 Insol in hot $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)
 Insol in $\text{KOH} + \text{Aq}$ (Chodnew, J pr 28 222)

Slowly sol in an aq solution of calcium hydrogen carbonate. The velocity of the reaction may be much increased by the addition of small amounts of alkali sulphate or CaSO_4 (Rohland, Z anal 1909, 48 629)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Solubility in (calcium succrate + sugar) + Aq
 1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 6.26 g Fe_2O_3 , 296.5 g sugar and 24.2 g CaO dissolves 4.71 g Fe_2O_3 , 174.4 g sugar and 14.1 g CaO dissolves 3.08 g Fe_2O_3 (Bodenbender, J B 1865 600)

Solubility of Fe_2O_3 in sugar solutions 1 l of sugar solution of given strength dissolves mg Fe_2O_3

% Sugar	mg Fe_2O_3	
	at 17.5°	at 45°
10	1 4	2 0
30	1 4	
50	0 8	1 1

(Stolle, Z Ver Zuckerind, 1900, 50 340)

*Calcined*Solubility of calcined Fe_2O_3 in acids at 25°

Acid	Time	g Fe_2O_3 in 10 ccm of the solution
N-HF	4½ hrs	0 0889
	43½ "	0 2035
	129½ "	0 2194
N-HCl	4½ "	0 0224
	43½ "	0 1000
	139½ "	0 1910

(Deussen, Z anorg 1905, 44 413)

See also Ferric hydroxide

Min *Hematite* Rather easily sol in $\text{HCl} + \text{Aq}$, but not readily sol in other acids

*Melancon oxide**See Ferric hydroxides***Ferroferric oxide, $6\text{FeO}, \text{Fe}_2\text{O}_3$**

$\text{FeO}, \text{Fe}_2\text{O}_3 = \text{Fe}_3\text{O}_4$ With insufficient $\text{HCl} + \text{Aq}$ for complete solution, FeO is dissolved and Fe_2O_3 left (Berzelius)

Insol in $\text{HNO}_3 + \text{Aq}$ at the ordinary temperature (Millon)

Insol in acetone (Naumann, B 1904, 37 4329)

Solubility of Fe_2O_3 in sugar solutions 1 l of sugar solution of given strength dissolves mg Fe_2O_3

% Sugar	mg Fe_2O_3		
	at 17.5°	at 45°	at 75°
10	10.3	10.3	12.4
30	12.4	10.3	12.4
50	14.5	10.3	14.5

(Stolle, Z Ver Zuckerind 1900, 50 340)

Min Magnetite Insol in HNO_3 , but sol in hot $\text{HCl} + \text{Aq}$

Iron sesquioxide zinc oxide, Fe_2O_3 , ZnO

See Ferrite, zinc

Ferric oxybromide

Basic ferric bromides containing three equivalents, or less, of base to one of acid may be obtained dissolved in H_2O (Ordway, Am J Sci (2) 26 202)

The most basic soluble compound obtained by three months' digestion of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ with $\text{Fe}_2\text{Br}_6 + \text{Aq}$, is Fe_2Br_6 , 14 Fe_2O_3 (Béchamp)

Ferric oxychlorides

(a) Soluble $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ dissolves in $\text{Fe}_2\text{Cl}_6 + \text{Aq}$. By digesting until the acid reaction of the chloride has disappeared a solution of Fe_2Cl_6 , 2 Fe_2O_3 is obtained (Pettenkofer, Report (2) 41 289)

By digesting for several days in the cold, Fe_2Cl_6 , 5 Fe_2O_3 is obtained, and still more basic compounds by further addition of $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$. When the solution contains Fe_2Cl_6 , 12 Fe_2O_3 it gelatinises, but still dissolves completely in H_2O . The most basic soluble compound is Fe_2Cl_6 , 20 Fe_2O_3 (Béchamp, A ch (3) 57 296)

If the digestion is carried on several weeks, a solution containing Fe_2Cl_6 , 23 Fe_2O_3 is obtained, this can be boiled and diluted without pptn, but $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ is precipitated by the addition of very many salts (Ordway, Sill Am J (2) 26 197)

Solutions containing 10 or less molecules Fe_2O_3 to 1 mol Fe_2Cl_6 can be dried without the oxychloride becoming insoluble (Ordway)

The above solutions do not become cloudy by boiling or diluting (Phillips)

A very dil solution of Fe_2Cl_6 , 10 Fe_2O_3 remains clear after protracted boiling, and may be boiled without decomp even when Fe_2Cl_6 , 20 Fe_2O_3 is present (Béchamp)

HNO_3 , and $\text{HCl} + \text{Aq}$ form precipitates in the above solutions, which are sol on addition of more H_2O . $\text{H}_2\text{SO}_4 + \text{Aq}$ forms a precipitate insol in H_2O (Béchamp)

Fe_2Cl_6 , 9 Fe_2O_3 is easily sol in H_2O , weak alcohol, and glycerine, but solutions are pptd by small amts of H_2SO_4 , M_2SO_4 , citric or

tartaric acids, or a few drops of HCl , or $\text{HNO}_3 + \text{Aq}$ (Jeannel, C R 46 799)

Solutions containing 5 mols Fe_2O_3 to 1 n Fe_2Cl_6 are completely precipitated by K_2S , Na_2SO_4 , MgSO_4 , KNO_3 , NaNO_3 , $\text{Zn(NO}_3)_2$, KCl , NaCl , NH_4Cl , CaCl_2 , MgCl_2 , ZnCl_2 , KBr , or KSCN (Béchamp)

$\text{Ba(NO}_3)_2$ does not precipitate solutions of less than 18–20 Fe_2O_3 to 1 Fe_2Cl_6

$\text{Pb(NO}_3)_2$ or $\text{Pb(C}_2\text{H}_3\text{O}_2)_2$ do not precipitate solutions containing the compound Fe_2Cl_6 , 12 Fe_2O_3 , but a mixture of the two salts causes complete precipitation

Solution has been obtained containing Fe_2O_3 to 1 Fe_2Cl_6 , probably owing to a formation of soluble colloidal Fe_2O_3 (Magnier la Source, C R 90 1352)

Solubility determinations in the system Fe_2O_3 , HCl and H_2O , show that at 25° definite basic chloride is formed, but that a stable solid phase is one of a series of solid solutions containing Fe_2O_3 , HCl and H_2O (Cameron, J phys Chem 1907, 11 694)

(b) Insoluble Fe_2Cl_6 , 6 $\text{Fe}_2\text{O}_3 + 9\text{H}_2\text{O}$

(1) By exposing $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ to air Insol in H_2O sl sol in $\text{HCl} + \text{Aq}$ (Wittstein)
(2) From $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ and HNO_3 Insol in H_2O , and sl sol in $\text{HCl} + \text{Aq}$ (Béchamp)
2 Fe_2Cl_6 , 25 $\text{Fe}_2\text{O}_3 + 41\text{H}_2\text{O}$ Insol in H_2O (Béchamp)

Fe_2Cl_6 , 2 $\text{Fe}_2\text{O}_3 + 3\text{H}_2\text{O}$ Decomp by H_2O with residue of Fe_2O_3 , sl sol in dil acid (Rousseau, C R 110 1032)

Fe_2Cl_6 , 3 Fe_2O_3 As above (Rousseau, C R 113 542)

Ferric oxyfluoride, 3 Fe_2O_3 , 2 $\text{FeF}_3 + 4\text{H}_2\text{O}$

Ppt (Scheurer-Kestner)

Ferric oxysulphide, Fe_2O_3 , 3 Fe_2S_3

(Rammelsberg)

Iron phosphide, FeP

Very slowly (Freese), not (Hvoslef, A 10 99) sol in hot $\text{HCl} + \text{Aq}$ Still more insol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Freese)

Slowly sol in $\text{HNO}_3 + \text{Aq}$, and easily soluble in aqua regia (Struve)

Insol in ammonium citrate + Aq , sl sol in HCl (Dennis, J Am Chem Soc 18 16 483)

Fe_2P Slowly but completely sol in H_2SO_4 , or dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in hot conc H_2SO_4 , in HNO_3 , and in aqua regia (Freese, Pogg 132 225)

Insol in all acids except in a mixture of HNO_3 and HF (Maronneau, C R 190 130 657)

Fe_3P_4 Very slowly sol in hot conc $\text{HCl} + \text{Aq}$ 0.1 g dissolves by 4 days' heating with $\text{HCl} + \text{Aq}$ 0.3 g dissolves in hot conc H_2SO_4 in 1½ hours, 0.4 g in 2 hours in $\text{HNO}_3 + \text{Aq}$ Quite easily sol in aqua regia on warming (Freese)

Fe_2P_3 Insol in HCl , HNO_3 and aqua regia Sol in potassium hypobromite so

tion (Granger, Bull Soc 1896, (3) 15 1086)

Fe_2P_3 Very slowly sol in boiling $\text{HCl} + \text{Aq}$ Easily sol in HNO_3 or aqua regia (Struve, J B 1860 77)

Mixture (Freese, Pogg 132 225)

Almost insol in aqua regia Sol in fused alkali (Granger)

Fe_3P Nearly insol in dil acids, rapidly sol in HNO_3 or aqua regia, decomp by conc HCl or $\text{KOH} + \text{Aq}$ (Schneider, J B 1886 2026)

Of the nine iron phosphides described the constitution has been established for only two, Fe_3P and Fe_2P

Fe_3P Sol in conc HCl

Fe_2P Sol in hot aqua regia Insol in other acids (Le Chatelier, C R 1909, 149 709)

Iron selenide, Fe_2Se

Not attacked by HNO_3 or acetic acid SI attacked by conc HCl Readily attacked by aqua regia Sol in HF (Vigouroux, C R 1905, 141 829)

$\text{FeSe} + x\text{H}_2\text{O}$ Sol in HCl , HNO_3 , or $\text{HCl}_2\text{H}_2\text{O}_2 + \text{Aq}$ Insol in alkalis, or $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Reeb, J Pharm (4) 9 173)

Fe_2Se_3 Sol in dil HCl , or $\text{HNO}_3 + \text{Aq}$ with evolution of H_2Se Sol in conc $\text{HNO}_3 + \text{Aq}$ (Little, A 112 211)

Fe_3Se_4 Decomp by fuming HNO_3 (Fonzes-Diacon, C R 1900, 130 1711)

Fe_7Se_8 Decomp by fuming HNO_3 (Fonzes-Diacon, C R 1900, 130 1711)

FeSe_2 Insol in conc HCl , decomp by fuming HNO_3 (Fonzes-Diacon, C R 1900, 130 1711)

Iron silicide, Fe_3Si

Difficultly sol in $\text{HCl} + \text{Aq}$, easily sol even in dil $\text{HF} + \text{Aq}$ (Hahn, A 129 57)

Fe_2Si Not easily sol in conc HCl and HNO_3 but readily sol in HF (Moissan, C R 1895, 121 623)

$\text{Fe}_{10}\text{Si}_9$ Sol in hot $\text{HCl} + \text{Aq}$ only when melted (Hahn)

by conc HF or H_2SO_4 (Hahn)

Sol in cold HF (de Chalmot, Am Ch J 1897, 19 123)

Existence questioned by Jouve, (Bull Soc 1901, 25 290-293)

Fe_3Si Sol in HF and in fused KNO_3 and KNaCO_3 (de Chalmot, J Am Chem Soc 1895, 17 924)

Iron semisulphide, Fe_2S

Sol in dil acids with decomposition (Arfvedson, Pogg 1 72)

Ferrous sulphide, FeS

Decomp by dil acids, with evolution of H_2S and without separation of S, except with $\text{HNO}_3 + \text{Aq}$

$+x\text{H}_2\text{O}$ SI sol in H_2O , especially if hot (Berzelius)

1 l H_2O dissolves 70.1×10^{-6} moles FeS at 18° (Weigel, Z phys Ch 1907, 58 294)

Very violently decomp, even by dil acids Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ Insol in H_2S , or $(\text{NH}_4)_2\text{S} + \text{Aq}$ SI sol in Na_2S , or $\text{K}_2\text{S} + \text{Aq}$ Sol in Na_2S or $\text{K}_2\text{S} + \text{Aq}$ (de Koninck, Z angew Ch 1891 204)

Insol in NH_4NO_3 , or $\text{NH}_4\text{Cl} + \text{Aq}$ (Brett)

Not completely pptd in presence of Na citrate (Spiller)

Contrary to assertion of Persoz, it can be nearly completely pptd in presence of $\text{Na}_4\text{P}_2\text{O}_7$ by $(\text{NH}_4)_2\text{S} + \text{Aq}$ (Rose, Pogg 76 18)

Sol in alkali sulpho-molybdates, -tungstates, -vanadates, -arsenates, -antimonates, and -stannates (Storch, B 16 2015)

Sol in $\text{KCN} + \text{Aq}$

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Solubility of FeS in sugar solutions 1 l sugar of given strength dissolves mg FeS

% Sugar	mg FeS		
	at 17.5°	at 45°	at 75°
10	3.8	3.8	5.3
30	7.1	9.1	7.2
50	9.9	19.8	9.1

(Stolle, Z Ver Zuckerind 1900, 50 300)

Colloidal—A very dilute solution has been obtained which coagulated very readily (Winssinger, Bull Soc (2) 49 452)

Ferric sulphide, Fe_2S_3

Decomp by dil HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$ with evolution of H_2S , leaving a residue of Fe_2S_3

$+1\frac{1}{2}\text{H}_2\text{O}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$, also in alcoholic ammonia SI sol in $(\text{NH}_4)_2\text{S} + \text{very dil Na}_2\text{S}_2\text{O}_4 + \text{Aq}$ (Phipson, C N 30 139)

Iron disulphide, FeS_2

Insol in dil HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$ Decomp by HNO_3 or aqua regia with separation of S Insol in a 10% solution of alkali sulphide

Min *Pyrite Marcasite* Sol in a mixture of Na_2S and $\text{NaOH} + \text{Aq}$ $\text{Na}_2\text{S} + \text{Aq}$, or mixture of Na_2S and $\text{NaSH} + \text{Aq}$, insol in cold $\text{NaSH} + \text{Aq}$ Marcasite is more easily sol in above than pyrite (Becker, Sill Am J (3) 33 199)

Ferroferric sulphide, Fe_3S_9 or Fe_7S_8

Min *Pyrrhotite* Sol in dil acids with a residue of S Extremely slowly sol in a 10% solution of alkali sulphides (Terreil, C R 69 1360)

Iron (ferrous) nickel sulphide, $2\text{FeS}, \text{NiS}$ Min *Penitlandite***Ferrous phosphorus sulphide, $\text{FeS}, \text{P}_2\text{S}_3$**

(Berzelius)

$2\text{FeS}, \text{P}_2\text{S}_3$ Slowly decomp by H_2O Insol in boiling $\text{HCl} + \text{Aq}$, decomp by aqua regia (Berzelius, A 46 256)

Iron potassium sulphide (potassium sulphoferrite), $\text{K}_2\text{Fe}_2\text{S}_4 = \text{K}_2\text{S}, \text{Fe}_2\text{S}_3$

Insol in cold or hot H_2O Violently attacked by dil acids Not decomp by boiling with alkalis, alkali carbonates, or sulphides + Aq Decomp by KCN, or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Preis, J pr 107 16)

$\text{K}_2\text{S}, 2\text{FeS}$ (Schneider, Pogg 136 460)

Iron silver sulphide (silver sulphoferrite), $\text{Ag}_2\text{S}, \text{Fe}_2\text{S}_3$

Not attacked by dil $\text{HCl} + \text{Aq}$, decomp by conc $\text{HCl} + \text{Aq}$ (Schneider)

$2\text{Ag}_2\text{S}, \text{FeS}_2$ (Schneider, Pogg 138 305)
 $\text{Ag}_2\text{S}, 3\text{FeS}, \text{FeS}_2$ Min *Sternbergite* Decomp by aqua regia

Iron sodium sulphide (sodium sulphoferrite), $\text{Na}_2\text{Fe}_2\text{S}_4 + 4\text{H}_2\text{O}$

Insol in H_2O Decomp by very dil acids (Schneider, Pogg 138 302)

phosphide, Fe_2PS_3

decomp by acids at 100° boiling $\text{NaOH} + \text{Aq}$ (Ferrand, A ch 1899, (7) 17 410)

Ferrous telluride, FeTe

Insol in H_2O , sol in acids (Fabre, C R 105 277)

Kermes

See Antimony trisulphide

"Knallplatin" compounds

See Fulminoplatinum compounds

Krypton, Kr

Absorption by H_2O at t°

t°	Coefficient of absorption det by two series of experiment	
0	0 1249	0 1166
10	0 0965	0 0877
20	0 0788	0 0670
30	0 0762	0 0597
40	0 0740	0 0561
50	0 0823	0 0610

(Antropoff, Roy Soc Proc 1910, 83 A 480)

Lanthanic acid

Barium metalanthanate, $\text{Ba}(\text{H}_3\text{La}_5\text{O}_{15})_2$
 (Baskerville, J Am Chem Soc 1904, 2 79)

Lithium metalanthanate, $\text{LiH}_3\text{La}_5\text{O}_{15} + 2\text{H}_2\text{O}$
 (Baskerville)

Potassium metalanthanate, $\text{KH}_3\text{La}_5\text{O}_{15} + 15\text{H}_2\text{O}$

Decomp by H_2O (Baskerville)

Sodium metalanthanate, $\text{NaH}_3\text{La}_5\text{O}_{15} + 4\text{H}_2\text{O}$

Almost insol in H_2O , but decomp by 1 (Baskerville)

Disodium tetralanthanate, $\text{Na}_2\text{La}_4\text{O}_7$

Insol in H_2O (Baskerville)

Lanthanicotungstic acid

Ammonium lanthanicotungstate, $2(\text{NH}_4)_2\text{O}, \text{La}_2\text{O}_3, 16\text{WO}_3 + 16\text{H}_2\text{O}$

Ppt Insol in H_2O (E F Smith, J Am Chem Soc 1904, 26 1481)

Barium lanthanicotungstate, $5\text{BaO}, \text{La}_2\text{O}_3, 16\text{WO}_3 + 16\text{H}_2\text{O}$

Ppt (E F Smith)

Silver lanthanicotungstate, $5\text{Ag}_2\text{O}, \text{La}_2\text{O}_3, 16\text{WO}_3 + 4\text{H}_2\text{O}$

Very insol in H_2O (E F Smith)

Lanthanum, La

Slowly decomp cold, rapidly hot H_2O Not attacked by cold conc H_2SO_4 , but energetically by cold conc $\text{HNO}_3 + \text{Aq}$ Sol in dil acids (Hillebrand and Norton, Pogg 155 633)

Lanthanum bromide, $\text{LaBr}_3 + 7\text{H}_2\text{O}$

Easily sol in H_2O Not very sol in absolute alcohol Insol in ether (Clève, Sv V A H Bih 2 No 7)

Lanthanum nickel bromide, $2\text{LaBr}_3, 3\text{NiBr}_3 + 18\text{H}_2\text{O}$

Deliquescent (Frenchs and Smith, A 191 355)

Lanthanum zinc bromide, $2\text{LaBr}_3, 3\text{ZnBr}_3 + 36\text{H}_2\text{O}$

Very deliquescent (F and S)

Lanthanum carbide, LaC_2

Decomp by H_2O and dil acids (Pettersson, B 1895, 28 2422)

Sol in conc H_2SO_4 and dil acids, insol in conc HNO_3

Sol in fused oxidizing agents, decomp by H_2O at ordinary temps (Moissan, C R 1896, 123 149)

Lanthanum chloride, $LaCl_3$

Anhydrous Deliquescent (Hermann)
Insol in acetone (Naumann, B 1904, 37 329)
+ $7\frac{1}{2}H_2O$ Not deliquescent (Zschiesche)
Easily sol in alcohol (Hermann)

Lanthanum mercuric chloride, $2LaCl_3, HgCl_2 + \frac{8}{3}H_2O$

Not deliquescent Very sol in H_2O (Marignac, Ann Min (5) 15 272)

Lanthanum stannic chloride

See Chlorostannate, lanthanum

Lanthanum fluoride, $LaF_3 + -H_2O$

Precipitate Sl sol in $HCl + Aq$ (Cleve)

Lanthanum hydrogen fluoride, $2LaF_3, 3HF$

Precipitate (Frerichs and Smith, A 191 355)
Does not exist (Cleve, B 11 910)

Lanthanum hydride, La_2H_3

Decomp by dil acids (Winkler, B 24 1966)
 LaH_3 Decomp by H_2O Sol in acids with evolution of H_2 Decomp by alkalis (Muthmann, A 1902, 325 266)

Lanthanum hydroxide, $La_2O_3H_6$

Insol in H_2O , easily sol in acids, insol in KOH , or $NaOH + Aq$
Sol in citric acid (Baskerville, J Am Chem Soc 1904, 26 49)

Lanthanum zinc iodide, $2LaI_3, 3ZnI_2 + 27H_2O$

Very sol in H_2O (Frerichs and Smith, A 191 358)

Lanthanum nitride, LaN

Decomp by HI_2O with evolution of NH_3 Sol in mineral acids Decomp by alkali (Muthmann, A 1902, 325 275)

Lanthanum oxide, La_2O_3

Easily sol, even when ignited, in mineral and acetic acids (Hermann)
Sol in boiling conc $NH_4Cl + Aq$ (Mosander)
Sol in cold conc $NH_4NO_3 + Aq$ (Damour and Deville)
Insol in $(NH_4)CO_3 + Aq$ (Mosander)
Insol in acetone (Naumann, B 1904, 37 4329)

Lanthanum peroxide, La_2O_6

Sol in HCl, H_2SO_4, HNO_3 , and $HC_2H_3O_2 + Aq$ with decomp (Cleve, Bull Soc (2) 43 359)
 $La_2O_6 + xH_2O$ Unstable Sol in dil $H_2SO_4 + Aq$ with decomp (Mehkoff, Z anorg 1899, 21 71)

Lanthanum oxybromide, $LaOBr$

Ppt (Frerichs and Smith)

Lanthanum oxychloride, $3La_2O_3, 2LaCl_3$

Insol in H_2O Difficultly and slowly sol in HCl , or $HNO_3 + Aq$ (Hermann)
 $LaOCl$ Boiling H_2O dissolves only traces (Frerichs and Smith)

Lanthanum sulphide, La_2S_3

Decomp by H_2O and acids (Didier)

Lanthanum disulphide, LaS_2

Decomp by heat (Biltz, Z anorg 1911, 71 435)

Lead, Pb

Lead in contact with H_2O and air free from CO_2 gives a solution of PbO which turns litmus blue and turns red and is turned brown with H_2S

H_2O which has been boiled does not dissolve Pb if there is no access of air When shaken up with air it dissolves 0.01 to 0.008% PbO in 2 hours Pure spring water containing 1% grains salts in 2 pounds H_2O and no CO_2 when conducted through a lead pipe 150 feet long dissolves so much lead that it turns brown with H_2S (Yorke Phil Mag J 5 82)

CO_2 or small amts of salts prevent the solution of Pb 1 vol H_2O with $\frac{1}{2}$ vol CO_2 dissolves only a trace of Pb Spring H_2O containing in 10 pounds 1.21 grains $NaCl$ and $CaCl$ and 6.4 grains $CaCO_3$ dissolved in CO_2 does not dissolve lead (Yorke)

If the amt of salts in solution equals $\frac{1}{1000}$ the amt of H_2O and especially if they are carbonates very slight amts of Pb are dissolved (Christison Phil Mag J 21 158)

$CaCO_3$ dissolved in CO_2 water decreases the solubility of Pb more than any other salt

Distilled H_2O quietly standing in a closed flask with lead and air free from CO_2 deposits white flocks of PbO_2H_2 and dissolves $\frac{1}{1000}$ pt PbO The solution has an alkaline reaction (v Bonsdorff Pogg 41 305)

Water of 3 hardness does not take up enough Pb to become injurious (Clarke J B 1856 608)

Soluble carbonates increase the solubility of Pb in H_2O (Nevins C C 1851 608) especially $(NH_4)CO_3$ (Bottinger)

Presence of H_2SO_4 decreases the solubility of Pb (Horsford Chem Gaz 1849 247)

H_2O containing K_2SO_4 takes up only a trace of Pb (Wetzlar Schw J 54 324)

Presence of sulphates diminishes (Christison) does not diminish (Graham Miller and Hoffmann) the action of H_2O on Pb

$CaSO_4$ protects Pb but it is attacked by much $MgSO_4$ (Nevins)

$NaCl + Aq$ dissolves only a trace of Pb
 $\frac{1}{1000}$ pt in H_2O is not sufficient to prevent the action of Cl on Pb

Presence of chlorides increases the solubility (Graham Miller and Hoffmann Nevins)

H_2O containing KNO_3 does not corrode Pb

Nitrates hinder the action of H_2O (v Bonsdorff)

Nitrates increase the action of H_2O (Graham Miller and Hoffman) Nitrates have no influence (Kersting)

10 lbs of H_2O dissolved the following amts from Pb pipes in 24 hours if distilled $H_2O + 1\% Na_2CO_3$, 0.38 grain Pb, if Duna water, 0.19 grain Pb, if canal water, 0.15 grain Pb, if distilled $H_2O + 1\% NH_4NO_3$, 0.15 grain Pb, if hard well water, 0.04 grain Pb, if distilled $H_2O + 1\% KNO_3$, 0.01 grain Pb (Kersting, Dingl 169 183)

200 l Manchester drinking water dissolved 2.094 g from 1 sq metre Pb in 8 weeks, 9 l well water dissolved 1.477 g from 1 sq metre Pb in 8 weeks, 11 l distilled H_2O containing

are dissolved 110 003 g from 1 sq metre Pb in 8 weeks, distilled H_2O free from air dissolved 1 829 g from 1 sq metre Pb in 8 weeks, sea water dissolved 0 038 g from 1 sq metre Pb in 8 weeks (Calvert and Johnson, C N 16 171)

A lead pipe taken up in Paris, which had been exposed to action of ordinary H_2O for 200 years, was found perfectly smooth and uncorroded (Belgrand, C R 77 1055)

Pb is attacked by all waters, hard or soft, even highly calcareous water dissolves some lead (Mayençon and Bergeret, C R 78 484)

Pure distilled H_2O does not act on Pb, but extremely small quantities of NH_3 , HNO_3 , etc cause an action, but for this action on Pb the presence of air and CO_2 is also required (Stallman, Dingl 180 366)

100 ccm distilled H_2O dissolved 3 mg from 11 8 sq cm lead in one week when air without CO_2 was passed through the solution 8 mg were dissolved when the air contained CO_2 (Wagner, Dingl 221 260)

Action of dil salt solutions on lead In 500 ccm of the solutions containing salt, bright sheets of lead of 5600 sq metres surface were so suspended that the liquid reached all parts of the metal without hindrance, and the amts dissolved determined after 24, 48, and 72 hours of action

Salt	Grammes salt per litre	Dissolved Pb in mg per litre		
		after 24	48	72 hrs
NH_4NO_3	0 020	13 0		25
"	0 040	15 0		32
"	0 080	15 0		
{ KNO_3 + $NaNO_3$	{ 0 020 0 050	2 0	2 0	
{ KNO_3 + Na_2SO_4	{ 0 040 0 212	0 8	1 0	
{ KNO_3 + K_2CO_3	{ 0 045 0 308			0 3
{ KNO_3 + K_2SO_4	{ 0 070 0 504			0 5
$CaSO_4$	0 252	0 4		0 8
"	0 408	0 4	1 0	
K_2CO_3	0 310			0 2
"	0 516			0 2
$CaCl_2$	0 250	0 5	0 5	0 5
"	0 510	0 3		0 4
Na_2SO_4	0 200			0 8
"	0 400			0 5
{ NH_4NO_3 + $CaCl_2$	{ 0 020 0 060		1 8	
{ NH_4NO_3 + K_2CO_3	{ 0 020 0 100			0 4
Na_2SO_4	0 200			
Na_2SO_4 + K_2CO_3	0 200 0 040			0 1
$CaCl_2$	0 100			
Water from L Katrine		1 0	1 0	1 5
Distilled water		2 0	2 0	3 0

(Muir, C N 25 294)

Action of salt solutions on 11 8 sq cm Pb in one week while air either with or without CO_2 was passed through the solution

Solubility of Pb in salt solutions

100 ccm solutions containing the given amts salts dissolve Pb in mg —

Salt	g salt in 100 ccm	mg Pb dissolved	
		without CO_2	with CO
KCl	0 5	21	12
NaCl	0 5	21	12
NH_4Cl	1 0	12	5
$MgCl_2$	0 83	20	35
K_2SO_4	1 0	0	0
KNO_3	1 0	14	20
Na_2CO_3	1 0	0	
NaOH	0 923	430	
CaO, H_2	Saturated	137	

(Wagner, Dingl 221 260)

Solubility of Pb in salt solutions

25 sq cm were acted upon by a solution containing 0 2 g salt in a litre for 21 days

Three series of experiments were carried on I In corked flasks II In beakers covered with porous paper, diameter of mouth of beaker = 11 5 cm III In basins covered with porous paper, diameter of mouth of basin = 14 5 cm IV In corked flasks with constant current of air V In beakers half filled and covered with porous paper, the lead being suspended so that equal amts of surface were above and beneath the liquid

The amts in mgs of Pb dissolved were as follows —

Salt used	I	II	III	IV	V
NH_4NO_3	1 8	4 0	16 0		
KNO_3	1 6	0 5	6 0	1 5	
$CaCl_2$	3 0	2 8	5 5	3 5	3 5
$(NH_4)_2SO_4$	0 7	1 3	16 0	5 0	2 5
K_2CO_3	0 3	0 3	0 7	0 6	0 3
Dist H_2O	1 5	0 8	4 2	2 0	

(Muir, Chem Soc 36 660)

H_2O sat with CO dissolves 0 012 g Pb to a litre in 3 days (Muir, C R 77 1529)

Action of H_2O charged with CO under 760 mm pressure on Pb 3 mg of Pb were dissolved per litre in 24 hours, and the amt was not increased by further action The addition of 100 mg K_2CO_3 + 20 mg NH_4NO_3 to a litre prevented all action

Action of H_2O charged with CO under 6 atmos pressure on Pb

14 8 mg were dissolved per l in 24 hours, and 24 mg per l in 48 hours

Action of various salt solutions added to above solution of CO were as follows —

	mg salt per l	mg Pb dissolved	
		after 24 hrs	after 48 hrs
K_2CO_3	80	13 2	32 0
K_2CO_3	160		6 0
$CaCl_2$	160	32 0	44 0
NH_4NO_3	16	5 0	
NH_4NO_3	40	10 0	35 0
Distilled H_2O		14 8	24 0

(Murr, C N 33 125)

The corrosion of Pb by ordinary distilled H_2O depends upon the presence of CO_2 and O. If the dissolved CO_2 is double the amt of the dissolved O, the action is most energetic. When CO_2 is wholly absent and O present, the action is very slight, and when the H_2O contains $1\frac{1}{2}$ or more vol % CO_2 with normal amt of oxygen, there is no visible corrosion. Pure distilled H O containing neither O nor CO_2 has no action on Pb. In the above cases the greater part of the Pb remains in the form of a white ppt or crust on the Pb, but in the case where O and CO_2 are both present in the ratio of 1 2, very small amts of Pb go into solution in a few days, the amt, however, diminishes on standing. As the amt of CO_2 increases, the amt of Pb dissolved in the H_2O also increases.

NH_4OH alone does not protect Pb from corrosion, but when in combination with CO_2 the action is much diminished.

CaO_2H_2 , and $NaOH + Aq$ attack Pb much more actively in absence of CO and presence of air. In absence of dissolved O neither CaO_2H_2 nor $NaOH$ attacks Pb.

$Na_2CO_3 + Aq$ in absence of CO_2 attacks Pb slightly, but $NaHCO_3 + Aq$ has not the slightest action.

$CaH_2(CO_3)_2 + Aq$ also has not the slightest action on Pb, and the presence of $CaCO_3$ and CO wholly prevents H_2O attacking Pb.

$CaSO_4 + Aq$ in presence of air forms a crust on Pb, but no Pb is found in solution, but if air is excluded there is no visible action. Presence of CO_2 causes a strong corrosive action.

H O containing $CaSO_4$ and $CaH_2(CO_3)_2$ does not attack Pb.

The above reactions are not in the least altered by the presence of moderate amts of nitrates, chlorides, or ammonium, or organic compounds, but ammonium salts in excess have a strong solvent action on Pb. (Muller, J pr (2) 36 317.)

See also an extended report of the action of H_2O on Pb made to the Water Committee of Huddersfield, England, in 1886, by Messrs Crookes, Odling, and Lidy.

Very extended researches are published by Cornolley and Frew (Jour Soc Chem Ind 7 15), of which only the general conclusions can be given here.

The action of slaked lime, limestone, sand calcium silicate, mortar, etc., was tested. The results were as follows—

1 In nearly all cases the corrosion is greater with free exposure to the air than when air is excluded. The difference is especially great in those cases where the greatest action on the lead takes place. Aluminum hydroxide and blue clay form exceptions, and exert a greater corrosive action when air is excluded. In the case of $CaCO_3$, old mortar, $CaSiO_3$, or a mixture of $CaCO_3$ and CaO_2H_2 , the exclusion or presence of air makes no appreciable difference.

$KNO_3 + Aq$ shows a peculiar behaviour. In the presence of air it acts nearly as much on the Pb as pure H_2O , but when air is excluded it exerts nearly as much retarding action as $CaSiO_3$.

2 In the presence of air the action of H_2O on Pb is considerably increased by the presence of NH_4NO_3 or CaO_2H_2 , with exclusion of air, by $CaSO_4$, also by a mixture of CaO_2H_2 and sand. All the other investigated substances, even KNO_3 , hinder the action of H_2O on Pb either with or without exclusion of air.

3 $CaO_2H_2 + Aq$ exerts in all cases a much greater corrosive action than pure H O, and although this action is diminished by sand yet fresh mortar very quickly destroys lead pipes when in contact therewith. Old mortar, on the other hand, and also $CaSiO_3$ and $CaCO_3$, have a protective action.

4 The fact is very important that sand, $CaCO_3$, old mortar, $CaSiO_3$, and a mixture of sand and $CaCO_3$ afford considerable protection to lead against H_2O . A mixture of limestone and sandstone has more effect than the two substances separately.

5 $CaSiO_3$ totally prevents the corrosive action of KNO_3 and NH_4NO_3 , so that the lead is not attacked by solutions of those salts any more than by H_2O containing $CaSiO_3$ alone. Sand, and a mixture of sand and $CaCO_3$ have a similar effect, but not to such a degree.

6 The protective influence of $CaCO_3$ does not appear to depend on the presence of CO_2 and the formation of $CaH_2(CO_3)_2$.

7 $MgCO_3$ prevents the corrosion of Pb as much as $CaSiO_3$. (Cornolley and Frew, Jour Soc Chem Ind 7 15.)

Pb in contact with Zn or Fe is protected thereby from the solvent action of H O, and in fact the action is nearly null. Sn, on the other hand, increases the action. This is of importance in regard to the use of tin-coated lead pipes.

The presence of Cl salts does not influence the action of the H_2O on Pb, hard or soft H O provided it contains CO_2 having a strong corrosive action. Removal of air from H_2O diminishes the solvent action. Simple filtration will remove all Pb from H_2O if suitable filters are used. (Flogel, J B 1888 2645.)

Pure distilled H_2O has strong corrosive action on Pb, which is very much weakened by addition of a solution of $CaCO_3$ in carbonic acid water, but the presence of sulphates increase the action. Pb is not appreciably attacked by H_2O in presence of chlorides alone,

but very strongly when $CaSO_4$ is also present. H_2O containing CO_2 also corrodes Pb. The conclusion was drawn that the absence of action of H_2O on Pb in lead pipes is due to the presence of traces of $CaH_2(CO_3)_2$ (Barbaglia and Gucci, C C 1888 934)

Solubility in H_2O containing various solids in solution

Water used	Pts of lead per 100 000			
	1	2	3	4
Water alone, unfiltered	8 19	12 98	8 19	4 09
Water alone, filtered	3 00	4 09	2 07	2 32
Water containing 0 049 g NaCl per l, unfiltered	1 36	2 73	0 68	4 04
" " " " " " filtered	0 68	1 50	0 67	1 36
Water containing 0 49 g Na_2SO_4 per l, unfiltered	3 41	6 83	2 05	1 84
" " " " " " filtered	2 05	3 41	1 64	1 77
$CaHCO_3$ +Aq containing 0 04 g CaO as carbonate per l	2 45	3 14	2 63	5 70
$CaHCO_3$ +Aq with NaCl	2 05	3 41	2 35	3 40
$CaHCO_3$ +Aq with Na_2SO_4	2 18	3 32	2 05	3 16
$CaSO_4$ +Aq containing 0 095 g CaO as sulphate per l	6 83	6 83	3 41	1 35
$CaSO_4$ +Aq with NaCl	5 46	6 57	3 51	1 50
$CaSO_4$ +Aq with Na_2SO_4	4 78	5 87	3 69	1 77

Column 1 gives the numbers for distilled water free from air, column 2 for distilled water aerated by agitation with air, column 3 for water continuously aerated by passing 1 litre of air through it per hour, column 4 for distilled water through which 1 litre of air and 400 cc of CO_2 were passed per hour throughout the experiment (Antony and Benelli, Gazz ch it 1896, 26, (2) 97 and 352)

Almost insol in cold HCl +Aq, and only sl attacked when boiling. Completely sol in HNO_3 +Aq if not too conc, but presence of H_2SO_4 or HCl diminishes the solvent power to a great extent (Rose)

Granulated Pb is sl sol in conc HCl +Aq, addition of $PtCl_4$ makes the action very energetic. Dil HCl +Aq may also be used with $PtCl_4$ (Millon, C R 21 49)

HCl +Aq of 12 sp gr, with Pb, gives off H at ord temp, more abundantly when heated. Evolution of H is hastened by placing Cu in contact with the Pb (Stolba, J pr 94 113)

Quickly decomp by hot HCl +Aq, slowly by cold (Sharpley, C N 50 126)

Scarcely acted upon by boiling conc HCl +Aq

Sol in aqua regia

HNO_3 +Aq is the best solvent, but Pb is as good as insol in a mixture of HNO_3 and H_2SO_4 (Berzelius)

Not acted upon by very conc HNO_3 +Aq

Pb is only sl attacked by HNO_3 +Aq of any strength below 15° . Above 15° it is most rapidly attacked by a rather weak acid (Montemartini, Gazz ch it 22 397)

Action of H_2SO_4 on Pb

H_2SO_4 of 1 842 sp gr dissolves 201 g from 1 sq metre pure lead at ordinary temp (time?), and H_2SO_4 of 1 705 sp gr dissolves only 59 g

Slight impurities in the lead lessen this

solubility (Calvert and Johnson, Chem Soc (2) 1 66)

Strongly attacked by 99 8% H_2SO_4 at ord temp with exclusion of air (Lunge, Dingl 261 131)

When 0 2 g pure Pb was heated with 50 ccm H_2SO_4 of $66^\circ B$ there was no appreciable action below 175° . At 230 – 250° all the Pb was suddenly converted into $PbSO_4$, which dissolved (Bauer, B 8 210)

Lead is slowly attacked by pure cold conc H_2SO_4 +Aq (99 78% H_2SO_4). Lead vessels which held the H_2SO_4 were gradually destroyed by long standing (Napier and Lunge, C N 42 314)

H_2SO_4 +Aq (20%) does not evolve H under the same circumstances (Stolba)

Sol in $HC_2H_3O_2$ +Aq when in contact with the an

Strong NH_4OH +Aq does not dissolve litharge, but lead immersed in NH_4OH +Aq 3 days gives an ammoniac solution (0 0139% lead (Endemann, Am Ch J 1897, 19 892)

Somewhat sol in $NaCl$ +Aq (Reichelt, Dingl 172 155)

$NaCl$ +Aq attacks Pb at high temp (Lunge, l c)

Action of $KClO_3$. $KClO_3$ +Aq (6 3% $KClO_3$) oxidised 64 31 g Pb from 1 sq metre surface by boiling 7 hours, $KClO_3$ +Aq (25% $KClO_3$) oxidised 151 12 g under same conditions, and $Ca(ClO_3)_2$, $CaCl_2$ +Aq (20° Baume)

tions, and $\text{Ca}(\text{ClO}_3)_2$, $\text{CaCl}_2 + \text{Aq}$ (20° Baume), obtained by passing Cl_2 through $\text{CaO}_2\text{H}_2 + \text{Aq}$, oxidised 437.70 g (Lunge and Deggeler, Jour Soc Chem Ind 4 31)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Sol in a solution of K in liquid NH_3 (Kraus, J Am Chem Soc 1907, 29 1562)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0592 g Pb in 6 days (Gates, J phys Chem 1911, 15 143)

Solubility of Pb in petroleum

If b-pt is under 230°, only slightest trace is dissolved in 4 months; if 230–300°, 0.0026% in 4 months, if over 300°, 0.0244% in 4 months; if over 300°, 0.0244% in 4 months

Solubility of Pb in commercial oil of turpentine and resin oil

	Temp	% Pb dissolved	
		in 8 days	in 14 days
Fresh oil of turpentine	15–20°	sl trace	0.0722
Old oil of turpentine	15–20	0.0522	0.1435
Fresh oil of turpentine	100	0.265	0.715
Old oil of turpentine	100	0.982	1.851
Fresh oil of turpentine	130–150	0.938	2.045
Old oil of turpentine	130–150	1.738	4.083
Fresh resin oil	15–20	trace	0.024
Old "	15–20	0.073	0.185
Fresh "	100	0.380	0.880
Old "	100	1.190	2.711
Fresh "	130–150	1.050	2.065
Old "	130–150	2.208	4.740

(Fngler and Kneis, Dingl 263 193)

Pb is slowly attacked by oil of turpentine (Am Chem 4 289)

The fatty oils dissolve Pb in considerable amt (Muller, J B 1878 1169)

Not attacked by sugar + Aq (Klein and Berg, C R 102 1176)

Lead potassium amide

Su Potassium ammonoplumbite

Lead azoimide, basic, PbO , PbN_6

Insol in H_2O (Wohler, B 1913, 46 2054)

Lead azoimide, PbN_6

Insol in cold H_2O , much less sol in boiling H_2O than PbCl_2 . 1 l H_2O dissolves about $\frac{1}{2}$ g PbN_6 . Easily sol in warm $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ insol in conc $\text{NH}_4\text{OH} + \text{Aq}$ (Curtius, B 24 3344)

Lead bromide, PbBr_2

Sl sol in cold, more easily in hot H_2O , or in H_2O containing HCl , HNO_3 , or $\text{HC}_2\text{H}_3\text{O}_2$ (Lowig)

1 l H_2O dissolves 6 g PbBr_2 at 10°, addition of HBr causes a ppt which redissolves on further addition of HBr . 1000 pts of a liquid containing 720 pts HBr dissolve 550 g PbBr_2 . This solubility increases by heating (Ditte, C R 92 718)

1 l H_2O dissolves 26.28 millimols PbBr_2 at 25.2° (von Ende, Z anorg 1901, 26 159)

Solubility in 100 g H_2O at t°

t°	G PbBr_2
0	0.4554
15	0.7305
25	0.9744
35	1.3220
45	1.7457
55	2.1376
65	2.5736
80	3.3430
95	4.3613
* 100	4.7510

* By extrapolation

(Lichty, J Am Chem Soc 1903, 25 474)

Sl sol in H_2O

8.34×10^{-1} gram are dissolved in 1 liter of sat solution at 20° (Bottger, Z phys ch 1903, 46 603)

Solubility of PbBr_2 in $\text{HNO}_3 + \text{Aq}$ at 25.2°

S = solubility in millimols per litre

HNO_3 normal	S
0.001	39.11
0.01	39.87
0.051	42.56
0.04 $\text{KNO}_3 +$	
0.01 HNO_3	42.77

(von Ende, Z anorg 1901, 26 162)

Slowly sol in cold, easily in warm NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Wittstein)

Not pptd in presence of Na citrate (Spiller)

Insol in H_2O containing $\text{Pb}(\text{NO}_3)_2$ (von Ende, Z anorg 1901, 26 159)

Insol in benzene (Franchimont, B 16 387)

Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

+3 H_2O (Ditte, l c)

Lead hydrogen bromide, $5\text{PbBr}_2, 2\text{HBr} + 10\text{H}_2\text{O}$

Sol in $\text{HBr} + \text{Aq}$ (Ditte, C R 92 718)

Lead magnesium bromide, $\text{PbBr}_2, 2\text{MgBr}_2 + 16\text{H}_2\text{O}$

Very deliquescent. Decomp immediately by H_2O or alcohol (Otto and Drewes, Arch Pharm 229 585)

Lead potassium bromide (potassium bromoplumbite), $\text{PbBr}_2, \text{KBr} + \text{H}_2\text{O}$

(Remsen and Herty, Am Ch J 14 124)

$+-\text{H}_2\text{O}$ (Wells, Sill Am J 145 129)

$\text{PbBr}_2, 2\text{KBr}$ Sol in a little H_2O without decomp, but decomp by an excess with separation of PbBr_2 (Lowig)

$+\text{H}_2\text{O}$ (Wells, Sill Am J 145 129)

$2\text{PbBr}_2, \text{KBr}$ (Wells)

Lead potassium perbromide, $\text{K}_3\text{Pb}_2\text{Br}_8 + 4\text{H}_2\text{O}$

Decomp by H_2O and alcohol (Wells, Z anorg 4 340)

Lead rubidium bromide, $\text{PbBr}_2, 2\text{RbBr} + \frac{1}{2}\text{H}_2\text{O}$

(Wells, Sill Am J 146 34)

$2\text{PbBr}_2, \text{RbBr}$ (Wells)

uide

y H_2O (Lowig)

Lead chloride, $\text{PbBrCl} = \text{PbBr}_2, \text{PbCl}_2$

Can be recrystallised from H_2O without decomp (Hes, C N 43 216)

$3\text{PbCl}_2, \text{PbBr}_2$ Sol in H_2O with decomp
Sol in HCl and in HBr Insol in cold alcohol, sl sol in boiling alcohol (Thomas, C R 1899, 128 1235)

Lead bromiodide, $\text{PbBrI} = \text{PbBr}_2, \text{PbI}_2$

Decomp by H_2O Cryst from a solution of PbI_2 in HBr (Grissom and Thorp, Am Ch J 10 229)

$3\text{PbBr}_2, \text{PbI}_2$ Decomp by H_2O (Thomas, C R 1899, 128 1236)

$6\text{PbBr}_2, \text{PbI}_2$ (G and T)

Lead bromosulphide, $\text{PbBr}_2, \text{PbS}$

Properties as chlorosulphide (Parmentier)

Lead chloride, PbCl_2

Slowly sol in 135 pts H_2O at 12°, and in a much smaller quantity of hot H_2O (Bischof)

Sol in 30 pts cold and 22 pts hot H_2O (Wittstein)

Sol in 30 pts H_2O at 18.75° (Abl)

100 pts H_2O dissolve 4.59 pts PbCl_2 at 1.5° (Ure's Dict)

100 pts H_2O dissolve 0.9712 pt PbCl_2 at 20° (Formánek, C C 1887 270)

100 pts H_2O dissolve 0.946 pt PbCl_2 at 17.7° (Bell, Chem Soc (2) 6 355)

Sol in 105.2 pts H_2O at 16.5° (Bell, C N 16 69)

100 pts H_2O dissolve 0.8 pt PbCl_2 at 0°, 1.18 pts at 20°, 1.7 pts at 40°, 2.1 pts at 55°, 3.1 pts at 80° (Ditte, C R 92 718)
1.1 H_2O dissolves 38.80 millimols PbCl_2 at 25.2° (von Ende, Z anorg 1901, 26 143)
9.61 x 10⁻¹ gram are dissolved in 1 liter of sat solution at 20° (Eottger, Z phys ch 1903, 46 603)

Solubility in H_2O

100 g H_2O dissolve g PbCl_2 at t°

t°	G PbCl_2
0	0.6728
15	0.9090
25	1.0842
35	1.3244
45	1.5673
55	1.8263
65	2.1265
80	2.6224
95	3.1654
* 100	3.3420

* By extrapolation

(Lichty, J Am Chem Soc 1903, 25 474)

33.6 millimols Pb are dissolved in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)

1.1 H_2O dissolves 77.76 milliequivalents PbCl_2 at 25° Sp gr of the solution 25°/4° = 1.0069 (Harkins and Winninghoff, J Am Chem Soc 1911, 33 1816)

0.0388 mol mg PbCl_2 are sol in 1 l H_2O (Kernot and Pomilio, Soc R Napoli, 1912, (3), XVII, 353)

A colloidal modification is sol in hot water to give cryst modification (Van de Veide, Ch Z 1893, 17 1908)

Solubility in H_2O is not much increased by the addition of acids (Fresenius)

Sol in conc $\text{HCl} + \text{Aq}$, from which it is pptd by H_2O , but less sol in dil $\text{HCl} + \text{Aq}$ than in H_2O (Berzelius)

Sol in 1636 pts H_2O containing HCl (Bischof)

Sat solution of PbCl_2 in $\text{HCl} + \text{Aq}$ of 1.116 sp gr contains 2.566% PbCl_2 at 16.5°

Solubility in $\text{HCl} + \text{Aq}$ 100 pts liquid containing pts HCl of 1.1162 sp gr in 100 pts H_2O dissolve pts PbCl_2 at 17.7°

Pts HCl	Pts PbCl	Pts HCl	Pts PbCl_2	Pts HCl	Pts PbCl
1	0.347	8	0.099	50	0.356
2	0.201	9	0.096	60	0.559
3	0.165	10	0.093	70	0.933
4	0.145	15	0.090	80	1.498
5	0.131	20	0.111	90	2.117
6	0.107	30	0.151	100	2.900
7	0.100	40	0.216		

(Bell, Chem Soc 21 350)

Solubility of PbCl_2 in HCl

Amt HCl in 100 pts H_2O	Amount PbCl_2 dissolved in 1000 pts of liquid				
	At 0°	At 20	At 40	At 50°	At 80°
0 0	8 0	11 8	17 0	21 0	31 0
5 6	2 8	3 0	4 6	6 5	12 4
10 0	1 2	1 4	3 2	5 5	12 0
18 0	2 4	4 8	7 2	9 8	19 8
21 9	4 7	6 2	10 4	12 9	23 8
31 5	11 9	14 1	19 0	24 0	38 0
46 0	29 8	30 0			

(Ditte, C R 92 718)

Solubility in $\text{HCl} + \text{Aq}$ at 0° $\frac{\text{PbCl}_2}{2} = \frac{1}{2} \text{ mols}$ PbCl_2 in mgs in 10 ccm solution, $\text{HCl} =$
mols HCl in ditto

$\frac{\text{PbCl}_2}{2}$	HCl	$\frac{\text{PbCl}_2}{2}$	HCl
0 42	0	0 072	5 8
0 22	0 35	0 088	11 7
0 135	0 675	0 100	29 5
0 11	1 125	0 209	46 7
0 105	1 6	0 95	73 5
0 099	2 3	1 5	89 0
0 090	3 4	1 9	96 0
0 08	4 5	3 01	111 5

It is seen that very little $\text{HCl} + \text{Aq}$ is sufficient to diminish solubility very considerably, and, that on further addition of $\text{HCl} + \text{Aq}$, the solubility is nearly constant, and increases finally very much when large amts of $\text{HCl} + \text{Aq}$ are present (Engel, A ch (6) 17 359)

Solubility of PbCl_2 in $\text{HCl} + \text{Aq}$ at 25°

G HCl per l	G PbCl_2 per l	G HCl per l	C PbCl_2 per l
0	10 79	3	5 0
0 5	9 0	6	3 1
1	7 6	10	1 8
2	6 0		

(Noyes, Z phys Ch 1892, 9 623)

Solubility of PbCl_2 in $\text{HCl} + \text{Aq}$ at 25 20°

S = solubility in millimols per litre

HCl normal	S	HCl normal	S
0 0000	38 80	0 3714	6 35
0 0009	38 66	0 5142	5 37
0 0022	38 20	0 7386	4 73
0 0030	37 94	1 026	4 41
0 0045	37 35	1 538	4 61
0 0091	35 80	2 051	5 13
0 0114	34 99	2 564	6 25
0 0151	33 75	3 085	7 78
0 0226	31 46	3 718	8 16
0 0302	29 32	5 0	19 38
0 0452	25 46	7 5	65 86
0 0910	17 12	10 0	141 35
0 1850	10 12	12 05	164 3

(von Ende, Z anorg 1901, 26 148)

Solubility of PbCl_2 in HCl at 18°

HCl Normality	G PbCl_2 per l
0	9 34
0 0001	9 305
0 0002	9 300
0 0005	9 243
0 00102	9 200
0 0102	8 504

(Pleissner, Arb Kais Gesundamt 1907, 26 384)

Sol in hot, insol in cold conc H_2SO_4 (Hayes)Sol in dil $\text{HNO}_3 + \text{Aq}$, from which it is pptd by $\text{HCl} + \text{Aq}$ (Gladstone)Easily and completely decomp by hot $\text{HNO}_3 + \text{Aq}$ (Wurtz)Solubility of PbCl_2 in $\text{HNO}_3 + \text{Aq}$ at 25 2°

S = solubility in millimols per litre

HNO_3 normal	S
0 001	38 87
0 01	39 71
0 051	42 92
0 04 $\text{KNO}_3 +$	
0 01 HNO_3	43 36

(von Ende, Z anorg 1901, 26 162)

Solubility of PbCl_2 in $\text{NH}_4\text{Cl} + \text{Aq}$ at 25 20°

S = solubility in millimols per litre

NH_4Cl normal	S
0 25	9 47
0 50	7 11
1 0	4 35

(von Ende, Z anorg 1901, 26 152)

Solubility of $\text{PbCl}_2 + \text{NH}_4\text{Cl}$ at 22°

G equiv per l H_2O NH_4Cl	G equiv per 100 cc H_2O 1 bcl	G equiv per l H_2O PbCl_2	G equiv per 100 cc H_2O PbCl_2
0 0	7 49 x 10 ⁻³	1 0	0 758 x 10 ⁻³
0 1	3 10	1 2	0 707
0 2	1 916	1 5	0 671
0 3	1 508	2 0	0 695
0 4	1 348	2 5	0 812
0 5	1 263	3 0	0 968
0 55	1 189	4 0	1 502
0 6	1 092	5 0	2 338
0 65	1 012	6 0	3 580
0 7	0 956	7 0	5 628
0 8	0 837	7 29*	6 46
0 9	0 793		

* Saturated

(Bronsted, Cong Appl Chem 1909, Sec X, 110)

Solubility in $\text{NH}_4\text{Cl} + \text{Aq}$ at t°				Much more sol in $\text{HgCl}_2 + \text{Aq}$ than in H_2O			
t°	G PbCl_2 in 100 g of the solution	G NH_4Cl in 100 g of the solution	Solid phase	Grammes HgCl_2 in 100 cem	Grammes PbCl_2 dissolved	After subtracting amt dissolved by H_2O alone	Calculated no of milliequivalents
17°	0 89	0 0	PbCl_2	0	0 9712		
	0 21	0 96		4	1 8972	0 9350	23 37
	0 16	1 43		2	1 4874	0 5208	26 04
	0 14	2 40		1	1 2272	0 2600	26 00
	0 076	3 48		0 5	1 0808	0 1134	22 68
	0 078	4 23	$2\text{PbCl}_2, \text{NH}_4\text{Cl}$	0 25	1 0192	0 0500	20 00
	0 078	4 93		0 125	0 9926	0 0226	18 08
	0 098	12 36		(Formánek, C C 1887 270)			
	0 34	22 33		Solubility of PbCl_2 in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 20°			
	0 64	26 49		G equiv per l			
	0 52	26 68	$\text{Pb}(\text{NO}_3)_2$		PbCl_2		
	0 33	26 91	0 0		0 0777		
	0 30	27 03	0 2		0 0832		
	0 0	27 14					
50°	1 69	0 0	PbCl_2	(Noyes, Z phys Ch 1892, 9 623)			
	1 08	0 51		Solubility in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 25°			
	0 67	1 45		C = concentration of $\text{Pb}(\text{NO}_3)_2$ in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ expressed in milliequivalents per l			
	0 58	2 45		$d_1 = \text{Sp gr of } \text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 25°			
	0 48	4 86		S = Solubility of PbCl_2 in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ expressed in milliequivalents per l			
	0 49	12 45	$2\text{PbCl}_2, \text{NH}_4\text{Cl}$	$d_2 = \text{Sp gr } 25^\circ/4^\circ \text{ of } \text{PbCl}_2 + \text{Pb}(\text{NO}_3)_2 + \text{Aq}$			
	0 71	19 42		C	d_1	S	d_2
	1 76	27 16		20 020	1 0008	76 75	1 0095
	3 31	31 90		50 063	1 0045	76 64	1 0139
	3 96	33 56		99 660	1 0119	77 98	1 0210
	2 65	33 62	NH_4Cl	(Harkins and Winninohof, J Am Chem Soc 1911, 33 1816)			
	1 62	33 88		Solubility of PbCl_2 in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 25°			
	0 32	34 14		G $\text{Pb}(\text{NO}_3)_2$ per l		% PbCl_2	
	0 0	34 25		0		1 09	
100°	3 10	0 0		PbCl_2	3 31		1 10
	2 02	1 32	6 62		1 05		
	1 85	5 33	33 12		1 11		
	1 80	6 01	82 80		1 29		
	1 76	8 59	(Armstrong and Fyfe, Proc Roy Soc 1913, (A) 88 234)				
	1 98	13 19	Solubility of PbCl_2 in $\text{KCl} + \text{Aq}$ at 25°				
	4 54	26 08	S = Solubility in millimols per litre				
	8 32	32 64	KCl normal		S		
	11 40	36 29	0 0000		38 80		
	12 67	37 62	0 001		38 32		
	12 50	38 14	0 0025		37 85		
	11 60	38 32	0 0049		37 02		
	10 70	38 66	0 0049		37 02		
	9 88	40 22	0 0099		35 28		
	9 26	41 90	0 0200		32 16		
	4 21	42 91	0 0599		22 62		
	3 06	43 20					
	1 61	43 42					
	0 0	43 51					

These results show that the double salt $\text{PbCl}_2, 2\text{NH}_4\text{Cl}$ can only exist in aqueous solution at temperature above 70° (Demassieux, C R 1913, 156 894)

(von Ende, Z anorg 1901, 26 151)

Solubility of $\text{PbCl}_2 + \text{KCl}$ in H_2O at 20°

Values = g equivalents

In 1000 g solution		In 1000 g H_2O		Solid phase
PbCl_2	KCl	PbCl_2	KCl	
		28 0	4 57	$\text{PbCl}_2, \text{KCl}$ $\frac{1}{3}\text{H}_2\text{O} + \text{KCl}$
17 80	3 18	23 42	4 18	$\text{PbCl}_2, \text{KCl}$ $\frac{1}{3}\text{H}_2\text{O}$
16 56	3 05	21 50	3 96	
15 50	2 91	19 85	3 78	
14 76	2 77	18 66	3 50	
13 96	2 66	17 48	3 33	
13 16	2 47	16 17	3 03	
13 08	2 45	16 06	3 01	
12 94	2 40	15 80	2 93	
12 96	2 36	14 92	2 87	
12 86	2 35	15 63	2 86	
12 44	2 30	15 03	2 78	$2\text{PbCl}_2, \text{KCl}$
11 84	2 29	14 30	2 77	
11 38	2 24	13 70	2 70	
10 60	2 20	12 72	2 64	
11 98	2 29	14 35	2 62	
10 46	2 14	12 47	2 55	
10 22	2 10	12 13	2 49	
9 82	2 04	11 60	2 41	
9 34	1 96	10 96	2 31	
8 94	1 88	10 42	2 20	
7 86	1 57	8 92	1 79	PbCl_2
7 72	1 52	8 72	1 74	
7 66	1 40	8 56	1 57	
7 46	1 32	8 29	1 47	
7 36	1 24	8 11	1 34	
7 38	1 23	8 13	1 37	
7 30	1 12	7 98	1 23	
7 34	1 12	8 01	1 25	
7 36	1 05	8 00	1 15	
7 48	1 02	8 10	1 10	
7 52	0 98	8 13	1 06	PbCl_2
7 70	0 93	8 28	1 00	
7 82	0 88	8 38	0 94	
8 24	0 82	8 79	0 85	
8 42	0 78	8 96	0 83	
8 84	0 71	9 36	0 76	
9 54	0 63	10 03	0 67	
10 68	0 57	11 18	0 60	
12 32	0 52	12 85	0 54	
12 38	0 50	12 88	0 52	PbCl_2
12 36	0 48	12 85	0 50	
12 56	0 47	13 04	0 49	
12 48	0 45	12 95	0 47	
12 24	0 37	13 65	0 38	
14 52	0 29	14 88	0 30	
19 00	0 19	19 33	0 19	

(Bronsted, Z phys Ch 1912, 80 208)

PbCl_2 is sol in 120 pts pure H_2O , but on adding 5% NaCl 437 pts are required to effect solution. When PbCl_2 is digested with conc $\text{NaCl} + \text{Aq}$, 1 pt dissolves in 129 pts of the liquid

A study of the equilibrium between lead chloride and sodium chloride in aqueous solution at 13° , 50° and 100° shows that at none of these temp do these chlorides form a double salt (Demasseux, C R 1914, 158 702)

Solubility in salts + Aq at 25°

Salt used	Concentration of the salt Equivalents per liter	Solubility of PbCl_2 Equivalents per liter
None	0	0 07770
HCl	0 05	0 04786
"	0 1	0 03243
"	0 2	0 01927
KCl	0 05	0 0482
"	0 1	0 0341
"	0 2	0 0219
MgCl_2	0 05	0 0503
"	0 1	0 0350
CaCl_2	0 05	0 0503
"	0 1	0 0355
"	0 2	0 0219
MnCl_2	0 05	0 0501
"	0 1	0 0349
"	0 2	0 0217
ZnCl_2	0 2	0 0220
CdCl_2	0 05	0 0601
"	0 1	0 0481
"	0 2	0 0355

(Noyes, Z phys Ch 1892, 9 623)

Sol in $\text{KOH} + \text{Aq}$ (Rose)

Less sol in dil salt solutions than in H_2O , especially $\text{CaCl}_2 + \text{Aq}$, sol in 534 pts H_2O containing CaCl_2 (Bischof)

More sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ than in H_2O , but not as sol as AgCl (Herschell, 1819)

More sol in $\text{Na}_2\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ than in H_2O (Anthon)

Easily sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in conc alcohol (Wittstein) Insol in 94% alcohol, very sl sol in cold or hot 76% alcohol

Solubility in alcohol at 25°

Alcohol = g mol alcohol in 1 l of solvent

 PbCl_2 = g mol PbCl_2 in 1 l of solution

Alcohol	4	2	1	$\frac{1}{2}$	$\frac{1}{4}$
PbCl_2	0 0172	0 0257	0 0298	0 0330	0 0338

Alcohol	$\frac{1}{8}$	0
PbCl_2	0 0367	0 0388

(Kernot and Pomilio, Soc R Napoli, (3) 17 353)

Insol in benzene (Franchimont, B 16 387)

Insol in CS_2 (Arcetowski, Z anorg 1894, 6 257)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B

1909, **42** 3790), ethyl acetate (Naumann, B 1910, **43** 314)

Insol in methylal (Eidmann, C C 1899, II, 1014)

Insol in acetone (Naumann, B 1904, **37** 4329)

Glycerine dissolves 1 995% PbCl_2
1 pt glycerine+1 pt H_2O dissolves 1 32%

PbCl_2
1 pt glycerine+3 pts H_2O dissolves 1 0365%

PbCl_2
Glycerine containing 87 5% H_2O dissolves 0 91% PbCl_2 (Piesse, B 7 599)

Solubility of PbCl_2 in mannite+Aq at 25°
Mannite=g mol mannite in 1 l of solvent

PbCl_2 =g mol PbCl_2 in 1 l of solution

Mannite $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{8}$ $\frac{1}{16}$ $\frac{1}{32}$
 PbCl_2 0 0408 0 0403 0 0394 0 0384 0 0385

Mannite $\frac{1}{64}$ 0

PbCl_2 0 0377 0 0388

(Kernot and Pomilio, Soc R Napoli, (3) 17 353)

Min *Cotunnite*

Lead tetrachloride, PbCl_4

Sol in H_2O with subsequent decomp (Rivot, Beudant, and Dagun, Ann Min (5) 4 239)

Obtained in a pure state by Friedrich Sol in a little cold H_2O , but is decomp by warming or diluting Miscible with conc HCl +Aq, not attacked by conc H_2SO_4 even on warming (Friedrich, W A B 102, 2b 534)

Lead tetrachloride with MCl

See Chloroplumbate, M

Lead magnesium chloride, PbCl_2 , 2MgCl_2 + $13\text{H}_2\text{O}$

Deliquescent Decomp by H_2O (Otto and Drewes, Arch Pharm 228 495)

Lead potassium chloride (potassium chloroplumbite), PbCl_2 , KCl

(Remsen and Herty, Am Ch J 14 125)

Contains $\frac{1}{3}$ H_2O (Wells, Sill Am J 145 130)

See also Demassieux, PbCl_2 + KCl under PbCl_2

2PbCl_2 , KCl (Wells)

See also Demassieux as above

Lead rhodium chloride

See Chlororhodite, lead

Lead rubidium chloride, PbCl_2 , 2RbCl + $\frac{1}{2}\text{H}_2\text{O}$

(Wells, Sill Am J 146 34)

2 PbCl_2 , RbCl (Wells)

Lead sodium chloride

Decomp by H_2O

Lead sodium tetrachloride, 2PbCl_4 , 9NaCl

Very sol in H_2O (Sobrero and Selmi, Arch (3) 29 165)

See also Chloroplumbate, lead

Lead thalious chloride, PbCl_2 , 3TlCl

Sl sol in cold, more in hot H_2O (Noyes, Z phys Ch 9 622)

PbCl_2 , TlCl Ppt (Ephraim, Z anorg 1909, **61** 245)

Lead chloride ammonia, 2PbCl_2 , 3NH_3

(Rose, Pogg 20 157)

Lead tetrachloride ammonia, PbCl_4 , 4NH_3

Pptd from chloroform solution (Matthews, J Am Chem Soc 1898, **20** 825)

PbCl_4 , 2NH_3 Fumes in the air Decomp by H_2O (Matthews)

Lead chloride arsenate, $3\text{Pb}_3(\text{AsO}_4)_2$, PbCl_2

See Arsenate chloride, lead

Lead chloride borate, $\text{Pb}(\text{BO}_2)_2$, PbCl_2 + H_2O

See Borate chloride, lead

Lead chloride carbonate

See Carbonate chloride, lead

Lead chloride chlorite

See Chlorite chloride, lead

Lead chloride with fluoride and iodide

See Lead chlorofluoride and Lead chloroiodide

Lead chloride phosphate

See Phosphate chloride, lead

Lead chloride phosphite, PbCl_2 , $\text{Pb P}_2\text{O}_5$ (?)

Ppt (Berzelius)

Does not exist (Rose)

Lead chloride sulphate

See Sulphate chloride, lead

Lead chloride sulphide, PbCl , 3PbS

See Lead chlorosulphide

Lead chlorofluoride, PbClF

Sl sol in H_2O without decomp Easily sol in HNO_3 +Aq (Berzelius)

Solubility in H_2O

100 g H_2O dissolve 0 0211 g PbClF at 0°, 0 0370 g at 25°, 0 1081 g at 100° (Starck, Z anorg Ch 1911, **70** 174)

Solubility in HCl +Aq at 25°

Solution of PbClF in HCl +Aq containing 0 0535 g equiv per l contains 0 0758 g PbClF in 100 cc of solvent

Solution of PbClF in HCl +Aq containing

0.1069 g equiv per l contains 0.1006 g PbClF in 100 cc of solvent (Starck)

Solubility in acetic acid at 25°

Solution of PbClF in $\text{HC}_2\text{H}_3\text{O}_2$ containing 0.0518 g equiv per l contains 0.05129 g PbClF in 100 cc of solvent

Solution of PbClF in $\text{HC}_2\text{H}_3\text{O}_2$ containing 0.1055 g equiv per l contains 0.0561 g PbClF in 100 cc of solvent (Starck)

Solubility in $\text{PbCl}_2 + \text{Aq}$

t°	G equiv per l PbCl_2	G PbClF in 100 cc of solvent
18°	0.0100	0.0020
"	0.0195	0.0016
"	0.0495	0.0002
25°	0.00996	0.0030
"	0.0196	0.0008
"	0.0392	0.0005

(Starck)

Lead chloriodide, $2\text{PbCl}_2, \text{PbI}_2$

Sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$ (Poggiale, J pr 35 329)

$\text{PbCl}_2, \text{PbI}_2$ Sol in hot $\text{HCl} + \text{Aq}$ (Engelhardt)

Sol in H_2O (Thomas, C R 1898, 126 1351)

Lead chloroselenide

Decomp by boiling H_2O and by conc $\text{KOH} + \text{Aq}$ (Fonze-Diacon, C R 1900, 130 1133)

Lead chlorosulphide, $\text{PbCl}_2, 3\text{PbS}$

Partially decomp by hot H_2O Not attacked by dil, but decomp by conc $\text{HCl} + \text{Aq}$ (Hunsfeld, J pr 7 27)

PbS, PbCl Decomp by H_2O , acids, or alkalies (Purmentier, C R 114 298)

$\text{ClPbS}_2, \text{PbS}_2, \text{PbS}, \text{PbCl}$ Ppt (Hofmann, B 1904, 37 250)

Lead fluoride, PbF_2

Very sl sol in H_2O , and not more in $\text{HIF} + \text{Aq}$ (Berzelius, Pogg 1 31)

5.5 millimols are sol in 1000 ccm H_2O (Jacquet, Z anorg 1901, 27 38)

1 l H_2O dissolves 640 mg at 18° (Kohl rausch, Z phys Ch 1901, 50 356)

641 mg in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

More sol in HNO_3 , or $\text{HCl} + \text{Aq}$ Sl sol in $\text{Kl} + \text{Aq}$ (Herty, Am Ch J 14 107)

Sl sol in dil $\text{Hl} + \text{Aq}$, insol in strong $\text{HF} + \text{Aq}$

0.0130 g atoms Pb are sol in 1000 cc Hl (Jaeger, Z anorg 1901, 27 37)

Insol in liquid Hl (Franklin, Z anorg 1905, 46 2)

Insol in liquid NH_3 (Gore, Am J Ch 1893, 20 828)

Insol in ethylacetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329)

Lead potassium fluoride, $3\text{KF}, \text{HF}, \text{PbF}_4$

Decomp H_2O , stable in dry air (Brauner, Z anorg 1894, 7 7)

Lead silicon fluoride

See Fluosilicate, lead

Lead tantalum fluoride

See Fluotantalate, lead

Lead titanium fluoride

See Fluotitanate, lead

Lead fluoride sulphate

See Sulphate fluoride, lead

Lead hydroxide, PbO_2H_2

Not appreciably sol in H_2O (Jaeger, Z anorg 1901, 27 38)

1 l H_2O dissolves 0.155 g PbO_2H_2 at 20° and 100° (Sehnal, C R 1909, 148 1396)

Solubility in $\text{NaOH} + \text{Aq}$

G Na in 20 ccm	G Pb in 20 ccm
0.2024	0.1012
0.3196	0.1736
0.5866	0.3532
0.9476	0.4071
1.7802	0.5170

(Rubenbauer, Z anorg 1902, 30 336)

Solubility of PbO_2H_2 in $\text{NaOH} + \text{Aq}$ at 25°

G mol per l		Solid Phase
Na	Pb	
0.274	0.0181	PbO_2H_2
0.431	0.287	"
0.476	0.319	"
0.745	0.489	"
1.132	0.711	"
1.519	0.101	"

(Wood, Chem Soc 1910, 97 884)

Insol in acetone (Naumann, B 1904, 37 4329)

$2\text{PbO}, \text{PbO}_2\text{H}_2 = 3\text{PbO}, \text{H}_2\text{O}$ Sol in 10,000 to 12,000 pts H_2O (Yorke) Sol in 7000 pts H_2O (v Bonsdorff, Pogg 41 307)

0.45 millimol Pb are sol in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)

Sol in acids Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in NaOH , or $\text{KOH} + \text{Aq}$ Sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$, and repptd by $\text{NH}_4\text{OH} + \text{Aq}$

Solubility in $\text{KOH} + \text{Aq}$, according to Ditte (C R 94 130) When $\text{KOH} + \text{Aq}$ is gradu-

ally added to lead hydroxide suspended in H_2O , the lead hydroxide is at first dissolved proportional to the amount of KOH, until the strength reaches 200 g KOH to 1 litre H_2O . The solubility then diminishes and increases again until 400 g KOH are dissolved in 1 litre H_2O . The amorphous lead hydroxide is then converted into crystalline $2PbO(PbO_2H_2)$. By further addition of KOH the solubility is suddenly decreased, and then increases again (Ditte)

Sol in triethyl toluenyl ammonium hydroxide + Aq

Sol in sorbine + Aq (Pelouze)

Sol in acetates + Aq (Mercer)

Sol in Ca, Ba, Sr, K, or Na succinate + Aq

Not pptd in presence of Na citrate + Aq (Spiller)

See also under Lead, and Lead oxide

Lead perhydroxide, PbO_2, H_2O

See Lead peroxide

Lead imide, $PbNH$

Decomp by H_2O and dilute acids (Franklin, Z anorg 1905, 46 27)

Lead iodide, PbI_2

Sol in 187 pts boiling H_2O (Berthelot)

Sol in 1235 pts H_2O at ord temp, and 194 pts at 100° (Denot, J pr 1 425)

Sol in 2400 pts H_2O at 18.75° (Abl)

Sat PbI_2 + Aq at 20° contains 0.0017 pt, at 27° , 0.002 pt, at 100° , 0.0039 pt PbI_2 (Lassaigne, J chim med 7 364)

11 H_2O dissolves 0.6 g PbI_2 at 10° (Ditte, C R 92 718)

1.1 H_2O dissolves 1.58 millimols PbI_2 at 25.2° (Von Ende, Z anorg 1901, 26 159)

0.47×10^{-1} gram are dissolved in 1 litre of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

Solubility in 100 g H_2O at t°

t°	G PbI
0	0.0442
15	0.0613
25	0.0764
35	0.1042
45	0.1453
55	0.1755
65	0.2183
80	0.3023
95	0.3960
* 100	0.4360

* By extrapolation

(Lichty, J Am Chem Soc 1903, 25 474)

0.0013 g mol PbI_2 are dissolved in 1.1 H_2O at 20° (Fedotieff, Z anorg 1911, 73 178)

Not more sol in $HC_2H_3O_2$ + Aq than in H_2O , contrary to Henry (Denot, l c)

Pptd from aqueous solution by little HI + Aq, but redissolved by the addition of more (Ditte, C R 92 718)

Insol in cold, sol in hot HCl + Aq with decomp

Solubility of PbI_2 in HNO_3 + Aq at 25.2°

S = Solubility in millimols per litre

HNO_3 normal	S
0.001	38.87
0.01	39.06
0.051	39.45
0.04 KNO_3 +	
0.01 HNO_3	39.45

(von Ende, Z anorg 1901, 26 162)

Sol in KOH + Aq

Sol in conc KI, NaI, BaI_2 , SrI_2 , CaI_2 , and MgI_2 + Aq, from which it is pptd by H_2O (Berthelot)

Very sol in KI + Aq, 2 mols PbI_2 being dissolved for 1 mol KI (Boullay)

Sol in NH_4I + Aq. Easily sol in $Na_2S_2O_3$ + Aq (Werner, C N 53 51)

Not pptd in presence of Na citrate (Spiller)

Solubility in sat I_2 + Aq at $20^\circ = 0.00216$ g mol per l. Solid phase $PbI_2 + I_2$ (Fedotieff Z anorg 1911, 73 178)

Very easily sol in liquid NH_3 (Franklin Am Ch J 1898, 20 828)

Sl sol in alcohol (Henry) Decomp by boiling ether (Vogel)

100 g formic acid dissolve 0.25 g at 19.5° (Aschan, Ch Ztg 1913, 37 1117)

Insol in CS_2 (Arcetowski, Z anorg 1894 6 257)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904 37 4329)

0.02 pts are sol in 100 pts acetone at 59°

0.02 pts are sol in 100 pts amyl alcohol at 133.5°

0.50 pts are sol in 100 pts aniline at 13°

1.10 pts are sol in 100 pts aniline at 154° (Laszczyński, B 1894, 27 2287)

Solubility of PbI_2 in pyridine at t°

t°	G PbI_2 per 100 g pyridine	Solid phase
-37	0 166	PbI_2, C_5H_5N
-20	0 175	"
-9	0 186	"
0	0 200	"
+3	0 215	"
6	0 225	"
15	0 208	$PbI_2, C_5H_5N + PbI_2, 2C_5H_5N$
35	0 188	$PbI_2, 2C_5H_5N$
57	0 190	"
77	0 228	"
92	0 290	"
98	0 340	"
105	0 370	"
108	0 410	"
112	0 445	"

(Heise, J phys Ch 1912, 16, 273)

Lead hydrogen iodide, $PbH_2I_4 = PbI_2, 2HI$ Cold H_2O dissolves out HI Sol in hot H_2O , from which crystallizes PbI_2 (Guyot, J chim med 12 247) $+10H_2O$ Decomp by H_2O (Berthelot, C R 91 1024)**Lead lithium iodide, $PbI, LiI + 5H_2O$** Loses 1 mol H_2O at 95° and loses another mol H_2O at 100° (Bogorodski, C C 1894, II 515) $PbI_2, 2LiI + 6H_2O$ Sl sol in H_2O (Mosnier, C R 1895, 120 446)**Lead magnesium iodide, $PbI_2, 2MgI_2$** Decomp by H_2O and by alcohol (Mosnier, A ch 1897, (7) 12 402) $+16H_2O$ Very hygroscopic Decomp immediately by H_2O (Otto and Drewes, Arch Pharm 229 180)**Lead nickel iodide, $PbNi_2I_6 + 3H_2O$** Decomp by H_2O (Mosnier, A ch 1897, (7) 12 411)**Lead potassium iodide (Potassium iodoplumbite), PbI_2, KI** Permanent Completely decomp by H_2O Unacted upon by cold, but completely decomp by hot alcohol (Boullay, A ch (2) 34 366) $+2H_2O$ The only salt that could be obtained by Remsen and Herty (Am Ch J 14 110) $PbI, 2KI$ Sl sol in boiling chloroform, easily sol in strong $KI + Aq$, insol in alcohol (Brooks, C N 1898, 77 191) $+2H_2O$ Decomp by H_2O (Berthelot, A ch (5) 29 289)

Does not exist (R and H)

 $+4H_2O$ (Ditte, C R 92 134) Does not exist (R and H) $PbI_2, 4KI$ Decomp by H_2O , insol in alcohol (Boullay) Does not exist (R and H) $3PbI_2, 4KI + 6H_2O$ (Berthelot, l c) Does not exist (R and H)**Lead potassium periodide, $K_3Pb_2I_8 + 4H_2O$** Decomp by H_2O or alcohol (Wells, Z anorg 4 346)**Lead rubidium iodide, $PbI_2, RbI + 2H_2O$**

(Wells, Sil Am J 146 34)

Lead silver iodide, $PbI, 2AgI$

(Ruff and Geisel, B 1905, 38 2663)

Lead silver iodide ammonia, $PbI_2, 2AgI, 5NH_3$

(Ruff and Geisel, B 1905, 38 2663)

Lead sodium iodide, PbI_2, NaI Decomp by H_2O (Poggiale, C R 20 1180) $+xH_2O$ (Remsen and Herty, Am Ch J 14 124) $PbI_2, 2NaI + 6H_2O$ Sl sol in H_2O (Moissner, C R 1895, 120 445)**Lead iodide ammonia, $PbI_2, 2NH_3$** Decomp by H_2O (Rammelsberg, Pogg 48 166)**Lead iodide carbonate**

See Carbonate iodide, lead

Lead iodosulphide, $PbS, 4PbI_2$ Decomp by light, heat, acids and alkalies (Lenher, J Am Chem Soc 1895, 17 512) Sol in conc HI , insol in dil $HI + Aq$ (Lenher, J Am Chem Soc 1901, 23 681) $IPbS, PbS_2PbI$ Ppt (Hofmann, B 1904, 37 251)**Lead suboxide, Pb_2O** Decomp by H_2O into PbO_2, H_2 Decomp by dil $H_2SO_4, HCl, HNO_3, HC_2H_3O_2 + Aq$, or alkalies, into PbO , which dissolves, and Pb , which dissolves or not, according to the reagent Sol in dil $Pb(NO_3) + Aq$ **Lead monoxide (Litharge), PbO** Sol in 7000 pts H_2O (Horsford)Pure PbO is insol in H_2O (Brandecke, Report 53 155, Siebold, Repert, 53 174, Herbergen, Repert 55 55) Sl sol in H_2O (York, Phil Mag (3) 5 82)0.31 millmoles Pb are dissolved in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)1.71 $\times 10^{-2}$ g are dissolved in 1 litre of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

Easily sol in acids

Sol in KOH, or NaOH + Aq, also in $\text{CaO} \cdot \text{H} + \text{Aq}$

Sol in boiling $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ with pptn of Aq

Sol in CaCl_2 , and $\text{SrCl}_2 + \text{Aq}$ (André, C R 104 359)

Sol in $\text{MgCl}_2 + \text{Aq}$ (Voigt, Ch Ztg 13 695)

Sol in boiling $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ with pptn of CaO

Partially sol in $\text{Cd}(\text{NO}_3)_2$, and $\text{Mn}(\text{NO}_3)_2 + \text{Aq}$ with pptn of CdO and MnO respectively

Not acted upon by Mg, Ag, Co, Ni, or Ce nitrates + Aq (Persoz)

Very sol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (Rochleder)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in acetone (Eidmann, C C 1899, II, 1014)

When finely pulverised, sol in cane sugar + Aq, but less than Pb_3O_4 (Pescher)

Sol in glycerine. Readily sol in glucose + Aq (Persoz)

Sol in volatile oils (Schweitzer)

Yellow modification

Solubility in H_2O at 22°

	Solubility in g equiv per litre
1 Yellow PbO , obtained by boiling lead hydroxide with 10% NaOH	1.03×10^{-4}
2 Yellow PbO , obtained by heating 1 at 630°	1.05×10^{-4}
3 Yellow PbO , obtained by heating at 740° red PbO , formed by boiling lead hydroxide with conc NaOH	1.00×10^{-4}
4 Yellow PbO obtained by heating pure, commercial, yellow-brown PbO at 620°	1.09×10^{-4}

(Ruef, Z. anorg. 1906, 50 273)

Red modification Obtained by boiling lead hydroxide with conc NaOH + Aq

Solubility in H_2O at 22° = 0.06×10^{-4} g equiv per l (Ruef, Z. anorg. 1906, 50 273)

Yellow brown modification Solubility in H_2O at 22° 1.10×10^{-4} g equiv per litre (Ruef, Z. anorg. 1906, 50 273)

See also Lead

Min. Material

Lead oxide (Red lead), Pb_3O_4

Insol in H_2O

Converted by acids into PbO and salts of monoxide

Sol in a large amt of glacial acetic acid (Berzelius). Insol in acetic acid (Schonbein, J. pr. 74 325)

Solution in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ may decompose or not according to concentration of acid. When treated with an excess of $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ of 8° B, Pb_3O_4 is quickly dissolved, but the solution soon deposits PbO_2 , this decomposition is facilitated by dilution. But if Pb_3O_4 is treated with a large excess of glacial $\text{HC}_2\text{H}_3\text{O}_2$, it dissolves, and the solution is permanent if atmospheric air is excluded, and temp does not rise above 40° (Jacquelin, J. pr. 53 152)

Insol in acetone (Eidmann, C C 1899, II, 1014, Naumann, B 1904, 37 4329)

Easily sol in cane sugar + Aq (Pescher) Min. *Minimum*

Lead sesquioxide, Pb_2O_3

Insol in H_2O or in KOH + Aq

Decomp by strong acids into PbO_2 and corresponding salt of monoxide

Lead peroxide, PbO_2

Insol in H_2O . Sol in acids, also in conc alkali hydroxides + Aq. The solutions in acids are very unstable, except when concentrated and kept at a low temperature.

Decomp by cold HCl, HCN, HBr, and HI + Aq. Not attacked by other acids when cold, but decomp thereby when hot. Insol in moderately conc HNO_3 , H_2SO_4 , or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$.

There are two forms of PbO , the amorphous and the crystalline.

1 l of very conc H_2SO_4 dissolves 10 millimols crystalline PbO .

Solubility of amorphous PbO in $\text{H}_2\text{SO}_4 + \text{Ac}$ at 22°

99.5 millimols PbO are dissolved in 1 l of acid containing 1720 g H_2SO_4 .

4 millimols PbO are dissolved in 1 l of acid containing 1097 g H_2SO_4 .

x = mols H_2SO_4 per mole of H_2O

c = millimols PbO dissolved in 1 litre

x	c	x	c
0.32	0.82	0.20	8×10^{-4}
0.30	0.4	0.15	5×10^{-4}
0.25	7.10	0.10	1×10^{-4}

(Dolezale and Fenech, Z. anorg. 1906, 51 25, 5)

Decomp by $\text{NH}_4\text{OH} + \text{Aq}$. Sol in conc KOH, or NaOH + Aq.

Sol with decomp in $\text{H}_2(\text{NO}_3)_2 + \text{Aq}$ (Evoll)

Insol in acetone (Eidmann, C C 1899, II, 1014, Naumann, B 1904, 37 2913)

Min. *Plattnerite*

Lead manganese peroxide, PbO , 4MnO

Ppt (Gibbs and Parkmann, Sill. Am. J. (2) 39 55)

Lead oxybromide, PbBr₂, PbO

Insol in H₂O
 +1, 1½, and 3H₂O (André, C R 96 1502)
 6PbO, PbBr₂+2H₂O Ppt (Stromholm, Z anorg 1904, 38 436)

Lead oxychloride, 2PbCl₂, PbO+2H₂O

(André, C R 96 435)
 PbCl₂, PbO Absolutely insol in hot or cold H₂O (André, A ch (6) 3 108)
 Min *Matlockite*
 +H₂O Sol in hot NaOH+Ag (André) 0.38 millimols Pb are dissolved in 1 litre H₂O at 18° (Pleissner, C C 1907, II 1055)
 PbCl₂, 2PbO Insol in H₂O Sol in dil KOH+Ag (about 110 g in 1 l) (Ditte, C R 94. 1180)
 Min *Mendipite* Easily sol in HNO₃+Ag +2H₂O (André, A ch (6) 3 111)
 PbCl₂, 3PbO Insol in H₂O (Dobereiner)
 +½H₂O Ppt (Stromholm, Z anorg 1904, 38 435)
 +2H₂O 0.10 millimols Pb are dissolved in 1 litre H₂O at 18° (Pleissner, C C 1907, II 1056)
 +3H₂O Ppt (André, C R 104 359)
 +4H₂O Nearly insol in H₂O Sl sol in NaOH+Ag (Vauquelin)
 PbCl₂, 5PbO (Dobereiner)
 6PbO, PbCl+2H₂O Ppt (Stromholm, Z anorg 1904, 38 434)
 PbCl₂, 7PbO *Cassel-yellow*

Lead strontium oxychloride, 2PbO, SrCl+5H₂O

(André, C R 104 359)

Lead oxychloride, iodide, PbCl₂, PbI₂, 4PbO

Min *Schwarzenbergite* Sol in dil HNO₃+Ag

Lead oxyiodide, PbI₂, PbO

Insol in boiling H₂O or KI+Ag (Brandes, A 10 269)
 +½H₂O (Ditte, C R 92 145)
 +H₂O
 PbI₂, 2PbO Insol in H₂O (Denot, J Pharm 20 1)
 +H₂O
 PbI₂, 3PbO+2H₂O Ppt (Kuhn, C C 1847 593)
 PbI₂, 5PbO Insol in H₂O (Denot)
 +7H₂O (Ditte, C R 92 145)
 6PbO, PbI₂+2H₂O Ppt (Stromholm, Z anorg 1904, 38 437)
 9PbO, PbI₂+2H₂O (Stromholm, Z anorg 1904, 38 437)

Lead oxyperiodide, PbO, PbI₂I₃

Decomp by boiling H₂O Sol in dil HCl₂H₂O₂+Ag (Groger, W A B 100, 2b 415)

Lead phosphide, PbP₂

Decomp by H₂O and dil acid. (Bassett, C R 1913, 157 721)

Lead phosphoselenide, Pb₂P₂Se₂

Insol in H₂O or HCl+Ag Sol in HNO₃+Ag
 Insol in cold, slowly decomp by hot alkalis+Ag (Hahn, J pr 2 93 430)
 2PbSe, P₂Se₂ Insol in H₂O HCl or HNO₃+Ag Slowly sol in red fuming HNO₃ (Hahn)
 2PbSe, P₂Se₂ Decomp by fuming HNO₃ (Hahn)

Lead selenide, PbSe

Cold HNO₃+Ag dissolves Pb with separation of Se, which dissolves on warming (Liddle, A 112 212)
 Min *Clausthalite* Sol in HNO₃+Ag with separation of Se, when warmed

Lead mercury selenide, (Pb Hg)

Min *Lehrbachite*

Lead sulphide, PbS

Very sl sol in H₂O
 1 l H₂O dissolves 3.6×10⁻⁴ mols Pb₂ at 18° (Weigel, Z phys Ch 1907 58 294)
 1 l H₂O dissolves 3×10⁻⁴ g Pb₂ at 25° (Hevesy, Z anorg 1913 82 325)
 Insol in dilute acid-alkali and alkali sulphides+Ag Decomp with solution in moderately dil HNO₃+Ag With conc HNO₃ or aqua regia, PbSO₄ is formed Sol in hot conc HCl+Ag
 1 l H₂O sat with H₂S dissolves 1.5×10⁻⁴ g PbS at 25° (Hevesy, Z anorg 1913 82 325)
 Insol in NH₄Cl or NH₄NO₃+Ag Bret
 Somewhat sol in H₂S+Ag when heated therewith in a sealed tube (Schwarzenberg, A ch (3) 32 168)
 Insol in potassium tetrathionate+Ag (Rosenblatt, Z anal 26 15)
 Sol in Na₂SO₃+Ag (Weigel, J anal Ch 5 646)
 Insol in liquid NH₃ (Farrar, A J C P J 1898, 20 528)
 Min *Galena*, *Galerite*

Lead polysulphide, Pb₂S₃

Ppt insol in alkali sol in conc HNO₃ (Bodroff, C P 130 1398)

Lead platinum sulphide

See Sulphoplatinate, lead

Lead sulphide mercuric chloride, 2PbS·4HgCl₂

Decomp by H₂O (Ley, C P 96 1666)

Lead sulphobromide, chloride, or iodide

See Lead bromosulphide, etc

Lead disulphodumide, PbN_2S , NH_3

Ppt

Very stable in the air or in a vacuum

Sol in no solvent without decomp

When rapidly heated it explodes very violently at 140° (Ruff, B 1904, 37 1581)**Lead telluride, $PbTe$** Insol in H_2O Sol in cold $HNO_3 + Aq$ (Rose, Pogg 13 68)Min *Alluite* Easily sol in $HNO_3 + Aq$ **"Leucone"**Wohler (A 127 268) gives this substance the formula $H_{10}Si_2O_{10}$, but it is identical with silicoformic anhydride, $Si_2H_2O_3$, which see**Lime***Quacklime*, CaO See Calcium oxide*Slaked lime*, $CaO \cdot H_2O$ See Calcium hydroxide**Lithium, Li** Decomposes H_2O Easily sol in dil acids Slowly attacked by conc H_2SO_4 , rapidly by conc $HNO_3 + Aq$
Insol in hydrocarbons Sol in liquid NH_3 , but not so easily as KSol in liquid NH_3 (Franklin, Am Ch J 1898, 20 520)

1 gram atom dissolves

at	0°	in	3 93	mol	liquid	NH_3
"	-25°	"	3 93	"	"	"
"	-50°	"	3 93	"	"	"
"	-50°	"	3 93	"	"	"

(Ruff, B 1906, 39 510)

Sol in ethylamine Insol in propylamine and in secondary and tertiary amines (Kraus, J Am Chem Soc 1907, 29 1561)

Lithium amalgam, $LiHg$ $LiHg$ is obtained at all temp up to 100°
Can be cast from Hg without decomp at any temp below 100° (Kerp, Z anorg 1900, 25 68)**Lithium amide, $LiNH$**

(Ruff, B 1911 44 505)

Decomp slowly in the air

Slowly decomp by cold, rapidly by hot H_2O Slowly decomp by HCl

Slowly decomp by cold rapidly by hot abs alcohol (Lutherley Chem Soc 1894, 65 18)

Lithium amide, Li_3NH Hydroscopic decomp by H_2O (Dafert, M 1910, 31 994)**Lithium ammonia, Li, NH_3** Decomp by H_2O at ordinary temp, sol in liquid NH_3 (Moissan, C R 1898, 127 689) $Li, 3NH_3$ (Moissan, C R 1901, 133 716)**Trilithium ammonium, Li_3NH_4** Very hydroscopic, decomp by H_2O (Dafert, M 1910, 31 992)**Lithium antimonide, Li_3Sb** Decomp by H_2O with evolution of H_2
Sol in liquid NH_3 (Lebeau, C R 1902, 134 285)**Lithium arsenide, Li_3As** Decomp by H_2O , decomp violently by fuming HNO_3 (Lebeau, C R 1899, 129 50)**Lithium azoimide, LiN_3**

Deliquescent Stable in aq solution

36 12 pts are sol in 100 pts H_2O at 10° 62 07 " " " " 100 " H_2O " 15.5° 66 41 " " " " 100 " H_2O " 16° 20 26 " " " " 100 " abs alcohol at 16°

Insol in ether (Curtius, J pr 1898, (2) 58 277)

+ H_2O Very hydroscopic, decomp in the air Very sol in H_2O and alcohol (Dennis, Z anorg 1898, 17 18)**Lithium bromide, $LiBr$**

Deliquescent

100 pts H_2O dissolve at

0°	34°	59°	82°	103°
143	196	222	244	270 pts $LiBr$

Sp gr of $LiBr + Aq$ at 19.5°	"	"	"	"
0	10	15	20	25
1 035	1 072	1 113	1 156	1 204

35	40	45	50	55%
1 309	1 368	1 432	1 500	1 580

(Kremers, Pogg 103 65 104 133 Gerlach, Z anal 8 255)

Temp of maximum μ -mol $LiBr$ dissolved density of $LiBr + Aq$ in 1000 g H_2O

1 921°	0 2911
0 551°	0 1383

(de Coppet, C R 1900, 131 178)

Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Solubility in glycol at $11.7^\circ = 37.5\%$ (de Conninck, Belg Acad Bull 1905, 359)

Sol in acetone (Naumann, B 1904, 37 4328, Idmann, C C 1899, II 1014)

Sol in methyl acetate (Naumann, B 1909, 42 3789) ethyl acetate (Naumann, B 1904, 37 3601)

Difficultly sol in ethyl acetate (Nau-
mann, B 1910, 43 314)
+H₂O 100 g H₂O dissolve 209 g LiBr
at 44° (Bogorodski, C C 1894, II 514)
+2H₂O (Bogorodski)
+3H₂O 100 g H₂O dissolve 80 g LiBr
at -30°, and 122 g at -10° (Bogorodski)

Lithium molybdenyl bromide, LiBr, MoOBr₃
+4H₂O

Very hygroscopic (Weinland and Knoll,
Z anorg 1905, 44 111)

Lithium bromide ammonia

LiBr, NH₃ Sol in H₂O with decomp
LiBr, 2NH₃ " " " " "
LiBr, 3NH₃ " " " " "
LiBr, 4NH₃ " " " " "

(Bonnetot, C R 1900, 130 1395)

Lithium carbide, Li₂C₂

Insol in conc acids
Sol in fused oxidizing agents, decomp H₂O
in the cold (Moissan, C R 1896, 122 363)

Lithium subchloride, Li₂Cl

Decomp by H₂O (Guntz, C R 1895,
121 945)

Lithium chloride, LiCl

Very deliquescent Most deliquescent salt
known to Berzelius Very sol in H₂O Sol
in 1 315 pts H₂O at 15° (Gerlach)

100 pts H₂O dissolve at
0° 20° 65° 80° 69° 140° 160°
63 7 80 7 104 2 115 129 139 145 pts LiCl
(Gerlach, Z anal 8 281)

Sp gr of LiCl + Aq at 15° containing
1 5 10 15 20% LiCl,
1 006 1 030 1 058 1 086 1 117
25 30 35 40% LiCl
1 148 1 182 1 219 1 256
(Gerlach, Z anal 8 281)

Sp gr of LiCl + Aq at 18° containing
5 10 20 30 40% LiCl
1 0274 1 0563 1 115 1 181 1 255
(Kohlrausch, W Ann 1879 1)

Sp gr of LiCl + Aq at 25°

Concentration of LiCl + Aq	Sp gr
1-normal	1 0243
1/100 "	1 0129
1/1000 "	1 0062
1/10000 "	1 0030

(Wagner, Z phys Ch 1890, 5 38)

Sp gr of LiCl + Aq

g LiCl in 1000 g of solution	Sp gr
0	1 000000
2 3923	1 001405
6 2360	1 003647
10 1093	1 005921

(Dijken, Z phys Ch 1897, 24 109)

Sp gr of LiCl + Aq at 0°
% LiCl 4 26 12 18 22 2 32 5 41 4 43 2
Sp gr 1 026 1 073 1 133 1 203 1 267 1 282
(Lemoine, C R 1897, 125 603)

Sp gr of LiCl + Aq at 20°

Normality of LiCl + Aq	% LiCl	Sp gr
10 35	35 97	1 2230
7 17	26 40	1 1550
5 57	21 10	1 1215
2 98	11 83	1 0691
1 06	4 37	1 0232

(Forchheimer, Z phys Ch 1900, 34 25)

Sp gr 20° 4° of a normal solution of LiCl =
1 022375 (Haigh, J Am Chem Soc 1912,
34 1151)

Sp gr of dil LiCl + Aq at 20 004°
Conc = g equiv LiCl per l at 20 004°
Sp gr compared with H₂O at 20 004° = 1

Conc	Sp gr
0 0000	1 000 000 0
0 0001	1 000 002 5
0 0002	1 000 005 0
0 0005	1 000 012 6
0 0010	1 000 025 3
0 0020	1 000 050 5
0 0050	1 000 125 5
0 0100	1 000 251 0

(Lamb and Lee J Am Chem Soc 1915, 35
1655)

B-pt of LiCl + Aq

% LiCl	B pt	Sp gr
3 38	101°	16 66
6 54	102	19 55
13 04	105	21 5

(Skinner, Chem Soc 61 341)

Sat $\text{LiCl} + \text{Aq}$ boils at 171° (Kremers)B-pt of $\text{LiCl} + \text{Aq}$ P=pts LiCl to
100 pts H_2O

B pt	P	B pt	P	B pt	P
101°	3 5	124°	48 5	147°	87 5
102	7	125	50	148	90
103	10	126	51 5	149	92 5
104	12 5	127	53	150	95
105	15	128	54 5	151	97 5
106	17 5	129	56	152	100
107	20	130	57 5	153	102 5
108	22	131	59	154	105
109	24	132	60 5	155	107 5
110	26	133	62	156	110 5
111	28	134	63 5	157	113 5
112	30	135	65	158	116 5
113	32	136	66 5	158 5	117 96
114	33 5	137	68	159	119 5
115	35	138	69 75	160	122 5
116	36 5	139	71 5	161	125 5
117	38	140	73 25	162	128 5
118	39 5	141	75	163	131 5
119	41	142	77	164	135
120	42 5	143	79	165	138 5
121	44	144	81	166	142 5
122	45 5	145	83	167	146 5
123	47	146	85	168	151

(Gerlach, Z anal 26 437)

Cl+Aq at 0°

	10 cc of solution			Sp gr of solution
	HCl	LiCl	HCl	
120	0 0	51 0	0 0	1 255
97 5	22 5	41 4	8 2	1 243
67 0	66 0	28 5	24 1	1 249
58 0	81 0	24 6	29 5	1 251

(Engel, A ch (6) 13 385)

See also $\text{LiCl} + \text{H}_2\text{O}$ Sol in liq uid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sol in absolute alcohol, ether, and alcohol-ether

B-pt of alcoholic solution of LiCl

% LiCl	B pt	% LiCl	B pt
2 4	78 $43^\circ + 0$ 70°	9 93	78 $43^\circ + 5$ 55°
5 39	" +2 15	15 94	" +11 75
8 01	" +4 18		

(Skinner)

Solubility in alcohol+Aq decreases to 40% alcohol+60% H_2O . Curve shows minimum at 30% H_2O to 70% alcohol. The sat pure H_2O and pure alcohol solutions cooled to 0° deposit LiCl , H_2O and LiCl , $4\text{C}_2\text{H}_5\text{O}$ respectively (Pina de Rubies, C A 1914 743, 3006)

Solubility in ethyl alcohol

Temp 1 06° 5 07° 13 0° 25 0° 40 6° 62 6°
% LiCl 14 14 13 14 15 18
(Lemoine, C R 1897, 125 605)

100 g ethyl alcohol dissolve at

0° 5° 10° 15° 17°
14 42 15 04 16 77 18 79 20 31 g LiCl

The solid phase from 0° – 17° is LiCl , $4\text{C}_2\text{H}_5\text{O}$

20° 30° 40° 50° 60°
24 28 25 10 25 38 24 40 23 46 g LiCl

The solid phase from 20° – 60° is LiCl
(Turner and Bissett, Chem Soc 1913, 103 1907)

Solubility in ethyl alcohol+Aq at 25°

100 g of the solution contain

G $\text{C}_2\text{H}_5\text{OH}$	G H_2O	G LiCl
0	55 10	44 90
5 96	51 52	42 52
11 07	48 73	40 20
17 46	43 90	38 64
18 56	43 70	37 74
22 16	41 17	36 67
26 29	39 51	34 70
28 97	37 42	33 61
29 27	36 89	33 84
30 10	36 64	33 26
30 51	35 67	33 82
32 79	34 95	32 26
38 40	31 58	30 02
49 27	24 67	26 06
50 32	24 04	25 64
53 50	20 94	25 56
58 15	18 47	23 38
59 78	17 46	22 76
63 09	14 83	22 08
70 24	8 66	21 10
70 70	8 26	21 04
70 74	7 78	21 48
79 26	0	20 74

The solid phase in the mixtures which are richest in alcohol is LiCl , in the other mixtures the solid phase is $\text{LiCl} + \text{H}_2\text{O}$

(Pina de Rubies, C C 1915, I 521)

Sp gr of LiCl in ethyl alcohol (LiCl , $2\text{C}_2\text{H}_5\text{O}$)

% salt	Sp gr at 14°	Sp gr at 0°
0	0 797	0 809
5 2	0 839	0 851
10 1	0 871	0 881
14 6	0 903	0 903

(Lemoine, C R 1897, 125 605)

Solubility in methyl alcohol at t°

t°	% LiCl in sat solution
1	26
23	27
50	30

(Lemoine, C R 1897, 125 604)

Sp gr of LiCl in methyl alcohol (LiCl, 3CH₄O)

% salt	5.2	14.5	22.1
Sp gr at 21.5°	0.836	0.910	0.974
Sp gr " 0°	0.854	0.926	0.988

(Lemoine, C R 1897, 125 604)

15.86 g are sol in 100 g propyl alcohol (Schlamp, Z phys Ch 1894, 14 276)

Sol in 15 pts fusel oil (Gooch, Am Ch J 9 33)

100 g methyl alcohol dissolve 42.36 g LiCl at 25°

100 g ethyl alcohol dissolve 25.83 g LiCl at 25°

100 g propyl alcohol dissolve 16.22 g LiCl at 25°

100 g isoamyl alcohol dissolve 9.03 g LiCl at 25°

(Turner and Bissett, Chem Soc 1913, 103 1909)

Solubility of fused LiCl in alcohols at 25°

Solvent	% LiCl
Water	45.0
Ethyl alcohol	2.475
Propyl alcohol	3.720
Butyl alcohol	9.56
Amyl alcohol	8.26
Allyl alcohol	4.20
Glycerine	4.14
Phenol (at 53°C)	1.89

(Patten and Mott, J phys Chem 1904, 8 158)

100 pts pyridine dissolve 7.78 pts LiCl at 15°, 14.26 pts LiCl at 100° (Laszczynski, B 1894, 27 2288)

Soluble in anhydrous pyridine, 97% pyridine+Aq, 95% pyridine+Aq, and 93% pyridine+Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3789), ethyl acetate (Naumann, B 1910, 43 314)

Sol in ethyl acetate (Naumann, B 1904, 37 3601)

Solubility in glycol at 15°=11% (de Coninck, Belg Acad Bull 1905, 359)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Sol in ethylamine (Shinn, J phys Chem 1907, 11 538)

Sol in acetone (Eidmann, C C 1899, II 1014)

Solubility of LiCl in acetone

Pts sol in 100 pts acetone	t
4.60	0
4.40	12
4.11	25
3.76	46
3.12	53
2.14	58

(Laszczynski, B 1894, 27 2287)

+H₂O 13.536 millimols are contained in 1 l sat solution at 25° (Herz, Z anorg 1912, 73 274)

Solubility in HCl+Aq at 25°

Millimols HCl in 10 ccm	Millimols LiCl in 10 ccm
6.30	135.36
10.53	134.14
17.64	126.52
	122.58

(Herz, Z anorg 1912, 73 274)

+2H₂O Sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)+3H₂O (Bogorodski, C C 1894, II 514)

Lithium gold chloride

See Chloraurate, lithium

Lithium manganous chloride, LiCl, MnCl₂+3H₂ODecomp by H₂O, stable only in excess of LiCl (Chassevant, A ch (6) 30 10)Lithium mercuric chloride, 2LiCl, HgCl₂Very deliquescent and sol in H₂O (Harth, Z anorg 1897, 14 323)Lithium nickel chloride, LiCl, NiCl₂+3H₂ODeliquescent Sol in H₂O and alcohol (Chassevant)Lithium thallic chloride, 3LiCl, TlCl₃+8H₂OVery deliquescent Sol in H₂O (Pratt, Am J Sci 1895, (3) 49 404)

Lithium stannic chloride

See Chlorostannate, lithium

Lithium uranous chloride, Li₂UCl₆

As K salt (Aloy, Bull Soc 1899, (3) 21 264)

Lithium uranium chloride, UCl₄, 2LiClVery hygroscopic, sol in H₂O with decomp Sol in acetic acid Decomp by alcohol (Aloy, Bull Soc 1899, (3) 21 264)

Lithium zinc chloride, LiCl , $\text{ZnCl}_2 + 3\text{H}_2\text{O}$

Extremely deliquescent (Ephraim, Z anorg 1908, 59 68)

3LiCl , $\text{ZnCl}_2 + 10\text{H}_2\text{O}$ (?) Not obtained in solid state (Ephraim, Z anorg 1908, 59 69)

Lithium chloride ammonia

LiCl , NH_3

LiCl , 2NH_3

LiCl , 3NH_3

LiCl , 4NH_3

Above salts are all decomp by H_2O (Bonnefoi, C R 1898, 127 367-369)

Lithium chloriodide, $\text{LiCl}_4\text{I} + 4\text{H}_2\text{O}$

Deliquescent (Wells and Wheeler, Sil Am J 144 42)

Lithium fluoride, LiF

Very difficultly sol in H_2O (Berzelius, Pogg 1 17)

Two crystalline forms Only very sl sol in H_2O Very sl decomp by H_2O at red heat (Poulenc, Bull Soc 1894, (3) 11 17)

Sp gr of solution sat at $18^\circ = 1.003$ and contains 0.27% LiF (Mylius, B 1897, 30 1718)

Sol in 800 pts H_2O , and the presence of NH_4F and NH_3 decreases solubility to 1 3500 (Carnot, Bull Soc 1889, (3) 1 250)

Two crystalline forms are very sl sol in HCl , easily sol in HNO_3 (Poulenc, Bull (3) 11 17)

Crystalline forms are insol in 95% (Poulenc)

in methyl acetate (Naumann, B 1890, 3790)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Lithium hydrogen fluoride, LiHF_2

Difficultly sol in H_2O , but more easily than LiF (Berzelius)

Lithium silicon fluoride

See Fluosilicate, lithium

Lithium stannic fluoride

See Fluostannate, lithium

Lithium tantalum fluoride

See Fluotantalate, lithium

Lithium uranyl fluoride, UO_2F_2 , 4LiF

(Ditte)

Lithium zirconium fluoride

See Fluozirconate, lithium

Lithium hydride, LiH

Not deliquescent Decomp by H_2O (Guntz, C R 1896, 123 997)

Lithium hydrosulphide, LiSH (?)

Deliquescent Sol in H_2O and alcohol (Berzelius, Pogg 6 439)

Lithium hydroxide, LiOH

Not so deliquescent as NaOH , and apparently not more sol in hot than cold H_2O (Gmelin, Galb 62 399)

Not deliquescent (Arfvedson, A ch 10 82)

The solubility of LiOH in H_2O can be expressed by $y = 6.6750 + 0.00346t + 0.0003t^2$, where y = the percentage of Li_2O in a saturated solution (Dittmar, Jour Soc Chem Ind 7 730)

Solubility of LiOH in H_2O at t°

t°	G per 100 g Solution		G LiOH per 100 g H_2O
	Li_2O	LiOH	
0	6.67	10.64	12.7
10	6.74	10.80	12.7
20	6.86	10.99	12.8
25	6.95	11.14	12.9
30	7.05	11.27	12.9
40	7.29	11.68	13.0
50	7.56	12.12	13.3
60	7.96	12.76	13.8
80	8.87	14.21	15.3
100	10.02	16.05	17.5

(Seidell's Solubilities, 1st Ed 174)

A sat aq solution contains 7.09% LiOH (Schrenemakers, C C 1905, II 1486)

Sp gr of $\text{LiOH} + \text{Aq}$ at 18° containing

1.25 2.5 5 7.5% LiOH
1.0132 1.0276 1.0547 1.0804

(Kohlrausch, W Ann 1879 1)

Solubility in $\text{Li}_3\text{SbS}_4 + \text{Aq}$ at 30°

% LiOH	% Li_3SbS_4	Solid Phase
11.4	0	LiOH , H_2O
9.1	8.3	"
2.3	29.9	"
2.1	48.3	"
2.1	52.1	LiOH , $\text{H}_2\text{O} + \text{Li}_3\text{SbS}_4$, $10\text{H}_2\text{O}$
1.4	51.8	Li_3SbS_4 , $10\text{H}_2\text{O}$
0	51.3	"

(Donk, Chem Weekbl 1908, 5 529, 629, 767)

Sl sol in alcohol, insol in alcohol-ether (Mayer)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Insol in acetone (Naumann, B 1904, **37** 4329, Eidmann, C C 1899, II 1014)

Cryst also with H_2O , and $\frac{1}{2}H_2O$ (Gottg, B 20 2912)

Lithium imide, Li_2NH

Decomp at high temp Insol in toluene, benzene, ether and ethyl acetate Decomp $CHCl_3$ (Ruff, B 1911, **44** 506)

Lithium iodide, LiI

Deliquescent

Solubility in 100 pts H_2O at

0° 19° 40° 59° 75° 80° 99° 120°

151 164 179 200 263 435 476 538 pts LiI

Sp gr of $LiI + Aq$ at 19.5° containing

5 10 15 20 25 30% LiI ,
1 038 1 079 1 124 1 172 1 224 1 280

35 40 45 50 55 60% LiI
1 344 1 414 1 489 1 575 1 670 1 777

(Kremers, Pogg 104 133, 111 60 Gerlach, Z anal 8 295)

Sp gr of $LiI + Aq$ at 18° containing

5 10 15 20 25% LiI
1 0361 1 0756 1 1180 1 1643 1 2138

(Kohlrausch, W Ann 1879 1)

Temp of maximum g-mol LiI dissolved
density of $LiI + Aq$ in 1000 g H_2O

2 516° 0 1795
0 039° 0 4666

(de Coppet, C R 1900, **131** 178)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 828)

100 g methyl alcohol dissolve 343.4 g LiI at 25°

100 g ethyl alcohol dissolve 250.8 g LiI at 25°

100 g propyl alcohol dissolve 47.52 g LiI at 25°

100 g isoamyl alcohol dissolve 112.50 g LiI at 25°

In the case of propyl alcohol the solid phase at 25° is $LiI \cdot 4C_3H_7O$ (Turner and Bissett, Chem Soc 1913, **103** 1909)

Solubility in organic solvents at t°

C = pts by wt of LiI in 100 ccm of the sat solution

L = no of liters which at the saturation temp hold in solution 1 mol LiI

Solvent	t	C	L
Furfural	25°	45.86	0.292
Nitromethane	25°	2.519	5.32
"	0°	1.219	10.98

(Walden, Z phys Ch 1906, **55** 718)

Solubility in glycol at 15.3° = 28% (de Coninck, Belg Acad Bull 1905, 359)

Sol in benzonitrile (Naumann, B 1914, **47** 1369)

Sol in methyl acetate (Naumann, B 1909, **42** 3789)

Difficultly sol in ethyl acetate (Naumann, B 1910, **43** 314)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, **37** 4328)

+ H_2O Mpt below 200° (Bogorodsky, C C 1897, II 175)

+ $2H_2O$ Mpt 86-88° (Bogorodsky)

+ $3H_2O$ Mpt 75° (Bogorodsky)

Sol in absolute alcohol without decomp (Thirsoff, Chem Soc 1894, **66** (2) 234)

The composition of the hydrates formed by LiI at different dilutions is calculated from determinations of the lowering of the fr-pt produced by LiI and of the conductivity and sp gr of $LiI + Aq$ (Jones, Am Ch J 1905, **34** 301)

Lithium mercuric iodide, $2LiI, HgI_2 + 6H_2O$

Very deliquescent Decomp by H_2O Very sol without decomp in alcohols, glycerine, acetone, fuming formic acid, acetic acid, ethyl acetate, ethyl oxalate, etc Less sol in nitrobenzene Insol in benzene and methyl iodide (Duboin, C R 1905, **141** 1017)

+ $8H_2O$ Decomp by H_2O Very sol in alcohols, glycerine, acetone, fuming formic acid, acetic acid, ethyl acetate, etc without decomp Sol in nitrobenzene Insol in benzene and methyl iodide (Duboin, l c)
+ $9H_2O$ Hydrosopic Sol in alcohol and acetone without decomp (Dobroserdoff, C C 1901, I 664)

Lithium nitride, Li_3N

Sol in H_2O with decomp (Ouvrard, C R 114 120)

Very hydropscopic (Dafert, M 1910, **31** 987)

Lithium oxide, Li_2O

Slowly sol in H_2O to form $LiOH$

See Lithium hydroxide

Lithium peroxide, Li_2O_2

(de Forcrand, C R 1900, **130** 1467)

Lithium hydrogen peroxide, $Li_2O_2, H_2O_2 + 3H_2O$

Sol in H_2O Insol in alcohol (de Forcrand, C R 1900, **130** 1466)

Lithium selenide, Li_2Se

Sol in H_2O (Fabre, C R 103 269)

+ $9H_2O$ Sol in H_2O (Fabre)

Lithium silicide, Li_6Si

Decomp by H_2O and by dil acids Decomp by aqueous solutions of alkalis with evolution of H (Moissan, C R 1902, **134** 1083)

Lithium monosulphide, Li_2S

More sol in H_2O or alcohol than LiOH

Luteochromium bromide, $\text{Cr}(\text{NH}_3)_6\text{Br}_3$

Less sol in H_2O than the chloride (Jorgensen, J pr (2) 30 1)

— bromoplatinate, $[\text{Cr}(\text{NH}_3)_6]_2(\text{PtBr}_6)_3 + 4\text{H}_2\text{O}$

Sl sol in H_2O Insol in alcohol (Jorgensen)

— chloride, $\text{Cr}(\text{NH}_3)_6\text{Cl}_3 + \text{H}_2\text{O}$

Efflorescent, and very sol in H_2O (Jorgensen)

— chloroplatinate

(a) $[\text{Cr}(\text{NH}_3)_6]_2(\text{PtCl}_6)_3 + 6\text{H}_2\text{O}$ Nearly completely insol in H_2O (Jorgensen)

(b) $\text{Cr}(\text{NH}_3)_6\text{Cl}(\text{PtCl}_6) + 2\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O into above, insol in alcohol (Jorgensen)

(c) $[\text{Cr}(\text{NH}_3)_6]_2\text{Cl}_4(\text{PtCl}_6) + 2\text{H}_2\text{O}$ Decomp by H_2O into (a) (Jorgensen)

— mercuric chloride, $\text{Cr}(\text{NH}_3)_6\text{Cl}_3, \text{HgCl}_2$

Decomp by H_2O , sl sol in dil $\text{HCl} + \text{Aq}$, insol in alcohol

$\text{Cr}(\text{NH}_3)_6\text{Cl}_3, 3\text{HgCl}_2 + 2\text{H}_2\text{O}$ Decomp by dil $\text{HCl} + \text{Aq}$ into above salt (Jorgensen)

isomcyanide, $\text{Cr}(\text{NH}_3)_6\text{Cr}(\text{CN})_6$

precipitate

— cobaltcyanide, $\text{Cr}(\text{NH}_3)_6\text{Co}(\text{CN})_6$

Nearly insol in H_2O or in conc $\text{HCl} + \text{Aq}$ (Jorgensen)

— ferrocyanide, $\text{Cr}(\text{NH}_3)_6\text{Fe}(\text{CN})_6$

Very sl sol in cold H_2O or dil acids (Jorgensen)

— iodide, $\text{Cr}(\text{NH}_3)_6\text{I}_3$

Sl sol in H_2O (Jorgensen, l c)

— iodosulphate, $\text{Cr}(\text{NH}_3)_6\text{SO}_4\text{I}$

Sol in H_2O , nearly insol in dil $\text{NH}_4\text{OH} + \text{Aq}$ or alcohol (Jorgensen)

— nitrate, $\text{Cr}(\text{NH}_3)_6(\text{NO}_3)_3$

Sol in 35–40 pts H_2O Insol in cold dil $\text{HNO}_3 + \text{Aq}$ or alcohol Can be crystallised out of H_2O containing a little HNO_3 (Jorgensen, J pr (2) 30 1)

— nitrate chloroplatinate,

$\text{Cr}(\text{NH}_3)_6(\text{NO}_3)_2\text{PtCl}_6 + \text{H}_2\text{O}$

Insol in H_2O Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Jorgensen)

— nitratosulphate, $\text{Cr}(\text{NH}_3)_6(\text{NO}_3)\text{SO}_4$

Sol in H_2O , insol in alcohol (Jorgensen)

Luteochromium oxalate, $[\text{Cr}(\text{NH}_3)_6]_2(\text{C}_2\text{O}_4)_3 + 4\text{H}_2\text{O}$

Nearly insol in cold H_2O (Jorgensen)

— orthophosphate, $\text{Cr}(\text{NH}_3)_6\text{PO}_4 + 4\text{H}_2\text{O}$

Sl sol in H_2O , easily sol in dil acids (Jorgensen)

— sodium pyrophosphate,

$\text{Cr}(\text{NH}_3)_6(\text{NaP}_2\text{O}_7) + 11\frac{1}{2}\text{H}_2\text{O}$

Nearly insol in cold H_2O , wholly insol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen)

— sulphate, $[\text{Cr}(\text{NH}_3)_6]_2(\text{SO}_4)_3 + 5\text{H}_2\text{O}$

Quite sol in H_2O , insol in alcohol (Jorgensen)

— sulphate chloroplatinate,

$[\text{Cr}(\text{NH}_3)_6(\text{SO}_4)]_2\text{PtCl}_6$

Nearly insol in H_2O (Jorgensen)

Luteocobalt diamine chromium sulphocyanide

See Diamine chromium luteocobalt sulphocyanide

Luteocobaltic bromide, $\text{Co}(\text{NH}_3)_6\text{Br}_3$

Sol in H_2O Precipitated from saturated H_2O solution by dil $\text{HBr} + \text{Aq}$ (Jorgensen, J pr (2) 35 417)

— brompermanganate,

$\text{Co}(\text{NH}_3)_6\text{Br}_2(\text{MnO}_4)$

Easily sol in H_2O (Klobb, A ch (6) 12 5)

— bromoplatinate, $\text{Co}(\text{NH}_3)_6\text{Br}_3, \text{PtBr}_4 + \text{H}_2\text{O}$

Sl sol in H_2O , can be recrystallised from hot H_2O containing HBr (Jorgensen)

— bromosulphate, $\text{Co}(\text{NH}_3)_6\text{Br}(\text{SO}_4)$

Nearly insol in H_2O Very sl sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen)

— carbonate, $[\text{Co}(\text{NH}_3)_6]_2(\text{CO}_3)_3 + 7\text{H}_2\text{O}$

Efflorescent, easily sol in H_2O

$[\text{Co}(\text{NH}_3)_6]_2(\text{CO}_3)_3, \text{H}_2\text{CO}_3 + 5\text{H}_2\text{O}$ Less sol in H_2O than the neutral salt (Gibbs and Genth)

— chloride, $\text{Co}(\text{NH}_3)_6\text{Cl}_3$

Sol in 17.09 pts H_2O at 10.5° , 16.81 pts at 11.4° , 16.48 pts at 12° , and more easily in hot H_2O (F Rose)

100 pts H_2O dissolve 4.26 pts at 0° , and 12.74 pts at 46.6° (Kurnakoff, J russ Soc 24 629)

Not appreciably sol in conc $\text{HCl} + \text{Aq}$ (Jorgensen)

Insol in alcohol or solutions of the alkali chlorides (Gibbs and Genth)

Insol in $\text{NH}_4\text{OH} + \text{Aq}$

Aqueous solution is pptd by alcohol, mineral acids, or alkali chlorides

Luteocobaltic mercuric chloride, $\text{Co}(\text{NH}_3)_6\text{Cl}_2$, $\text{HgCl}_2 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in hot H_2O (Krok, 1870)

By recrystallizing from hot H_2O containing HCl is converted into—

$\text{Co}(\text{NH}_3)_6\text{Cl}_3$, $3\text{HgCl}_2 + \text{H}_2\text{O}$ Very sl sol in cold H_2O (Jorgensen)

$\text{Co}(\text{NH}_3)_6\text{Cl}_3$, $2\text{HgCl}_2 + \frac{1}{2}\text{H}_2\text{O}$ Sol in hot H_2O , from which it crystallizes on cooling Insol in cold conc $\text{HCl} + \text{Aq}$, and is pptd from H_2O solution by HCl or alcohol (Carstanjen)

Does not exist (Jorgensen)

$+3\text{H}_2\text{O}$ More easily sol in cold H_2O and other solvents than the preceding comp (Carstanjen, Berlin, 1861)

Does not exist (Jorgensen)

— **stannous chloride**, $2\text{Co}(\text{NH}_3)_6\text{Cl}_3$,

$3\text{SnCl}_2 + 10\text{H}_2\text{O}$

$+8\text{H}_2\text{O}$

— **chlaurate**, $\text{Co}(\text{NH}_3)_6\text{Cl}_3$, AuCl_3

Very sl sol in cold, more easily in hot H_2O containing HCl (Gibbs and Genth, Sill Am J (2) 23 330)

— **chloriodate**, $[\text{Co}(\text{NH}_3)_6\text{Cl}_2]_2\text{I}_4\text{O}_{11} + \text{H}_2\text{O}$

— **chloriridite**, $\text{Co}(\text{NH}_3)_6$, IrCl_6

Insol in boiling H_2O or dil $\text{HCl} + \text{Aq}$ (Gibbs)

— **chloriridate**, $2\text{Co}(\text{NH}_3)_6\text{Cl}_3$, 3IrCl_4

Insol in H_2O (Gibbs)

— **chlorochromate**, $\text{Co}(\text{NH}_3)_6\text{CrO}_4\text{Cl} + 3\text{H}_2\text{O}$

Sol in H_2O (Klobb, Bull Soc 1901, (3) 25 1027)

— **chlorofluoride**, $\text{Co}(\text{NH}_3)_6\text{Cl}_2\text{F}$

(Bohm, Z anorg 1905, 43 339)

— **chloropalladite**, $2\text{Co}(\text{NH}_3)_6\text{Cl}_3$, 3PdCl_2

Easily sol in dil $\text{HCl} + \text{Aq}$ (Gibbs, Sill Am J (2) 37 58)

— **chloroperchlorate**, $\text{Co}(\text{NH}_3)_6\text{Cl}(\text{ClO}_4)_2$

(Millosevich, Gazz ch it 1901, 31 (2) 285)

— **chloropermanganate**,

$\text{Co}(\text{NH}_3)_6\text{Cl}_2(\text{MnO}_4)$

Can be recrystallized from H_2O (Klobb, C R 103 384)

— **chloropermanganate ammonium chloride**, $\text{Co}(\text{NH}_3)_6\text{Cl}_2(\text{MnO}_4)$, NH_4Cl

Easily sol in H_2O (Klobb)

Luteocobaltic chloropermanganate potassium chloride, $\text{Co}(\text{NH}_3)_6\text{Cl}_2(\text{MnO}_4)$, KCl

Very easily sol in H_2O , with decomp into constituents, sol in $\text{KCl} + \text{Aq}$ (Klobb)

— **chloropermanganate sodium chloride**, $\text{Co}(\text{NH}_3)_6\text{Cl}_2(\text{MnO}_4)$, NaCl

Very sol in H_2O (Klobb)

— **chloroplatinate**, $2\text{Co}(\text{NH}_3)_6\text{Cl}_3$, $3\text{PtCl}_4 + 6\text{H}_2\text{O}$

Can be recrystallized from much hot H_2O (Gibbs and Genth)

$+21\text{H}_2\text{O}$ (Gibbs and Genth)

$\text{Co}(\text{NH}_3)_6\text{Cl}_3$, $\text{PtCl}_4 + \frac{1}{2}\text{H}_2\text{O}$ Very sl sol in cold, decomp by hot H_2O into—

$2\text{Co}(\text{NH}_3)_6\text{Cl}_3$, $\text{PtCl}_4 + 2\text{H}_2\text{O}$ By recrystallizing from hot H_2O containing HCl this salt is converted into the above salt (Jorgensen)

— **chlororhodite**

Nearly insol in boiling H_2O or dil acids Sol in conc $\text{HCl} + \text{Aq}$ (Gibbs, Sill Am J (2) 37 57)

— **chlororuthenate**, $2\text{Co}(\text{NH}_3)_6\text{Cl}_3$, 3RuCl_4

Sol in dil acids (Gibbs)

— **chloroselenate**, $\text{Co}(\text{NH}_3)_6\text{ClSeO}_4 + 3\text{H}_2\text{O}$

Decomp by H_2O (Klobb, Bull Soc 1901, (3) 25 1029)

— **chlorosulphate**, $\text{Co}(\text{NH}_3)_6\text{Cl}(\text{SO}_4)$

Sol in H_2O

$+3\text{H}_2\text{O}$ Only sl sol in cold H_2O (Klobb, Bull Soc 1901, (3) 25 1025)

— **ammonium chlorosulphate**,

$[\text{Co}(\text{NH}_3)_6]_4\text{Cl}_4(\text{SO}_4)_6$, $3(\text{NH}_4)_2\text{SO}_4 + 6\text{H}_2\text{O}$

Decomp by H_2O (Klobb, Bull Soc 1901, (3) 25 1027)

— **chlorosulphate chloroplatinate**,

$2\text{Co}(\text{NH}_3)_6\text{Cl}(\text{SO}_4)$, PtCl_4

Very sl sol in cold pure H_2O Can be recrystallized out of H_2O containing HCl (Krok)

— **chlorosulphate mercuric chloride**,

$\text{Co}(\text{NH}_3)_6\text{Cl}(\text{SO}_4)$, HgCl_2

Scarcely sol in pure H_2O , but can be crystallized from warm acidified H_2O (Krok)

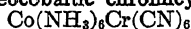
— **chlorosulphate**, $\text{Co}(\text{NH}_3)_6(\text{SO}_3)\text{Cl} + 3\text{H}_2\text{O}$

Sol in H_2O (Vortmann and Magdeburg, B 22 2637)

— **chromate**, $[\text{Co}(\text{NH}_3)_6]_2(\text{CrO}_4)_3 + 5\text{H}_2\text{O}$

Ppt Sol in hot H_2O

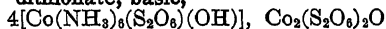
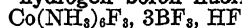
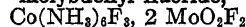
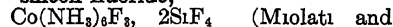
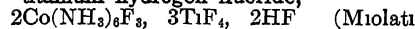
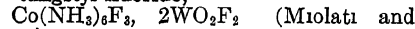
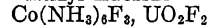
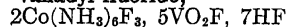
$[\text{Co}(\text{NH}_3)_6]_2(\text{Cr}_2\text{O}_7)_3 + 5\text{H}_2\text{O}$ Moderately sol in hot H_2O

Luteocobaltic chromicyanide,

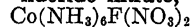
Ppt (Braun)

— **cobalticyanide,** $\text{Co}(\text{NH}_3)_6\text{Co}(\text{CN})_6$

Ppt

— **dithionate, basic,**Sol in H_2O and dil alcohol— **ferricyanide,** $\text{Co}(\text{NH}_3)_6\text{Fe}(\text{CN})_6 + \frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Braun)— **fluoride,** $\text{Co}(\text{NH}_3)_6\text{F}_3$ Sl sol in cold H_2O Nearly insol in acids (Bohm, Z anorg 1905, 43 340)— **hydrogen fluoride,** $\text{Co}(\text{NH}_3)_6\text{H}_3\text{F}_6$ Sl sol in H_2O Decomp by hot H_2O (Miolati and Rossi, Real Ac Linc 1896, (5) 5 II, 185)— **hydrogen boron fluoride,**Cryst from H_2O acidified with HF (Miolati and Rossi)— **molybdenyl fluoride,**Cryst from H_2O containing HF (Miolati and Rossi)— **silicon fluoride,**— **titanium hydrogen fluoride,**— **tungstyl fluoride,**— **uranyl fluoride**Can be cryst from H_2O containing HF (Miolati and Rossi)— **vanadyl fluoride,**

Ppt (Miolati and Rossi)

— **fluoride nitrate,**

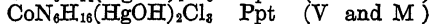
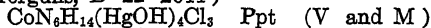
(Bohm, Z anorg 1905, 43 336)

— **hydroxide,** $\text{Co}(\text{NH}_3)_6(\text{OH})_3$

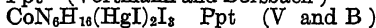
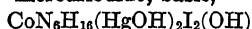
Known only in aqueous solution

Luteocobaltic mercuric hydroxylchloride,

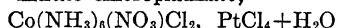
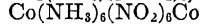
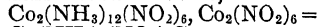
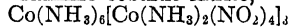
Ppt Easily decomp (Vortmann and Morgulis, B 22 2644)

— **iodide,** $\text{Co}(\text{NH}_3)_6\text{I}_3$ Insol in cold, but moderately sol in hot H_2O According to Jorgensen, contains HNO_3 and has the formula $\text{Co}_2(\text{NH}_3)_{12}\text{I}_4(\text{NO}_3)_2$ — **iodosulphate,** $\text{Co}(\text{NH}_3)_6\text{I}(\text{SO}_4)$ Can be recrystallized from hot H_2O Sl sol in warm, nearly insol in cold H_2O (Krok, B 4 711)— **mercuriodide,** $\text{Co}_2\text{N}_{12}\text{H}_{38}(\text{HgI})_3\text{I}_6$

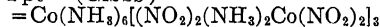
Ppt (Vortmann and Borsbach)

— **mercuriodide, basic,**Insol in H_2O Sl sol in H_2O (Vortmann and Borsbach, B 23 2804)— **nitrate,** $\text{Co}(\text{NH}_3)_6(\text{NO}_3)_3$ Sol in H_2O Can be recrystallized from boiling H_2O Sol in about 60 pts H_2O Insol in conc $\text{HNO}_3 + \text{Aq}$ (Jorgensen, J pr (2), 35 417)

Almost insol in acids (Rogojski, A ch (3), 41 454)

Insol in NH_4OH , HCl , and $\text{HNO}_3 + \text{Aq}$, decomp by $\text{H}_2\text{SO}_4 + \text{Aq}$ (Gibbs and Genth) $\text{Co}(\text{NH}_3)_6(\text{NO}_3)_3$, HNO_3 Decomp by H_2O or dil alcohol (Jorgensen, J pr (2), 44 63)— **nitrate chloroplatinate,**Not decomp by H_2O (Jorgensen)— **nitratosulphate,** $\text{Co}(\text{NH}_3)_6(\text{NO}_3)(\text{SO}_4)$ Sol in H_2O (Jorgensen)— **nitrite cobaltic nitrite,**Nearly insol in H_2O (Jorgensen)Much less sol in H_2O than the corresponding roseo salt (Gibbs)— **diamine cobaltic nitrite,**

Ppt (Gibbs)

Nearly insol in cold, sl sol in boiling H_2O (Jorgensen, Z anorg 5 179)— **oxalate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{C}_2\text{O}_4)_3 + 4\text{H}_2\text{O}$ Insol in hot or cold H_2O Easily sol in $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$

Luteocobaltic oxalate chloraurate,
 $2\text{Co}(\text{NH}_3)_6(\text{C}_2\text{O}_4)\text{Cl}, \text{AuCl}_3 + 4\text{H}_2\text{O}$
 Easily sol in hot H_2O (Gibbs)

— **perchlorate,** $\text{Co}(\text{NH}_3)_6(\text{ClO}_4)_3$
 (Millosevich, Gazz ch it 1901, 31, (2) 285)

— **permanganate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{MnO}_4)_3$
 Nearly insol in H_2O 100 pts H_2O at 0°
 dissolve only 0.072 pt salt Moderately
 sol in hot H_2O (Klobb, A ch, (6) 12 5)

— **persulphate sulphate,**
 $[\text{Co}(\text{NH}_3)_6]_2\text{S}_2\text{O}_8(\text{SO}_4)_2$
 Much less sol in H_2O than the sulphate
 Sol in 641 pts H_2O at 18.8° and in 632
 pts at 20° Not easily sol even in boiling
 H_2O (Jorgensen, Z anorg 1898, 17 459)

— **orthophosphate,** $\text{Co}(\text{NH}_3)_6(\text{PO}_4) + 4\text{H}_2\text{O}$
 Sl sol in cold H_2O Easily sol in dil acids
 (Jorgensen)
 $[\text{Co}(\text{NH}_3)_6]_3(\text{PO}_4)_3(\text{PO}_4\text{H})_3 + 5\frac{1}{2}\text{H}_2\text{O}$ (?)
 Ppt (Braun)
 $[\text{Co}(\text{NH}_3)_6]_2(\text{PO}_4\text{H})_3 + 4\text{H}_2\text{O}$ Ppt Easily
 sol in very dil $\text{HCl} + \text{Aq}$ (Jorgensen)

— **metaphosphate**
 Ppt

— **pyrophosphate,** $[\text{Co}(\text{NH}_3)_6]_2\text{P}_2\text{O}_7 + 6\text{H}_2\text{O}$
 (Gibbs, Am Acad Proc 11 29), or
 $\text{Co}_2(\text{NH}_3)_{12}\text{P}_2\text{O}_7(\text{ONa})_2$ (Vortmann, B 11
 2181), or $\text{Co}(\text{NH}_3)_6(\text{P}_2\text{O}_7\text{Na}) + 11\frac{1}{2}\text{H}_2\text{O}$
 (Jorgensen, J pr (2) 35 438)
 Very nearly insol in H_2O With H_2O at
 80° it is decomp into—
 $[\text{Co}(\text{NH}_3)_6]_4(\text{P}_2\text{O}_7)_3 + 20\text{H}_2\text{O}$ Less easily
 sol than the preceding salt

— **pyrophosphate, acid,** $\text{Co}(\text{NH}_3)_6(\text{P}_2\text{O}_7\text{H})$
 Wholly insol in H_2O Somewhat sol in
 dil $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ Easily sol in $\text{HCl} + \text{Aq}$
 (Jorgensen)

— **sodium pyrophosphate,**
 $\text{Co}(\text{NH}_3)_6(\text{P}_2\text{O}_7\text{Na}) + 11\frac{1}{2}\text{H}_2\text{O}$
 Ppt Not wholly insol in cold H_2O
 Decomp by hot H_2O Less sol in $\text{NH}_4\text{OH} +$
 Aq than in H_2O (Jorgensen)
 $[\text{Co}(\text{NH}_3)_6]_4(\text{P}_2\text{O}_7)_3, 2\text{Co}(\text{NH}_3)_6(\text{NaP}_2\text{O}_7)$
 $+ 39\text{H}_2\text{O}$ As above (Jorgensen)

— **selenate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{SeO}_4)_2 + 5\text{H}_2\text{O}$
 Very sol in H_2O (Klobb, Bull Soc
 1901, (3) 25 1028)

— **hydrogen selenate,**
 $[\text{Co}(\text{NH}_3)_6]\text{H}(\text{SeO}_4)_2 + 2\frac{1}{2}\text{H}_2\text{O}$
 Not decomp by H_2O (Klobb)

Luteocobaltic ammonium selenate,
 $[\text{Co}(\text{NH}_3)_6]_2(\text{SeO}_4)_3, (\text{NH}_4)_2\text{SeO}_4 + 4\text{H}_2\text{O}$

Very sol in H_2O
 $[\text{Co}(\text{NH}_3)_6]_2(\text{SeO}_4)_3, (\text{NH}_4)_2\text{SeO}_4 + 8\text{H}_2\text{O}$
 Very sol in H_2O (Klobb)

— **sulphocyanide,** $\text{Co}(\text{NH}_3)_6(\text{SCN})_3$
 Decomp by hot H_2O (Miolati, Z anorg
 1900, 23 241)

— **mercuric sulphocyanide,**
 $\text{Co}(\text{NH}_3)_6(\text{SCN})_3, 2\text{Hg}(\text{SCN})_2$
 Decomp by H_2O
 Cryst from dil $\text{NH}_4\text{SCN} + \text{Aq}$ (Miolati)

— **platinum sulphocyanide,**
 $[\text{Pt}(\text{SCN})_4]_3[\text{Co}(\text{NH}_3)_6(\text{SCN})_3]_2$
 Decomp by hot H_2O (Miolati)

— **silver sulphocyanide,**
 $\text{Co}(\text{NH}_3)_6(\text{SCN})_3, 2\text{AgSCN}$
 Decomp by hot H_2O (Miolati)

— **sulphate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3 + 5\text{H}_2\text{O}$
 Sl sol in cold, more easily in hot H_2O
 $+ 6\text{H}_2\text{O}$ (Krok, B 4 711)

— **hydrogen sulphate,**
 $\text{Co}(\text{NH}_3)_6\text{H}(\text{SO}_4)_2$
 Decomp by alcohol to sulphate (Jor-
 gensen, Z anorg 1898, 17 458)

$4[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3, 5\text{H}_2\text{SO}_4 + 10\text{H}_2\text{O}$
 Very sol in H_2O with decomp into the normal
 sulphate

When pulverized it seems to dissociate
 slowly in contact with abs alcohol (Klobb,
 Bull Soc 1901, (3) 25 1025)

— **ammonium sulphate,**
 $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3, (\text{NH}_4)_2\text{SO}_4 + 8\text{H}_2\text{O}$
 Sol in H_2O with decomp (Klobb)

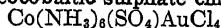
— **cerium sulphate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3,$
 $\text{Ce}_2(\text{SO}_4)_3 + 1\frac{1}{2}\text{H}_2\text{O}$
 Very sl sol in cold, and practically insol
 in boiling H_2O Sol in acids (Gibbs, Am
 Ch J 15 560)

$[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3, 3\text{Ce}(\text{SO}_4)_2 + \text{H}_2\text{O}$ As
 above (Wing, Sill Am J (2) 49 363)

— **lanthanum sulphate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3,$
 $\text{La}_2(\text{SO}_4)_3 + \text{H}_2\text{O}$
 Sl sol in H_2O (Wing)

— **thallic sulphate,** $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_4)_3,$
 $\text{Tl}_2\text{O}(\text{SO}_4)_2 + 5\text{H}_2\text{O}$
 Decomp by cold H_2O (Gibbs)

— **sulphate bromaurate,**
 $\text{Co}(\text{NH}_3)_6(\text{SO}_4)(\text{AuBr}_4)$
 Very sl sol in H_2O with apparent decomp
 Insol in alcohol (Jorgensen)

Luteocobaltic sulphate chloraurate,Sl sol in H_2O (Jorgensen)

— **cobaltic sulphite**, $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_3)_3$,
 $\text{Co}_2(\text{SO}_3)_3 + \text{H}_2\text{O} = \text{dichrocobaltic sulphite}$, $[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_3)_3 + 2\text{H}_2\text{O}$, which see

$[\text{Co}(\text{NH}_3)_6]_2(\text{SO}_3)_3$, $2\text{Co}_2(\text{SO}_3)_3 + 15\text{H}_2\text{O} =$
diamine cobaltic sulphite, $[\text{Co}(\text{NH}_3)_2]_2(\text{SO}_3)_2 + 5\text{H}_2\text{O}$, which see

Luteorhodium bromide, $\text{Rh}(\text{NH}_3)_6\text{Br}_3$

Less sol in H_2O than the chloride (Jorgensen, J pr (2) 44 51)

— **chloride**, $\text{Rh}(\text{NH}_3)_6\text{Cl}_3$

Sol in 7 to 8 pts H_2O at 8° (J)+ H_2O Extremely efflorescent (J)

— **rhodium chloride**, $\text{Rh}(\text{NH}_3)_6\text{Cl}_3$, RhCl_3

Sol in H_2O (Jorgensen, Z anorg 5 174)

— **chloroplatinate**, $2\text{Rh}(\text{NH}_3)_6\text{Cl}_3$, $3\text{PtCl}_4 + 6\text{H}_2\text{O}$

Insol in H_2O Sol in warm $\text{HCl} + \text{Aq}$ (J)
 $\text{Rh}(\text{NH}_3)_6\text{Cl}_3$, $\text{PtCl}_4 + \frac{1}{2}\text{H}_2\text{O}$ Decomp
 by H_2O into chloride and above salt (J)

— **nitrate**, $\text{Rh}(\text{NH}_3)_6(\text{NO}_3)_3$

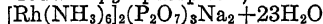
Sol in 48 to 49 pts H_2O at ord temp
 $\text{HNO}_3 + \text{Aq}$ diluted with 5 vols H_2O ppts
 the salt completely from aqueous solution
 (Jorgensen, J pr (2) 44 51)

$\text{Rh}(\text{NH}_3)_6(\text{NO}_3)_3$, HNO_3 Decomp by
 H_2O or dil alcohol (Jorgensen, J pr (2),
 44 63)

— **orthophosphate**, $\text{Rh}(\text{NH}_3)_6\text{PO}_4 + 4\text{H}_2\text{O}$

Sl sol in cold H_2O (J)

— **sodium pyrophosphate**,



Nearly wholly insol in H_2O Wholly insol
 in $\text{NH}_4\text{OH} + \text{Aq}$ (J)

— **sulphate**, $[\text{Rh}(\text{NH}_3)_6]_2(\text{SO}_4)_3 + 5\text{H}_2\text{O}$

Sol in 43 pts H_2O at 20° (J)**Magnesium, Mg**

Does not decomp H_2O at ord temp, but
 decomp slowly at 100° H_2O containing
 acids dissolves Mg easily Sol in cold dil
 $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Difficultly sol in cold
 $\text{H}_2\text{SO}_4 + \text{Aq}$ (Bunsen) Cold nitrosulphuric
 acid does not attack (Bunsen) Cold
 $\text{NH}_4\text{OH} + \text{Aq}$, $\text{KOH} + \text{Aq}$, or $\text{NaOH} + \text{Aq}$
 do not attack (Maak, Phipps) Sol in NH_4Cl
 or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Wohler)

Very rapidly sol in $\text{K}_2\text{S}_2\text{O}_8 + \text{Aq}$ and
 $(\text{NH}_4)_2\text{S}_2\text{O}_8 + \text{Aq}$ with violent evolution of
 gas (Levi, Gazz ch it 1908, 38 (1), 583)

Attacked by aqueous solution of KCl ,
 NH_4Cl , NaCl , LiCl , CuCl_2 , CdCl_2 , CoCl_2 ,
 PbCl_2 , HgCl_2 , FeCl_3 , CrCl_3 , PtCl_4 , AuCl_3 ,
 CuSO_4 , ZnSO_4 , FeSO_4 and MnSO_4

Sl attacked by hot 30% $\text{CaCl}_2 + \text{Aq}$, not
 by 30% $\text{MgCl}_2 + \text{Aq}$, $\text{BaCl}_2 + \text{Aq}$ and $\text{SrCl}_2 +$
 Aq (Tommasi, Bull Soc 1899, (3), 21 886)

Not attacked by $\text{NH}_4\text{F} + \text{Aq}$, very slowly
 by solutions of BaCl_2 , CaCl_2 , KCl , $\text{K}_3\text{Fe}(\text{CN})_6$,
 NaNO_3 , $\text{Na}_2\text{S}_2\text{O}_3$ and Na_2HPO_4 Solutions
 of $\text{NaC}_2\text{H}_3\text{O}_2$, $\text{Na}_2\text{B}_4\text{O}_7$, alum and chrome
 alum attack vigorously Solutions of
 $(\text{NH}_4)_2\text{CO}_3$, NH_4Cl , $(\text{NH}_4)_2\text{C}_2\text{O}_4$, $(\text{NH}_4)_2\text{S}$
 and Na_2CO_3 attack even more vigorously
 (Mouraur, C R 1900, 130 140)

Insol in liquid NH_3 (Gore, Am Ch J
 1898, 20 828)

Insol in liquid HF (Franklin, Z anorg
 1905, 46 2)

Somewhat sol in liquid NH_3 , if a clean
 metallic surface is in contact with the pure
 solvent (Kraus, J Am Chem Soc, 1907,
 29 1561)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0104 g
 Mg in 6 days (Gates, J phys Chem 1911,
 15 143)

Magnesium arsenide, Mg_3As_2

Decomp on air (Parkinson, Chem Soc
 5 127)

Magnesium azonide, $\text{Mg}(\text{N}_3)_2$

Decomp by hot H_2O (Curtius, J pr
 1898, (2) 58 292)

Magnesium boride, Mg_3B_2

Sol in $\text{HCl} + \text{Aq}$ (Winkler, B 23 774)

Magnesium bromide, MgBr_2

Deliquescent Very sol in H_2O with evolu-
 tion of heat

Sat $\text{MgBr}_2 + \text{Aq}$ contains at

— 18°	+ 17°	48°	62°	97°
52	58	60	9	62
5 8% MgBr_2				

(Etard, A ch 1894, (7), 2 541)

See also $\text{MgBr}_2 + 6\text{H}_2\text{O}$

Sp gr of $\text{MgBr}_2 + \text{Aq}$ at 19.5° containing

5	10	15	20	25 % MgBr_2 ,
1.043	1.087	1.137	1.191	1.247

30	35	40	45	50 % MgBr_2
1.31	1.377	1.451	1.535	1.625

(Kremers, Pogg 108 118, calculated by
 Gerlach, Z anal 8 285)

$\text{MgBr}_2 + \text{Aq}$ is sl decomp by evaporation

Solubility of MgBr_2 in alcohols

MgBr_2 forms with methyl alcohol a complex, $\text{MgBr}_2 \cdot 6\text{CH}_3\text{OH}$

Solubility of $\text{MgBr}_2 \cdot 6\text{CH}_3\text{OH}$ in CH_3OH at t°

t°	% by weight of MgBr_2 in $6\text{CH}_3\text{OH}$	t°	% by weight of MgBr_2 in $6\text{CH}_3\text{OH}$
0	42.6	130	63.6
20	44.6	140	66.8
40	46.7	150	70.2
60	48.9	160	74.0
80	51.4	170	78.5
100	55.5	180	84.5
110	58.0	185	88.0
120	60.7	190 mpt	100

(Menschutkin, Z anorg 1907, 52 11)

MgBr_2 forms with ethyl alcohol a complex, $\text{MgBr}_2 \cdot 6\text{C}_2\text{H}_5\text{OH}$

Solubility of $\text{MgBr}_2 \cdot 6\text{C}_2\text{H}_5\text{OH}$ in $\text{C}_2\text{H}_5\text{OH}$ at t°

t°	% by weight of MgBr_2 in $6\text{C}_2\text{H}_5\text{OH}$	t°	% by weight of MgBr_2 in $6\text{C}_2\text{H}_5\text{OH}$
0	17.2	80	73.8
10	24.9	85	76.2
20	32.7	90	78.7
30	40.3	95	82.3
40	47.8	100	86.7
50	55.1	103	90.0
60	62.2	106	94.4
70	68.8	108.5 mpt	100
75	71.4		

(Menschutkin)

MgBr_2 forms with propyl alcohol a complex, $\text{MgBr}_2 \cdot 6\text{C}_3\text{H}_7\text{OH}$

Solubility of $\text{MgBr}_2 \cdot 6\text{C}_3\text{H}_7\text{OH}$ in $\text{C}_3\text{H}_7\text{OH}$ at t°

t°	% by weight of MgBr_2 in $6\text{C}_3\text{H}_7\text{OH}$	t°	% by weight of MgBr_2 in $6\text{C}_3\text{H}_7\text{OH}$
0	77.9	43	93.0
10	81.5	46	94.3
20	85.1	48	95.8
30	89.5	50	97.8
40	92.0	52 mpt	100

(Menschutkin)

MgBr_2 forms with isobutylalcohol a complex, $\text{MgBr}_2 \cdot 6(\text{iso})\text{C}_4\text{H}_9\text{OH}$

Solubility of $\text{MgBr}_2 \cdot 6(\text{iso})\text{C}_4\text{H}_9\text{OH}$ in $\text{C}_4\text{H}_9\text{OH}$ at t°

t°	% by weight of MgBr_2 in $6(\text{iso})\text{C}_4\text{H}_9\text{OH}$	t°	% by weight of MgBr_2 in $6(\text{iso})\text{C}_4\text{H}_9\text{OH}$
0	55.8	60	82.4
10	60.5	65	84.2
20	65.2	71	88.0
30	69.8	75	92.0
40	74.3	77	94.6
50	78.5	80 mpt	100

(Menschutkin)

MgBr_2 forms with isoamylalcohol a complex, $\text{MgBr}_2 \cdot 6(\text{iso})\text{C}_5\text{H}_{11}\text{OH}$

Solubility of $\text{MgBr}_2 \cdot 6(\text{iso})\text{C}_5\text{H}_{11}\text{OH}$ in $\text{C}_5\text{H}_{11}\text{OH}$ at t°

t°	% by weight of MgBr_2 in $6(\text{iso})\text{C}_5\text{H}_{11}\text{OH}$	t°	% by weight of MgBr_2 in $6(\text{iso})\text{C}_5\text{H}_{11}\text{OH}$
0	70.2	38	88.7
10	75.6	40	90.0
20	80.2	42	92.0
30	84.5	44	94.2
35	86.7	46 mpt	100

(Menschutkin)

Solubility in ether at t°

t°	% MgBr_2	% $\text{MgBr}_2 \cdot 2\text{C}_4\text{H}_{10}\text{O}$
-8	0.6	1.08
0	0.8	1.44
+10	1.27	2.3
14	1.64	2.95
16	1.93	3.48
18	2.3	4.14
20	2.7	4.86
22 mpt	3.22	5.80

(Menschutkin, Z anorg 1906, 49, 36)

Solubility of $\text{MgBr}_2 \cdot 2\text{C}_4\text{H}_{10}\text{O}$ in ether at t°

"Lower solution" = the melted $\text{MgBr}_2 \cdot 2\text{C}_4\text{H}_{10}\text{O}$ which does not mix with the ether above

t°	Composition of lower solution		Composition of the upper layer	
	% MgBr_2	% $\text{MgBr}_2 \cdot 2\text{C}_4\text{H}_{10}\text{O}$	% MgBr_2	% $\text{MgBr}_2 \cdot 2\text{C}_4\text{H}_{10}\text{O}$
-10	42.0	75.7	1.8	3.2
0	41.0	73.9	2.3	4.1
+10	40.1	72.2	2.8	5.0
20	39.3	70.8	3.3	5.9
30	38.7	69.8	3.8	6.8
40	38.2	68.8	4.3	7.7
50	37.8	68.0	4.7	8.5
60	37.6	67.7	5.1	9.2
70	37.6	67.7	5.4	9.7
80	37.8	68.0	5.6	10.0
90	38.1	68.6	5.7	10.2

(Menschutkin)

Solubility of MgBr_2 in formic acid
 MgBr_2 forms with formic acid a complex,
 $\text{MgBr}_2 \cdot 6\text{HCOOH}$

Solubility of $\text{MgBr}_2 \cdot 6\text{HCOOH}$ in HCOOH
 at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{HCOOH}$
0	49.8
20	57.5
40	65.1
60	73.1
70	78.1
80	86.0
86	95.0
88 mpt	100

(Menschutkin, Z anorg 1907, 54 90)

Solubility of MgBr_2 in acetic acid
 MgBr_2 forms with acetic acid a complex,
 $\text{MgBr}_2 \cdot 6\text{CH}_3\text{COOH}$

Solubility of $\text{MgBr}_2 \cdot 6\text{CH}_3\text{COOH}$ in
 CH_3COOH at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{CH}_3\text{COOH}$
17	0.3
30	1.5
50	4.5
60	7.9
70	16.2
80	38.5
85	49.5
90	57.7
100	71.8
105	80.0
110	89.5
112 mpt	100.0

(Menschutkin)

Solubility of MgBr_2 in acetic anhydride
 MgBr_2 forms with acetic anhydride a complex,
 $\text{MgBr}_2 \cdot 6(\text{CH}_3\text{CO})_2\text{O}$

Solubility of $\text{MgBr}_2 \cdot 6(\text{CH}_3\text{CO})_2\text{O}$ in
 $(\text{CH}_3\text{CO})_2\text{O}$ at t°

t°	% by wt $\text{MgBr}_2 \cdot 6(\text{CH}_3\text{CO})_2\text{O}$
0	26.4
30	30.0
60	37.7
90	44.5
120	57.8
130	69.8
135	85.0
136-137 mpt	100

(Menschutkin, Z anorg 1909, 61 112)

Solubility of MgBr_2 in acetone
 MgBr_2 forms with acetone a complex,
 $\text{MgBr}_2 \cdot 3\text{CH}_3\text{COCH}_3$

Solubility of $\text{MgBr}_2 \cdot 3\text{CH}_3\text{COCH}_3$ in
 CH_3COCH_3 at t°

t°	% by wt $\text{MgBr}_2 \cdot 3\text{CH}_3\text{COCH}_3$
0	0.2
30	0.8
60	1.45
70	2.0
72	3.7
73	5.5
74	14.0
75	50.0
76	71.6
80	83.3
84	89.8
88	95.2
92 mpt	100

(Menschutkin, Z anorg 1907, 53 30)

Solubility of MgBr_2 in acetamide
 MgBr_2 forms with acetamide a complex,
 $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONH}_2$

Solubility of $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONH}_2$ in
 CH_3CONH_2 at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONH}_2$
50	5.5
70	56.0
90	57.8
110	60.5
130	65.0
150	71.5
160	80.0
165	85.5
169 mpt	90.0
	100.0

(Menschutkin, Z anorg 1909, 61 106)

Solubility of MgBr_2 in acetanilide
 MgBr_2 forms with acetanilide a complex,
 $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONHC}_6\text{H}_5$

Solubility of $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONHC}_6\text{H}_5$ in
 $\text{CH}_3\text{CONHC}_6\text{H}_5$ at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{CH}_3\text{CONHC}_6\text{H}_5$
107	5
140	9.0
170	19.3
185	29.6
195	39.0
200	49.0
205	59.5
209 mpt	73.2
	100.0

(Menschutkin, Z anorg 1909, 61 109)

Solubility of MgBr_2 in aniline

MgBr_2 forms with aniline three complexes,
 $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NH}_2$, $\text{MgBr}_2 \cdot 4\text{C}_6\text{H}_5\text{NH}_2$,
 $\text{MgBr}_2 \cdot 2\text{C}_6\text{H}_5\text{NH}_2$

Solubility of these complexes in aniline

Solubility of $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NH}_2$ in $\text{C}_6\text{H}_5\text{NH}_2$

t°	% by weight of $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NH}_2$
10	3 2
30	3 9
50	5 1
70	7 5
90	12 8
100	18 5
103 5	27 5

Solubility of $\text{MgBr}_2 \cdot 4\text{C}_6\text{H}_5\text{NH}_2$ in $\text{C}_6\text{H}_5\text{NH}_2$

t°	% by weight of $\text{MgBr}_2 \cdot 4\text{C}_6\text{H}_5\text{NH}_2$
103	24 0
120	24 3
140	24 9
160	26 0
180	28 3
200	33 5
220	45 0
230	55 0
237	76 3

Solubility of $\text{MgBr}_2 \cdot 2\text{C}_6\text{H}_5\text{NH}_2$ in $\text{C}_6\text{H}_5\text{NH}_2$

t	% by weight of $\text{MgBr}_2 \cdot 2\text{C}_6\text{H}_5\text{NH}_2$
237	76 3
250	77 3
260	78 1
270	79 0

(Menschutkin, Z anorg 1907, 52 159)

Solubility of MgBr_2 in benzaldehyde

MgBr_2 forms with benzaldehyde a complex, $\text{MgBr}_2 \cdot 3\text{C}_6\text{H}_5\text{CHO}$

Solubility of $\text{MgBr}_2 \cdot 3\text{C}_6\text{H}_5\text{CHO}$ in $\text{C}_6\text{H}_5\text{CHO}$ at t°

t°	% by wt $\text{MgBr}_2 \cdot 3\text{C}_6\text{H}_5\text{CHO}$	t	% by wt $\text{MgBr}_2 \cdot 3\text{C}_6\text{H}_5\text{CHO}$
0	0 7	140	17 8
30	1 3	145	37 5
60	1 9	146	65 0
80	2 5	148	84 5
100	3 4	153	93 2
120	6 0	159 mpt	100
130	9 5		

(Menschutkin, Z anorg 1907, 53 26)

Solubility of MgBr_2 in methylal

MgBr_2 forms with methylal a complex,
 $\text{MgBr}_2 \cdot 2\text{CH}_2(\text{OCH}_3)_2$

Solubility of $\text{MgBr}_2 \cdot 2\text{CH}_2(\text{OCH}_3)_2$ in $\text{CH}_2(\text{OCH}_3)_2$ at t°

t°	% by wt $\text{MgBr}_2 \cdot 2\text{CH}_2(\text{OCH}_3)_2$
20	0 3
40	0 45
60	0 6
80	0 75
100	0 9
106	1 1
106	86 2
108	90 8
110	95 4
112 mpt	100

(Menschutkin, Z anorg 1907, 53 32)

Solubility of MgBr_2 in dimethylcarbinol

MgBr_2 forms with dimethylcarbinol a complex, $\text{MgBr}_2 \cdot 4(\text{CH}_3)_2\text{CHOH}$

Solubility of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_2\text{CHOH}$ in $(\text{CH}_3)_2\text{CHOH}$ at t°

t°	% by weight of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_2\text{CHOH}$	t°	% by weight of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_2\text{CHOH}$
0	40 0	110	62 5
20	42 2	120	67 3
40	45 0	130	74 0
60	48 5	136	83 6
80	53 3	138	90 00
100	59 0	139 mpt	100

(Menschutkin)

Solubility of MgBr_2 in trimethylcarbinol

MgBr_2 forms with trimethylcarbinol a complex, $\text{MgBr}_2 \cdot 4(\text{CH}_3)_3\text{COH}$

Solubility of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_3\text{COH}$ in $(\text{CH}_3)_3\text{COH}$ at t°

t	% by weight of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_3\text{COH}$	t°	% by weight of $\text{MgBr}_2 \cdot 4(\text{CH}_3)_3\text{COH}$
24 4	0 06	65	50 5
25	1 0	70	62 5
35	9 5	75	77 0
45	19 1	77 5	85 0
55	32 2	79	91 5
60	40 5	80 mpt	100

(Menschutkin)

Solubility of MgBr_2 in phenylhydrazine

MgBr_2 forms with $\text{C}_6\text{H}_5\text{NHNH}_2$ a complex,
 $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NHNH}_2$

Solubility of $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NHNH}_2$ in $\text{C}_6\text{H}_5\text{NHNH}_2$ at t°

t°	% by wt of $\text{MgBr}_2 \cdot 6\text{C}_6\text{H}_5\text{NHNH}_2$
20	3 0
40	7 0
60	16 4
80	33 0
99	54 8
100	54 8
140	60 8
180	68 4
200	73 4

(Menschutkin, Z anorg 1907, **52** 162)

Solubility of MgBr_2 in urea

MgBr_2 forms with urea a complex, $\text{MgBr}_2 \cdot 6\text{CO}(\text{NH}_2)_2$

Solubility of $\text{MgBr}_2 \cdot 6\text{CO}(\text{NH}_2)_2$ in urea at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{CO}(\text{NH}_2)_2$
108 5	24 2
115	29 8
120	35 0
125	41 6
127	45 5
130	60 0

(Menschutkin, Z anorg 1909, **61** 116)

$\text{MgBr}_2 \cdot 6\text{CO}(\text{NH}_2)_2$ decomposes at 130° giving $\text{MgBr}_2 \cdot 4\text{CO}(\text{NH}_2)_2$

Solubility of $\text{MgBr}_2 \cdot 4\text{CO}(\text{NH}_2)_2$ in urea at t°

t°	% by wt $\text{MgBr}_2 \cdot 4\text{CO}(\text{NH}_2)_2$
130	58 0
145	60 7
160	67 2
165	71 4
170	83 7
171	96 0

(Menschutkin, Z anorg 1909, **61** 116)

Solubility of MgBr_2 in urethane

MgBr_2 forms with urethane a complex, $\text{MgBr}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$

Solubility of $\text{MgBr}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$ in $\text{NH}_2\text{COOC}_2\text{H}_5$ at t°

t°	% by wt $\text{MgBr}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$
35	43 3
50	45 6
70	51 3
80	56 2
85	59 8
90	66 5
*91 5	75 5

* Mpt of $\text{MgBr}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$
(Menschutkin, Z anorg 1909, **61** 113)

$\text{MgBr}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$ decomposes $90.5-91^\circ$ forming $\text{MgBr}_2 \cdot 4\text{NH}_2\text{COOC}_2\text{H}_5$

Solubility of $\text{MgBr}_2 \cdot 4\text{NH}_2\text{COOC}_2\text{H}_5$ in $\text{NH}_2\text{COOC}_2\text{H}_5$ at t°

t	% by wt $\text{MgBr}_2 \cdot 4\text{NH}_2\text{COOC}_2\text{H}_5$
91	69 4
100	73 8
110	80 0
115	84 1
120	90 0
123 mpt	100 0

(Menschutkin)

+ $6\text{H}_2\text{O}$

Solubility of $\text{MgBr}_2 + 6\text{H}_2\text{O}$ in H_2O at t°

t°	% by weight of $\text{MgBr}_2 + 6\text{H}_2\text{O}$	t°	% by weight of $\text{MgBr}_2 + 6\text{H}_2\text{O}$
0	76 0	120	89 0
20	78 1	140	92 0
40	80 2	150	94 9
60	82 3	160	98 0
80	84 4	164 mpt	100
100	86 6		

(Menschutkin, Z anorg 1907, **52** 153)

Sp gr of solution sat at $18^\circ = 1.655$, an contains 50.8% MgBr_2 (Mylus and Funf B 1897, **30** 1718)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 828)

Sol in alcohol Sol in acetone (Naumann, B 1904, **37** 4328, Eidmann, C C 1899, II 1014)

Difficultly sol in methyl acetate (Naumann, B 1909, **42** 3790)

Insol in ethyl acetate (Naumann, B 1910, **43** 314)

+ $10\text{H}_2\text{O}$ Sol in H_2O (Panfiloff, Chem Soc **26** 234)

Magnesium manganous bromide, $\text{MgBr}_2 \cdot 2\text{MnBr}_2 + 12\text{H}_2\text{O}$

Deliquescent (Saunders, Am Ch J **14** 150)

Magnesium mercuric bromide, $\text{MgBr}_2 \cdot \text{HgBr}_2$

Deliquescent

$\text{MgBr}_2 \cdot 2\text{HgBr}_2$ Not deliquescent

Magnesium molybdenyl bromide, $\text{MgBr}_2 \cdot \text{MoOBr}_3 + 7\text{H}_2\text{O}$

(Weinland and Knoll, Z anorg 1905, **44** 112)

Magnesium potassium bromide, $\text{MgBr}_2 \cdot 2\text{KBr} + 6\text{H}_2\text{O}$

Easily sol in H_2O , from which KBr crystallises at 75 to 87° Alcohol dissolves out MgBr_2 (Lowig, Repert **29** 261)

Formula is MgBr_2 , $\text{KBr}+6\text{H}_2\text{O}$ De-
liquescens (Lerch, J pr (2) 28 338)

Magnesium stannic bromide

See Bromostannate, magnesium

Magnesium chloride, MgCl_2

Deliquescent Very sol in H_2O with evolution of heat The solution decomposes on evaporation losing HCl , when less than 6 mols H_2O are present to 1 mol MgCl_2 (Casaseca, C R 37 350)

Anhydrous Sol in 1857 pts H_2O at 15° (Gerlach)

Sol in 1 pt cold H_2O (Foureroy)
Sat MgCl_2+Aq at 12.5° contains 64.8% MgCl_2 (Hassenfratz)
100 pts H_2O at 15.5° dissolve 200 pts MgCl_2 (Ure s Diet)

100 pts H_2O dissolve 52.2 pts MgCl_2 at 0° and sp gr of sat solution = 1.3619 at 15° (Engel, Bull Soc (2) 47 318)

1000 mols H_2O dissolve 108 mols MgCl_2 at 25°C (Löwenherz, Z phys Ch 1894, 13 479)

100 mols MgCl_2+Aq contain at t°
 t° 67.5 68.5 68.7 79.5 79.95
 Mol MgCl_2 11.58 11.92 11.71 12.28 12.39
 t° 116.67 152.6 181.2 186
 Mol MgCl_2 16.2 18.24 23.8 24 1-24.4
 (Vant Hoff and Meyerhoffer, B A B 1897, 73)

Solubility of MgCl_2 in H_2O at t°

t°	% MgCl_2	Solid phase
-10	11.4	Ice
-20	16	"
-30	19.4	"
-33.6	20.6	Ice + $\text{MgCl}_2 \cdot 12\text{H}_2\text{O}$
-20	26.7	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O}$
-16.4	30.5	"
-16.8	31.6	$\text{MgCl}_2 \cdot 12\text{H}_2\text{O} +$
		$\text{MgCl}_2 \cdot 8\text{H}_2\text{O}$
-3.4	34.3	$\text{MgCl}_2 \cdot 8\text{H}_2\text{O} + \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
0	34.6	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$
10	34.9	"
20	35.3	"
22	35.6	"
40	36.5	"
60	37.9	"
80	39.8	"
100	42.2	"
116.7	46.1	$\text{MgCl}_2 \cdot 6\text{H}_2\text{O} + \text{MgCl}_2 \cdot 4\text{H}_2\text{O}$
152.6	49.1	$\text{MgCl}_2 \cdot 4\text{H}_2\text{O}$
181.5	55.8	$\text{MgCl}_2 \cdot 4\text{H}_2\text{O} + \text{MgCl}_2 \cdot 2\text{H}_2\text{O}$
186	56.1	$\text{MgCl}_2 \cdot 2\text{H}_2\text{O}$

(Landolt-Bornstein, Tab 5th Ed 1912 480)

See also $\text{MgCl}_2+6\text{H}_2\text{O}$

Sp gr of MgCl_2+Aq at 15°

% MgCl_2	Sp gr	% MgCl_2	Sp gr	% MgCl_2	Sp gr
1	1.0084	13	1.1130	25	1.2274
2	1.0169	14	1.1220	26	1.2378
3	1.0253	15	1.1311	27	1.2482
4	1.0338	16	1.1404	28	1.2586
5	1.0422	17	1.1498	29	1.2690
6	1.0510	18	1.1592	30	1.2794
7	1.0597	19	1.1686	31	1.2903
8	1.0684	20	1.1780	32	1.3012
9	1.0772	21	1.1879	33	1.3121
10	1.0859	22	1.1977	34	1.3230
11	1.0949	23	1.2076	35	1.3340
12	1.1040	24	1.2175		

(Gerlach, Z anal 8 281)

Sp gr of MgCl_2+Aq at 18°

% MgCl_2	Sp gr	% MgCl_2	Sp gr	% MgCl_2	Sp gr
5	1.0416	20	1.1764	34	1.3210
10	1.0859	30	1.2779		

(Kohlrausch, W Ann 1879 1)

Sp gr of MgCl_2+Aq at 0° S=pts salt in 100 pts of solution, S_1 =mols salt in 100 mols solution

S	S_1	Sp gr
29.2056	7.230	1.2788
20.9293	4.762	1.1927
15.7989	3.423	1.1427
11.3249	2.355	1.1007
6.2008	1.233	1.0545

(Charpy, A ch (6) 29 23)

Sp gr of MgCl_2+Aq at 19.5°

Pts MgCl_2 in 100 pts H_2O	Sp gr	Pts MgCl_2 in 100 pts H_2O	Sp gr
10.7	1.0826	35.3	1.2388
22.0	1.1592	51.5	1.3235

(Kremers, Pogg 104 155)

Sp gr of $\text{MgCl}_2 + \text{Aq}$ at 14°

$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr
0	0 9993	17	1 0682	34	1 1407
1	1 0033	18	1 0724	35	1 1451
2	1 0073	19	1 0765	36	1 1495
3	1 0113	20	1 0807	37	1 1540
4	1 0154	21	1 0849	38	1 1584
5	1 0194	22	1 0891	39	1 1628
6	1 0234	23	1 0933	40	1 1673
7	1 0274	24	1 0976	41	1 1718
8	1 0314	25	1 1018	42	1 1763
9	1 0355	26	1 1061	43	1 1809
10	1 0395	27	1 1103	44	1 1855
11	1 0435	28	1 1146	45	1 1901
12	1 0476	29	1 1189	46	1 1948
13	1 0517	30	1 1232	47	1 1995
14	1 0558	31	1 1275	48	1 2042
15	1 0599	32	1 1319		
16	1 0641	33	1 1363		

(Oudemans, Z anal 7 420)

Sp gr of $\text{MgCl}_2 + \text{Aq}$ at 24°

$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr	$\frac{\% \text{MgCl}_2}{\% + 6\text{H}_2\text{O}}$	Sp gr
2	1 0069	30	1 1062	58	1 2167
4	1 0138	32	1 1137	60	1 2252
6	1 0207	34	1 1212	62	1 2338
8	1 0276	36	1 1288	64	1 2425
10	1 0345	38	1 1364	66	1 2513
12	1 0415	40	1 1441	68	1 2602
14	1 0485	42	1 1519	70	1 2692
16	1 0556	44	1 1598	72	1 2783
18	1 0627	46	1 1677	74	1 2875
20	1 0698	48	1 1756	76	1 2968
22	1 0770	50	1 1836	78	1 3063
24	1 0842	52	1 1918	80	1 3159
26	1 0915	54	1 2000		
28	1 0988	56	1 2083		

(Gerlach, Z anal 8 283 Calculated from Schiff)

Sp gr of $\text{MgCl} + \text{Aq}$ at 25°

Concentration of $\text{MnCl}_2 + \text{Aq}$	Sp gr
1-normal	1 1375
$\frac{1}{2}$ - "	1 0188
$\frac{1}{4}$ - "	1 0091
$\frac{1}{8}$ - "	1 0043

(Wagner, Z phys Ch 1890, 5 38)

Sp gr of $\text{MgCl}_2 + \text{Aq}$

$\frac{1}{2} \text{MgCl}_2 \text{ g in 1000 g of solution}$	Sp gr $16^\circ/16^\circ$
0	1 000000
0 4400	1 000372
0 8801	1 000741
1 7780	1 001458
3 4533	1 002888
7 4691	1 006219
14 7187	1 012235
29 6307	1 024647

(Dijken, Z phys Ch 1897, 24 108)

Sp gr of MgCl_2 at 20°

p = per cent strength of solution, d = o
served density, w = volume conc in gram
per cc $\left(\frac{pd}{100} = w\right)$

p	d	w
28 83	1 2569	0 36237
25 59	1 2241	0 31327
20 31	1 1735	0 23842
15 79	1 1324	0 17877
10 185	1 0833	0 11033
8 058	1 0650	0 08583
5 919	1 0473	0 06198
3 913	1 0304	0 04022
3 903	1 0240	0 03210
1 743	1 0126	0 01765

(Barnes, J Phys Chem 1898, 2 546)

Sp gr of $\text{MgCl}_2 + \text{Aq}$ at t°

t°	Concentration of $\text{MgCl}_2 + \text{Aq}$	Sp gr
23	1 pt MgCl_2 in 8 1874 pts H_2O	1 090
24	1 pt " " 102 1 " "	1 006

(Hittorf, Z phys Ch 1902, 39 628)

Sp gr of MgCl at 0°

G MgCl_2 in 100 ccm of solution 6 7158 9 950
Sp gr 1 0591 1 08

G MgCl_2 in 100 ccm of sol 13 8111 20 00
Sp gr 1 1106 1 16

(Bremer, C C 1902, I 293)

Sp gr of $\text{MgCl}_2 + \text{Aq}$ at 20° containing
g mols MgCl_2 per l
M 0 00493 0 007327 0 01 0 0310
Sp gr 1 000344 1 000524 1 000842 1 0027

M 0 05108 0 07171 0 10 0 25
Sp gr 1 004224 1 006036 1 008505 1 02090

M 0 50 0 75 0 9415
Sp gr 1 038496 1 056905 1 069617

(Jones and Pearce, Am Ch J 1907, 38 690)

$\text{MgCl}_2 + \text{Aq}$ containing 10% MgCl_2 boils at 101.6° , containing 20% MgCl_2 boils at 106.2° , containing 30% MgCl_2 boils at 115.6° (Gerlach)

Sat $\text{MgCl}_2 + \text{Aq}$ forms a crust at 122.5° , and contains 52.9 pts MgCl_2 to 100 pts H_2O (Gerlach, Z anal 26 426)

B-pt of $\text{MgCl}_2 + \text{Aq}$ P=pts MgCl_2 to 100 pts H_2O

B-pt	P	B-pt	P	B-pt	P
101°	4 9	111°	34 6	121°	50 8
102	9 2	112	36 6	122	52 2
103	13 2	113	38 4	123	53 6
104	16 7	114	40 2	124	55 0
105	19 9	115	41 8	125	56 4
106	22 5	116	43 4	126	57 7
107	25 0	117	44 9	127	59 0
108	27 5	118	46 4	128	60 3
109	29 9	119	47 9	129	61 6
110	32 3	120	49 4	130	62 9

(Gerlach, Z anal 26 440)

B-pt of $\text{MgCl}_2 + \text{Aq}$ containing % MgCl_2

% MgCl_2	B-pt	% MgCl_2	B-pt
4 6	101°	11 6	103°
8 4	102	14 3	104

(Skinner, Chem Soc 61 341)

Sol in $\text{KCl} + \text{Aq}$ at 50° (Uhhg, C C 1913, II 749)

Sol in 7 pts alcohol at 15° (Bergmann)
5 moderate heat (B)

100 pts alcohol of given sp gr dissolve pts MgCl_2

Sp gr	Pts MgCl_2	Sp gr	Pts MgCl_2
0.900	21 25	0.834	36 25
0.848	23 7.5	0.817	50 00

(Kiiwan)

$\text{MgCl}_2 + 6\text{H}_2\text{O}$ is sol in 5 pts alcohol of 0.90 sp gr and in 2 pts alcohol of 0.817 sp gr

Sol in 0.1828 pt strong alcohol at 82.5° (Wenzel)

B-pt of an alcoholic solution of MgCl_2

% MgCl_2	B-pt
5 56	$78.43^\circ + 0.73^\circ$
8 53	" +1 34
9 62	" +1 77
13 84	" +3 54

(Skinner, Chem Soc 61 341)

Even more sol in acetic ether than CaCl_2 (Cann, C R 102 363)

Sol in boiling amyl alcohol (Riggs, Sill Am J 144 103)

Sol in anhydrous pyridine Sol in 97%, 95% and 93% pyridine + Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

Insol in CS_2 (Aretowski, Z anorg 1894, 6 257)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ $2\text{H}_2\text{O}$ Very deliquescent (Ditte, A ch 1881, (5) 22 560)

+ $4\text{H}_2\text{O}$ (van't Hoff and Meyerhoffer)

+ $6\text{H}_2\text{O}$ Deliquescent Sol in 0.6 pt cold, and 0.273 pt hot H_2O (Casaseca, l c)

Solubility in H_2O at t°

t°	1000 mols H_2O dissolve mols MgCl_2	100 g H_2O dissolves g MgCl_2
3 5	99 6	52 65
25 0	104 5	55 26
50 0	110 6	58 66

(Biltz and Marcus, Z anorg 1911, 71 169)

Solubility in $\text{KCl} + \text{NH}_4\text{Cl} + \text{Aq}$ at 25° has been studied (Biltz and Marcus, Z anorg 1911, 71 178)

When the solid phases are $\text{MgSO}_4 + 6\text{H}_2\text{O}$ and $\text{MgCl}_2 + 6\text{H}_2\text{O}$, 1000 mols H_2O dissolve 104 mols MgCl_2 and 14 mols MgSO_4 at 25° (Lowenherz, Z phys Ch 1894, 13 480)

Solubility of $\text{MgCl}_2 + 6\text{H}_2\text{O}$ in $(\text{NH}_4)\text{MgCl}_2 + 6\text{H}_2\text{O} + \text{Aq}$ at t°

t°	Per 1000 mols H_2O	
	Mols NH_4Cl	Mols MgCl_2
3 5	0 5	99 5
25 0	0 5	103 8
50 0	0 8	111 2

(Biltz and Marcus, Z anorg 1911, 71 170)

Solubility data of $\text{MgCl}_2 + \text{KCl} + \text{MgKCl}_2$ are given by van't Hoff and Meyerhoffer (Z phys Ch 1899, 30 64)

+ $8\text{H}_2\text{O}$ Pptd from an aqueous solution which contains about 10 mols H_2O to 1 mol MgCl_2

+ $12\text{H}_2\text{O}$ Pptd from an aq solution which contains 1 mol MgCl_2 in about 12.06 mols of H_2O (Bogorodsky, C C 1899, I 246)

Magnesium manganous chloride, $\text{MgCl}_2, 2\text{MnCl}_2 + 12\text{H}_2\text{O}$

Deliquescent Very sol in H_2O and alcohol (Saunders, Am Ch J 14 148)

$2\text{MgCl}_2, \text{MnCl}_2 + 12\text{H}_2\text{O}$ Ppt Deliquesces in the air (Gossner, C C 1904, I 707)

Magnesium mercuric chloride, $\text{MgCl}_2, \text{HgCl}_2 + 6\text{H}_2\text{O}$

Very deliquescent More sol than the following salt (v Bonsdorff, Pogg 17 133)

$\text{MgCl}_2, 3\text{HgCl}_2 + 5\text{H}_2\text{O}$ Sol in H_2O with-

out decomp Easily sol in alcohol (v Bonsdorff)

Magnesium phosphoryl chloride, $\text{MgCl}_2, \text{POCl}_3$

Deliquescent Sol in H_2O with evolution of heat and decomposition Very sl sol in warm POCl_3 (Casselmann, A 98 223)

Magnesium potassum chloride, $\text{MgCl}_2, 2\text{KCl}+6\text{H}_2\text{O}$

Deliquescent, forming a solution of MgCl_2 , while KCl remains undissolved 100 pts H_2O dissolve 64.5 pts at 18.75° 20 pts salt dissolved in 80 pts H_2O lower the temp 1.75° (Bischof) Alcohol dissolves out MgCl_2 Decompose into the two salts by solution in H_2O (Marcet)

A sat solution in contact with solid KCl and KCl , MgCl_2 , H_2O at 50° contains 79.5 mol MgCl_2 and 14.9 mol KCl per 1000 mol H_2O A sat solution in contact with solid MgCl_2 , $6\text{H}_2\text{O}$ and KCl , MgCl_2 , H_2O at 50° contains 111.9 mol MgCl_2 and 1.2 mol KCl per 1000 mol H_2O (Uhlh, Chem Soc 1913, 104 (2) 775, C B Miner 1913, 417)

Min *Carnallite*

Magnesium rubidium chloride, $\text{MgCl}_2, \text{RbCl}+6\text{H}_2\text{O}$

Not decomp by a small quantity of H_2O (Fet and Kubiersky, Ch Ztg 16 335)

Magnesium sodium chloride, $\text{MgCl}_2, \text{NaCl}+2\text{H}_2\text{O}$

Sol in H_2O (Poggiale)

Magnesium thallic chloride, $2\text{TlCl}_3, \text{MgCl}_2+6\text{H}_2\text{O}$

Hygroscopic Can be cryst from H_2O (Gewecke, A 1909, 366 224)

Magnesium stannic chloride

See *Chlorostannate, magnesium*

Magnesium vanadium chloride, $\text{MgCl}_2, \text{VCl}_3+5\text{H}_2\text{O}$

Difficultly sol in H_2O and alcohol (Stahler, B 1904, 37 4412)

Magnesium zinc chloride, $\text{MgCl}_2, \text{ZnCl}_2+6\text{H}_2\text{O}$

Deliquescent, sol in H_2O (Warner, C N 27 271)

Magnesium chloride ammonia, $\text{MgCl}_2, 4\text{NH}_3$
Easily decomp (Clark, A 78 369)

Magnesium chloride hydroxylamine, $\text{MgCl}_2, 2\text{NH}_2\text{OH}+2\text{H}_2\text{O}$

100 g of solution in H_2O contain 44.4% at 20° (Antonow, J Russ Phys Chem Soc 1905, 37 478)

Magnesium fluoride, MgF_2

1 l H_2O dissolves 76 mg MgF_2 at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

87 mg are dissolved in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

Scarcely sol in acids (Gay-Lussac and Thénard) Insol in excess of HF When precipitated, is sol in aqueous solution of ammonium and magnesium salts Sol in dil HNO_3+Aq , from which it is precipitated by alcohol

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Min *Sellarsite*

Magnesium potassium fluoride, MgF_2, KF

Decomp by H_2SO_4 (Dubois, C R 1895, 120 679)

$\text{MgF}_2, 2\text{KF}$ Decomp by H_2SO_4 (Dubois)

Magnesium sodium fluoride, MgF_2, NaF

Insol in H_2O (Geuther, J B 1865 173)

Magnesium stannic fluoride

See *Fluostannate, magnesium*

Magnesium titanium fluoride

See *Fluotitanate, magnesium*

Magnesium zirconium fluoride

See *Fluozirconate, magnesium*

Magnesium hydrosulphide, MgS_2H_2

Known only in aqueous solution, which decomposes on warming Solution containing 16% MgS_2H_2 has sp gr 1.118 at 12° (Divers and Shumidzu, Chem Soc 45 699)

Magnesium hydroxide, MgO_2H_2

MgO is sol in 55 368 pts H_2O at ordinary temp and also at 100° (Fresenius A 59 117)

MgO is sol in 5142 pts H_2O at 15.5° (Fyfe) in 5800 pts at 15.8° (Henry J Pharm 13 2) in 7900 pts (Kirwan) in 16 000 pts (Dalton) in 100 000-200 000 pts cold H_2O (Bineau) in 36 000 pts boiling H_2O (Fyfe Ed Phil J 5 305)

Calculated from electrical conductivity of $\text{MgO}_2\text{H}_2+\text{Aq}$, 1 l H_2O dissolves 9 mg MgO_2H_2 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

Calculated from electrical conductivity, 1 l H_2O dissolves 0.076 g MgO_2H_2 at 18° (Dupré and Brutus, Z angew Ch 1903, 16 55)

Presence of CaO_2H_2 or CaSO_4 does not decrease the solubility (Henry) Presence of the salts of the alkali metals, especially ammonium salts, increase the solubility Insol in conc Na_2SO_4 , NaNO_3 , NaCl , or KNO_3+Aq (Karsten) Sol in $\text{NH}_4\text{OH}+\text{Aq}$, but insol in $\text{KOH}+\text{Aq}$ (Odling)

Easily sol in acids Sol in an aqueous solution of sugar Boiling alcohol dissolves traces

Solubility of MgO_2H_2 in $\text{NH}_4\text{Cl}+\text{Aq}$ at 29°

Conc of $\text{NH}_4\text{Cl}+\text{Aq}$ (Normal)	Acid required for liberating NH_3 in 25 cc (Normal)	Normality of		G per l	
		MgO_2H_2	NH_4Cl	MgO_2H_2	NH_4Cl
0.7	0.09835	0.156	0.388	4.55	20.86
0.466	0.1108	0.108	0.250	3.15	13.39
0.35	0.09835	0.089	0.172	2.60	9.21
0.23	0.1108	0.0638	0.106	1.88	5.67
0.17	0.1108	0.049	0.0771	1.43	4.13

(Herz and Muhs, Z anorg 1909, **38** 140)Solubility of MgO_2H_2 in $\text{NH}_4\text{NO}_3+\text{Aq}$ at 29°

Conc of $\text{NH}_4\text{NO}_3+\text{Aq}$ (Normal)	Acid required for liberating NH_3 in 25 cc (Normal)	Normality of		G per l	
		MgO_2H_2	NH_4NO_3	MgO_2H_2	NH_4NO_3
0.35	0.1108	0.0833	0.1834	2.43	14.69
0.175	0.1108	0.0495	0.076	1.45	6.09

(Herz and Muhs)

Completely insol in 16% $\text{NaCl}+\text{Aq}$ in presence of 0.8 g NaOH (Maigret, Bull Soc (3) **33** 681)

Solubility of MgO_2H_2 in $\text{NaCl}+\text{NaOH}+\text{Aq}$

G NaCl per l	G MgO per l of solution with added	
	0.8 g NaOH per l	4.0 g NaOH per l
125	0.07	0.03
140	0.045	
160	None	None

(Maigret)

Freshly pptd $\text{Mg}(\text{OH})_2$ is sol in $\text{Th}(\text{NO}_3)_4+\text{Aq}$ forming a colloidal solution (Halla, Z anorg 1912, **79** 262)

Insol in acetone (Naumann, B 1904, **37** 4329, Eidmann, C C 1899, II, 1014)

See also Magnesium oxide

Min *Brucite* Sol in cold citric acid + Aq (Bolton, C N **37** 14)

$2\text{MgO}, 3\text{H}_2\text{O}$ (Bender, B **3** 932)

Magnesium iodide, MgI_2

Very deliquescent

Solubility in H_2O See MgI_2+6 , and $8\text{H}_2\text{O}$ Sp gr of MgI_2+Aq at 19.5° containing

5 10 15 20 25 30% MgI_2 ,
1.043 1.088 1.139 1.194 1.254 1.32

35 40 45 50 55 60% MgI_2
1.395 1.474 1.568 1.668 1.78 1.915

(Kremers, Pogg **111** 62, calculated by Gerlach, Z anal **8** 285)

MgI_2+Aq decomp slightly on evaporation

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 828)

Sol in alcohol, ether, and wood-spirit

Solubility of MgI_2 in alcohols

MgI_2 forms with methyl alcohol a complex, $\text{MgI}_2, 6\text{CH}_3\text{OH}$

Solubility of $\text{MgI}_2, 6\text{CH}_3\text{OH}$ in CH_3OH at t°

t°	% by weight of $\text{MgI}_2, \text{CH}_3\text{OH}$	t°	% by weight of $\text{MgI}_2, 6\text{CH}_3\text{OH}$
0	49.6	120	66.2
20	52.6	140	69.5
40	55.3	160	73.2
60	58.0	180	77.1
80	60.6	200	81.5
100	63.3		

(Menschutkin, Z anorg 1907, **52** 15)

MgI_2 forms with ethyl alcohol a complex, $\text{MgI}_2, 6\text{C}_2\text{H}_5\text{OH}$

Solubility of $\text{MgI}_2, 6\text{C}_2\text{H}_5\text{OH}$ in $\text{C}_2\text{H}_5\text{OH}$ at t°

t°	% by weight of $\text{MgI}_2, 6\text{C}_2\text{H}_5\text{OH}$	t°	% by weight of $\text{MgI}_2, 6\text{C}_2\text{H}_5\text{OH}$
0	21.9	120	82.7
20	33.2	130	87.2
40	44.4	135	90.0
60	55.3	140	93.3
80	65.5	143	96.0
100	74.7	145	98.0
110	78.8	146.5 mpt	100

(Menschutkin)

MgI_2 forms with dimethylcarbinol a complex, $\text{MgI}_2, 6(\text{CH}_3)_2\text{CHOH}$

Solubility of $\text{MgI}_2, 6(\text{CH}_3)_2\text{CHOH}$ in $(\text{CH}_3)_2\text{CHOH}$ at t°

t°	% by weight of $\text{MgI}_2, 6(\text{CH}_3)_2\text{CHOH}$	t°	% by weight of $\text{MgI}_2, 6(\text{CH}_3)_2\text{CHOH}$
10	57.1	110	76.2
30	60.0	120	79.4
50	63.3	130	84.8
70	67.0	136	91.7
90	71.2	138 mpt	100

(Menschutkin)

Solubility of MgI_2 in ether at t°

t°	% MgI_2	% $\text{MgI}_2, 2\text{C}_4\text{H}_{10}\text{O}$
5.4	1.45	2.2
11.8	2.43	3.7
15.6	3.46	5.3
18.1	5.4	8.3
20.4	7.55	11.6
22.2	11.28	17.3

(Menschutkin, Z anorg 1906, **49** 41)

t°	% MgI ₂	% MgI ₂ 2C ₄ H ₁₀ O
	in lower layer	
14 8	35 5	54 4
17 6	35 5	54 4
20	35 8	54 8
28 4	35 5	54 4
33	35 7	54 7
35	35 3	54 1
in upper layer		
18 6	13 57	20 8
23 2	14 4	22 1
24 4	14 6	22 4
32 4	15 82	24 2
in solution when two layers mix		
37 3	19 4	29 3
38 5	22 45	34 4
38 5	26 07	39 9
38 5	29 8	45 7
38	32 8	50 3

(Menschutkin)

Solubility of MgI₂ in acetic acid
forms with acetic acid a complex,
I₃COOH

Solubility of MgI₂, 6CH₃COOH in
CH₃COOH at t°

t°	% by wt MgI ₂ 6CH ₃ COOH
20	0 6
40	2 0
60	5 0
70	9 5
75	13 0
80	18 5
85	27 1
95	42 0
105	54 5
115	65 0
125	73 8
135	85 0
140	94 0
142 mpt	100 0

(Menschutkin, Z anorg 1907, 54 93)

Solubility of MgI₂ in acetone
MgI₂ forms with acetone a complex, MgI₂
6CH₃COCH₃

Solubility of MgI₂, 6CH₃COCH₃ in
CH₃COCH₃ at t°

t°	% by wt MgI ₂ 6CH ₃ COCH ₃
0	4 9
30	6 7
50	8 3
60	10 2
70	15 2
80	28 6
85	40 0
90	59 2
95	80 0
100	92 5
105	98 5
106 5 mpt	100

(Menschutkin, Z anorg 1907, 53 30)

Solubility of MgI₂ in acetal
MgI₂ forms with acetal a complex, MgI₂,
2CH₃CH(OC₂H₅)₂

Solubility of MgI₂, 2CH₃CH(OC₂H₅)₂ in
CH₃CH(OC₂H₅)₂ at t°

t°	% by wt MgI ₂ 2CH ₃ CH(OC ₂ H ₅) ₂
20	0 15
60	0 45
77	0 6
77	92 0
79	93 7
81	95 5
83	97 3
86 mpt	100

(Menschutkin, Z anorg 1907, 53 33)

Solubility of MgI₂ in acetamide
MgI₂ forms with acetamide a complex,
MgI₂, 6CH₃CONH₂

Solubility of MgI₂, 6CH₃CONH₂ in
CH₃CONH₂ at t°

t	% by wt. of MgI ₂ 6CH ₃ CONH ₂
49	56 5
80	63 4
110	70 5
130	76 0
150	82 1
160	85 5
170	90 8
175	96 2
177 mpt	100 0

(Menschutkin, Z anorg 1909, 61 108)

Solubility of MgI_2 in acetonitrile
 MgI_2 forms with acetonitrile a complex,
 $\text{MgI}_2 \cdot 6\text{CH}_3\text{CN}$

Solubility of $\text{MgI}_2 \cdot 6\text{CH}_3\text{CN}$ in CH_3CN
 at t°

t°	% by wt $\text{MgI}_2 \cdot 6\text{CH}_3\text{CN}$
0	37.2
30	49.8
50	58.2
70	67.9
80	76.5
89	91.3

(Menschutkin, Z anorg 1909, 61 110)

Solubility of MgI_2 in benzaldehyde
 MgI_2 forms with benzaldehyde a complex,
 $\text{MgI}_2 \cdot 6\text{C}_6\text{H}_5\text{CHO}$

Solubility of $\text{MgI}_2 \cdot 6\text{C}_6\text{H}_5\text{CHO}$ in $\text{C}_6\text{H}_5\text{CHO}$
 at t°

t°	% by wt $\text{MgI}_2 \cdot 6\text{C}_6\text{H}_5\text{CHO}$
0	3.2
20	3.8
40	5.3
60	7.7
80	11.0
100	18.5
110	26.5
120	40.0
125	53.0
130	74.5
133	86.0
136	94.2
139 mpt	100

(Menschutkin, Z anorg 1907, 53 28)

Solubility of MgI_2 in methyl acetate
 MgI_2 forms with methyl acetate a complex,
 $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOCH}_3$

Solubility of $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOCH}_3$ in
 $\text{CH}_3\text{COOCH}_3$ at t°

t°	% by wt $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOCH}_3$
0	0.4
30	0.55
60	0.75
90	0.9
100	1.8
103	2.4
103	74.2
110	81.7
120	98.0
121 mpt	100.0

(Menschutkin, Z anorg 1909, 61 101)

Solubility of MgI_2 in methyl acetate
 MgI_2 forms with ethyl acetate a complex,
 $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOC}_2\text{H}_5$

Solubility of $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOC}_2\text{H}_5$ in
 $\text{CH}_3\text{COOC}_2\text{H}_5$ at t°

t°	% by wt $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOC}_2\text{H}_5$
0	3.2
20	4.8
40	8.6
50	13.7
55	21.5
60	38.0
65	63.5
70	90.5
75	97.7
78.5 mpt	100.0

(Menschutkin)

Solubility of MgI_2 in ethyl formate
 MgI_2 forms with ethyl formate a complex,
 $\text{MgI}_2 \cdot 6\text{HCOOC}_2\text{H}_5$

Solubility of $\text{MgI}_2 \cdot 6\text{HCOOC}_2\text{H}_5$ in
 HCOOC_2H_5 at t°

t°	% by wt $\text{MgI}_2 \cdot 6\text{HCOOC}_2\text{H}_5$
0	15.1
10	17.4
20	20.5
30	25
40	31.8
50	44
60	68
70.5 mpt	100

(Menschutkin)

Solubility of MgI_2 in isoamylacetate
 MgI_2 forms with isoamylacetate a complex,
 $\text{MgI}_2 \cdot 6\text{CH}_3\text{COO(iso)C}_5\text{H}_{11}$

Solubility of $\text{MgI}_2 \cdot 6\text{CH}_3\text{COO(iso)C}_5\text{H}_{11}$ in
 $\text{CH}_3\text{COO(iso)C}_5\text{H}_{11}$ at t°

t	% by wt $\text{MgI}_2 \cdot 6\text{CH}_3\text{COO(iso)C}_5\text{H}_{11}$
0	7.7
20	11.5
40	20.9
45	25.5
50	33.2
55	47.8
57.5	63.0
60 mpt	100.0

(Menschutkin)

Solubility of MgI_2 in isobutyl acetate
 MgI_2 forms with isobutylacetate a complex,
 $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOC}_4\text{H}_9$

Solubility of MgI_2 , $6\text{CH}_3\text{COO}(\text{iso})\text{C}_4\text{H}_9$ in $\text{CH}_3\text{COO}(\text{iso})\text{C}_4\text{H}_9$

t°	% by wt MgI_2 $6\text{CH}_3\text{COO}(\text{iso})\text{C}_4\text{H}_9$
0	10 5
20	13 6
40	17 6
50	20 4
60	24 9
70	33 7
75	40 5
80	52 0
85	89 0
87 5 mpt	100 0

(Menschutkin)

Solubility of MgI_2 in propyl acetate

MgI_2 forms with propyl acetate a complex, $\text{MgI}_2 \cdot 6\text{CH}_3\text{COOC}_3\text{H}_7$

Solubility of MgI_2 , $6\text{CH}_3\text{COOC}_3\text{H}_7$ in $\text{CH}_3\text{COOC}_3\text{H}_7$ at t°

t°	% by wt MgI_2 $6\text{CH}_3\text{COOC}_3\text{H}_7$
0	4 1
20	5 4
30	6 5
35	7 8
40	19 0
45	46 0
50	72 5
55	88 2
60	96 0
65 mpt	100 0

(Menschutkin)

Solubility of MgI_2 in urethane

MgI_2 forms with urethane a complex, $\text{MgI}_2 \cdot 6\text{NH}_2\text{COOC}_2\text{H}_5$

Solubility of MgI_2 , $6\text{NH}_2\text{COOC}_2\text{H}_5$ in $\text{NH}_2\text{COOC}_2\text{H}_5$ at t°

t°	% by wt MgI_2 $6\text{NH}_2\text{COOC}_2\text{H}_5$
32	51 8
50	59 4
70	70 7
80	78 8
84	85 0
87 mpt	100 0

(Menschutkin)

+6H₂O

Solubility of $\text{MgI}_2 + 6\text{H}_2\text{O}$ in H₂O at t°

t°	% by weight of $\text{MgI}_2 + 6\text{H}_2\text{O}$	t°	% by weight of $\text{MgI}_2 + 6\text{H}_2\text{O}$
43°	89 8	160°	91 7
80°	90 3	200°	93 4
120°	90 9	215°	94 3

(Menschutkin, Z anorg 1907, 52 156)

+8H₂O Sp gr of solution of $\text{MgI}_2 + 8\text{H}_2\text{O}$ sat at 18° containing 59.7% $\text{MgI}_2 = 1.909$ (Mylus, B 1897, 30 1718)

Solubility of $\text{MgI}_2 + 8\text{H}_2\text{O}$ in H₂O at t°

t°	% by weight of $\text{MgI}_2 + 8\text{H}_2\text{O}$
0	76 0
20	81 0
40	88 0
43 5	90 8

(Menschutkin)

+10H₂O Sol in H₂O (Panfiloff, C C 1894, II 610)

Magnesium mercuric iodide, MgI_2 , HgI_2

Known only in solution

+9H₂O Very deliquescent (Duboin, C R 1906, 142 1338)

Very sol in ethyl, methyl, propyl, butyl, isobutyl, amyl, isopropyl and allyl alcohols, ethyl, amyl, propyl and isobutyl acetates, ethyl cyanide and acetone Sol in benzyl alcohol Decomp by glycerine Sl sol in ethyl benzoate, amyl benzoate, nitrobenzene Decomp by ethyl oxalate Insol in toluene, benzene, ethyl iodide, CHCl_3 , CCl_4 , ethylene bromide, monochlor and monobrombenzene (Duboin, A ch 1909, (8) 16 276)

MgI_2 , 2HgI_2 Decomp by H₂O into HgI_2 and above compound, which remains in solution (Boullay)

+7H₂O Sat solution in H₂O at 17.8° has the composition MgI_2 , 1.29 HgI_2 , 11.06 H₂O (Duboin, C R 1906, 142 1338)

Magnesium potassium iodide, MgI_2 , $\text{KI} + 6\text{H}_2\text{O}$

Deliquescent (Lerch, J pr (2) 28 338)

Very hygroscopic (de Schulten, Bull Soc 1900 (3) 23 158)

Magnesium iodide ammonia, MgI_2 , 6NH_3

Practically insol in liquid NH_3 (Franklin, J Am Chem Soc 1913, 35 1459)

Magnesium nitride, Mg_3N_2

Decomp by moist air or H₂O Sol in dil or conc $\text{HCl} + \text{Aq}$, or $\text{HNO}_3 + \text{Aq}$ Sol in warm H_2SO_4 Insol in alcohol, ethyl iodide or phosphorus oxychloride (Briegleb and Geuther, A 123 236)

Decomp by H₂O (Smits, R t c 1894, 12 198)

Easily decomp H₂O when finely powdered (Rossel, C R 1895, 121 942)

Magnesium suboxide (?)

Decomp H₂O Sol in dil acids (Beetz, Pogg 127 45)

Magnesium oxide, MgO

Sol in 50 000–100 000 pts H₂O (Bineau C R 41 510) in 55 388 pts cold or hot H₂O (Fresenius A 59 123) in 100 000–200 000 pts H₂O (Bunsen) in 16 000 pts H₂O at ord temp (Dalton) in 7900 pts H₂O at ord temp (Kirwan) in 5760 pts H₂O at 15.5° and 36 000 pts at 100° (Fyfe)

Calc from electrical conductivity of $\text{MgO} + \text{Aq}$ 1 pt MgO is sol in 172,000 pts H_2O at 18° (Dupré, Zeit angew Ch 1903, 16 55)
 "Heavy" MgO is more sol in H_2O than "light" MgO The temp of preparation affects the rate of solution, the rate being diminished as the temp of preparation is increased (Anderson, Chem Soc 1905, 87 265)

Easily sol in acids, even in $\text{H}_2\text{SO}_4 + \text{Aq}$

Solubility in $\text{P}_2\text{O}_5 + \text{Aq}$ at 25°

Composition of the solution		Sp. gr. $25^\circ/25^\circ$	Solid phase
G MgO per l	G P_2O_5 per l		
0 207	0 486		$\text{MgHPO}_4 \cdot 3\text{H}_2\text{O}$
0 280	0 732		
0 553	1 917		
1 438	4 85		
2 23	7 35	1 006	
4 73	16 84	1 017	
11 19	38 59	1 042	
17 33	61 21	1 069	
26 09	93 09	1 109	
37 40	130 7	1 144	
75 5	281 8	1 285	
109 5	439 0		
122 6	498 4	1 470	
129 9	546 5		
140 0	584 0		
146 8	623 3	1 595	$\text{MgH}_2(\text{PO}_4)_2 \cdot x\text{H}_2\text{O}$
147 3	625 9		
150 3	645 8		
155 5	680 7		
87 1	779 6	1 626	
77 1	809 6	1 644	
70 6	835 1	1 654	

(Cameron, J phys Chem 1907, 11 364)

Sol in NH_4 salts, NaCl , or $\text{KCl} + \text{Aq}$ (Fresenius)

Solubility in $\text{MgCl}_2 + \text{Aq}$ at 25°

% MgCl_2	% MgO as $\text{Mg}(\text{OH})_2$
2 36	0 00008
4 47	0 00028
6 79	0 00048
9 02	0 00080
13 14	0 00115
15 15	0 00195
17 53	0 00240
18 52	0 00250
22 04	0 00245
23 78	0 00235
25 13	0 00230
26 88	0 00250
28 34	0 00230
29 80	0 00240
30 04	0 00250
34 22	0 0030

(Robinson, J phys Chem 1909, 13 676)

More sol in K_2SO_4 , and $\text{Na}_2\text{SO}_4 + \text{Aq}$ than in H_2O (Warrington)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sol in methyl alcohol to form a colloidal solution containing 16% MgO (Neuberg and Rewald (Biochem Z 1908, 9 547))

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602)

Insol in acetone (Naumann, B 1904, 37 4329)

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Solubility in (calcium succate + sugar) + Aq

1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 0.30 g MgO , containing 296.5 g sugar and 24.2 g CaO dissolves 0.24 g MgO containing 174.4 g sugar and 14.1 g CaO dissolves 0.22 g MgO (Bodenbender, J B 1865 600)

See also Magnesium hydroxide
Min Perchlorate

Magnesium peroxide, MgO_2

Sol in 14,550 pts H_2O at 20° (Foregger and Philipp, J Soc Chem Ind 1906, 25 298)

$5\text{MgO}, 2\text{MgO}_2 + 3\text{H}_2\text{O}$

$3\text{MgO}, 2\text{MgO} + 3\text{H}_2\text{O}$

$2\text{MgO}, 2\text{MgO}_2 + 3\text{H}_2\text{O}$

$4\text{MgO}, 2\text{MgO} + 3\text{H}_2\text{O}$

Above salts are decomp by H_2O

(Carrasco, Gazz ch it 1909, 39, (1) 47)

Magnesium oxybromide, $\text{MgBr} \cdot 3\text{MgO} - 12\text{H}_2\text{O}$

Decomp in the air and also by H_2O , alcohoh and most reagents (Tassilly, C R 1897, 125 607)

Magnesium oxychloride, $\text{MgOCl} - 16\text{H}_2\text{O}$

Easily decomp by H_2O and alcohol (Andre, A ch (6) 3 80)

$+ 6\text{H}_2\text{O}$ (Andre)

$2\text{MgO}, \text{HCl}, 5\text{H}_2\text{O}$ or $3\text{MgO}, \text{MgCl} - 10\text{H}_2\text{O}$ Solubility determinations show that this salt is the solid phase in equilibrium at 25° with solutions of MgCl and MgO containing from 10-15% MgCl (Robinson J phys Chem 1909, 13 677)

$\text{Mg}_6\text{OCl} + 6, 8, 14$ or $17\text{H}_2\text{O}$ Decomp by H_2O , which dissolves out MgCl (Bender, B 3 932)

$\text{Mg}_{11}\text{O}_1\text{Cl} + 14$, or $18\text{H}_2\text{O}$ Krause A 165 38)

$\text{Mg}_{10}\text{O}_9\text{Cl} + 24\text{H}_2\text{O} = 9\text{MgO} + \text{MgCl} + 24\text{H}_2\text{O}$ H_2O removes all MgCl by long digesting (Bender, A 159 341)

$+ 10$, and $15\text{H}_2\text{O}$ (Bender)

Magnesium oxysulphide, MgOS

(Reichel, J pr (2) 12 35)

Magnesium phosphide, Mg_3P_2

Decomp by H_2O , dil $HCl + Aq$, or $HNO_3 + Aq$ (Parkinson, Chem Soc 5 (2) 125 and 309)

Insol in moderately dil cold $HCl + Aq$, or boiling dil $H_2SO_4 + Aq$ Difficultly and slowly sol in aqua regia (Blunt, Chem Soc 3 (2) 106)

Decomp by H_2O , HCl , conc H_2SO_4 and by HNO_3 (Gautier, C R 1899, 128 1169)

Magnesium silicide, Mg_2Si

Slowly decomp by warm H_2O Slowly decomp by cold, rapidly by hot $NH_4Cl + Aq$ Decomp by cold dil $HCl + Aq$ (Geuther, J pr 95 425)

Mg_2Si Decomp by $HCl + Aq$ with residue of Si (Wohler, A 107 113)

Slowly decomp by H_2O at ord temp Violently decomp by HCl (Lebeau and Bossuet, C R 1908, 146 284)

Magnesium sulphide, MgS

Decomp by H_2O (Reichel, J pr (2) 12 55)

Sl sol in H_2O with rapid decomp (Freymy) Sol in acids with decomp

Anhydrous Crystalline Only very sl sol in cold H_2O Sol in HNO_3 and H_2SO_4 at ord temp Sol in PCl_3 and in chromyl chloride (Mourlot, C R 1898, 127 182)

Magnesium polysulphide, MgS_x

Known only in solution (Reichel)

Magnus' green salt

See Platodamine chloroplatinite

Manganese, Mn

Decomposes H_2O even in the cold, more rapidly when hot (Regnault)

Decomposes cold water violently (Bunsen)

Sol in all dil acids Slowly sol in cold H_2SO_4 (John)

Insol in cold, but rapidly sol in hot H_2SO_4 , Very easily sol in dil H_2SO_4 , or $HCl + Aq$, HNO_3 , or $HC_2H_3O_2 + Aq$ (Brunner)

Pure manganese is unaltered in dry air, even when finely powdered Slowly attacked by cold, quickly by hot H_2O Very sl attacked by cold H_2SO_4 , rapidly on warming, rapidly attacked by cold dil $H_2SO_4 + Aq$, violently by conc $HNO_3 + Aq$, and rapidly by dil HNO_3 , HCl , $HC_2H_3O_2 + Aq$, and also $NaOH + Aq$ Sol in $NH_4Cl + Aq$ (Prelinger, W A B 102, 2b 359)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

$\frac{1}{2}$ cem oleic acid dissolves 0.0276 g Mn in 6 days (Gates, J phys Chem 1911, 15 143)

Manganese antimonide, $MnSb$

Sol in hot aqua regia (Wedekind, B 1907, 40 1266)

Manganese azonide, basic, $Mn(OH)N_3$

Only sl sol in H_2O with decomp (Curatius, J pr 1898, (2) 58 293)

Manganese bismuthide, $MnBi$

Very sensitive towards acids with the exception of conc HCl (Wedekind, B 1911, 44 2665)

Manganese boride, MnB

Attacked by cold H_2O and by acids (Jassoneux, C R 1904, 139 1210)

Easily attacked by HCl , H_2SO_4 , and HF with evolution of BH_3 (Wedekind, B 1905, 38 1231)

MnB_2 Sol in acids, with evolution of H_2 (Troost and Hautefeuille, A ch (5) 9 65)

Slowly decomp by H_2O Sol in dil HCl and other dil acids with evolution of BH_3 (Wedekind, B 1905, 38 1229)

Manganous bromide, $MnBr_2$

Anhydrous Very deliquescent

Sat $MnBr_2 + Aq$ contains at

$-21^\circ + 7^\circ$ 11° 18° 38° 52°
52 1 56 5 57 0 59 1 62 7 64 2% $MnBr_2$,

64° 76° 89° 97° 105°
68 2 70 1 69 7 69 2 70 2% $MnBr_2$
(Étard, A ch 1894, (7) 2 541)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

$+H_2O$ (Lescœur, A ch 1894, (7) 2 104)

$+4H_2O$ More deliquescent than $MnCl_2$

Melts in crystal water when heated (Berthelot)

$+6H_2O$ (Kuznetsoff, C C 1897, II 329)

Manganous mercuric bromide

Deliquescent

Manganous palladium bromide

See Bromopalladite, manganous

Manganous stannic bromide

See Bromostannate, manganous

Manganese carbide, MnC

(Brown, J pr 17 492)

MnC_2

MnC_3 (Troost and Hautefeuille, A ch (5) 9 60)

Decomp by H_2O and by dil acids (Moissan, C R 1896, 122 422)

Manganous chloride, $MnCl_2$

Anhydrous Deliquescent

100 pts H ₂ O at t° dissolve pts MnCl ₂			
t°	Pts MnCl ₂	t°	Pts MnCl ₂
10	62 16	87 5	122 22
31 25	85 72	106 25	123 81
62 5	122 22		

or, sat MnCl₂+Aq at t° contains

t°	% MnCl ₂	t°	% MnCl ₂
10	38 33	87 5	55 0
31 25	46 15	106 25	55 32
62 5	55 0		

(Brandes, Pogg 22 263)

See also below under +2H₂O, and +4H₂O

Sp gr of MnCl₂+Aq at 15° a=sp gr if %
is MnCl₂, b=sp gr if % is MnCl₂+
4H₂O

%	a	b	%	a	b
5	1 045	1 0285	40	1 443	1 250
10	1 091	1 057	45	1 514	1 290
15	1 138	1 086	50		1 331
20	1 189	1 116	55		1 375
25	1 245	1 147	60		1 419
30	1 306	1 180	65		1 463
35	1 372	1 214	70		1 508

(Gerlach, Z anal 28 476)

Sp gr of MnCl ₂ +Aq at room temp	
% MnCl ₂	Sp gr
8 007	1 0960
15 650	1 1963
30 330	1 3372
40 132	1 4530

(Wagner, W Ann 1883, 18 273)

Sp gr of MnCl ₂ +Aq at t°		
t°	% MnCl ₂	Sp gr
14 5	5 0	1 0457
14 5	11 99	1 1076
14 0	14 98	1 1379
14 5	19 92	1 1891
14 0	23 10	1 2246
14 6	28 51	1 2888

(Long, W Ann 1880, 11 38)

Sp gr of MnCl ₂ +Aq at 25°	
Concentration of MnCl ₂ +Aq	Sp gr
1-normal	1 0513
1/2- "	1 0259
1/4- "	1 0125
1/8- "	1 0063

(Wagner, Z phys Ch 1890, 5 38)

Solubility of MnCl₂+KCl in H₂O at t°

t°	% MnCl ₂	% KCl	Solid phase
6	40 23 35 94	9 41 23 06	MnCl ₂ , 4H ₂ O MnCl ₂ , 4H ₂ O+MnCl ₂ , KCl, 2H ₂ O+KCl KCl
28 4	44 46 43 28 38 65	8 66 13 79 26 91	MnCl ₂ , 4H ₂ O MnCl ₂ , 4H ₂ O+MnCl ₂ , KCl, 2H ₂ O MnCl ₂ , 4H ₂ O+MnCl ₂ , 2KCl, 2H ₂ O+KCl KCl
52 8	50 14	6 01	MnCl ₂ , 4H ₂ O+MnCl ₂ , 2H ₂ O+MnCl ₂ , KCl, 2H ₂ O
62 6	51 86 49 95 44 05 36 85	6 67 12 49 18 77 31 57	MnCl ₂ , 2H ₂ O MnCl ₂ , 2H ₂ O+MnCl ₂ , KCl, 2H ₂ O MnCl ₂ , KCl, 2H ₂ O+MnCl ₂ , 2KCl, 2H ₂ O MnCl ₂ , 2KCl, 2H ₂ O+MnCl ₂ , 4KCl KCl

(Suss, Z Kryst Min 1912, 51 262)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 828)

Solutions of MnCl₂ in 75% alcohol saturated at t° contain

t	% MnCl ₂	t	% MnCl
10	23 1	43 75	37 5
25	36 1	87 5	32 2
		(B-pt)	

Solutions of MnCl_2 in absolute alcohol saturated at t° contain

t°	% MnCl_2	t°	% MnCl_2
11 25	33 3	76 25	36 2
37 5	33 3	(B-pt)	

(Brandes, *l c*)

MnCl_2 crystallises from above solutions on standing

When 15–20 vols ether are added to 1 vol absolute alcohol sat with MnCl_2 , MnCl_2 is completely pptd (Doberner)

Insol in oil of turpentine

Sol in urethane (Castoro, *Z anorg* 1899, 20 61)

Sl sol in benzonitrile (Naumann, *B* 1914, 47 1369)

Difficultly sol in methyl acetate (Naumann, *B* 1909, 42 3790)

Insol in ethyl acetate (Naumann, *B* 1910, 43 314)

$+\text{H}_2\text{O}$ Solubility in $\text{HCl}+\text{Aq}$ decreases with increasing amt of HCl . It is greater when hot than cold, but is not considerable even when HCl is conc 1 l conc $\text{HCl}+\text{Aq}$ sat at 12° dissolves 190 g MnCl_2 from $\text{MnCl}_2+\text{H}_2\text{O}$ (Ditte, *C R* 1881, 92 243)

$+\frac{5}{3}\text{H}_2\text{O}$ $\text{MnCl}_2+4\text{H}_2\text{O}$ effloresces to $\text{MnCl}_2+\frac{5}{3}\text{H}_2\text{O}$ in a dry atmosphere and under low pressure and not to $\text{MnCl}_2+2\text{H}_2\text{O}$ (Sabatier, *Bull Soc* 1894, (3) 11 547)

$+2\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	Pts MnCl_2 per 100 pts H_2O	Sp gr of sat solution
60	108 6	1 6108
70	110 6	1 6134
80	112 7	

(Dawson and Williams, *Z phys Ch* 1899, 31 63)

Sat aqueous solution of $\text{MnCl}_2+2\text{H}_2\text{O}$ Contains 51 86% MnCl_2 at 62.6° (Suss, *Z Krist* 1912, 51 262)

$+4\text{H}_2\text{O}$ Deliquescent

100 pts H_2O at t° dissolve

t°	Pts MnCl_2 $+4\text{H}_2\text{O}$	t°	Pts MnCl_2 $+4\text{H}_2\text{O}$
8	151	87 5	641
31 25	265	106 25	656
62 5	641		

(Brandes, *l c*)

Sol in 0.8 pt H_2O at 18.75° (Abt)

Pptd from solution in 9.17 mols H_2O (Kuznetsoff, *C C* 1899, I 246)

Sat aq solution contains at

-22°	-5°	$+7^\circ$	17°	19°	
34 7	37 8	40 4	41 2	42 3	% MnCl_2
35°	55°	57°	80°	100°	140°
44 4	48 2	50 0	51 0	53 7	54 7 % MnCl_2

(Étard, *A ch* 1894, (7) 2 537)

Solubility in H_2O at t°

t°	Pts MnCl_2 per 100 pts H_2O	Sp gr of sat solution
25	77 18	1 4991
30	80 71	1 5049
40	88 59	1 5348
50	98 15	1 5744
*57 65	105 40	1 6097

* Temp of transition into $\text{MnCl}_2+2\text{H}_2\text{O}$ (Dawson and Williams, *Z phys Ch* 1899, 31 63)

Sat aqueous solution of $\text{MnCl}_2+4\text{H}_2\text{O}$ contains 40 23% MnCl_2 at 6° , 44 6% MnCl_2 at 28.4° (Suss, *Z Krist* 1912, 51 262)

100 pts 75% alcohol dissolve at t°

t°	Pts MnCl_2 $+4\text{H}_2\text{O}$	t°	Pts MnCl_2 $+4\text{H}_2\text{O}$
10	53	43 75	144
25	132	87 5	100 1

(Brandes, *l c*)

Insol in absolute ether, which also does not abstract crystal H_2O

Insol in boiling oil of turpentine (Brandes)

Sol in conc HNO_3+Aq

$+5\text{H}_2\text{O}$ (Muller-Erzbach, *B* 1889, 25 3181)

$+6\text{H}_2\text{O}$ Pptd from solution in 11.7 mol

H_2O at -21° (Kuznetsoff, *C C* 1899, 246)

Manganese trichloride, MnCl_3

Immediately decomp by H_2O , sol in abs ether and in abs alcohol (Holmes, *J An Chem Soc* 1907, 29 1285)

Manganese tetrachloride, MnCl_4

Has not been isolated

Sol in H_2O , alcohol, or ether (Nickle *J B* 1865 225)

Composition is Mn_2Cl_8 (Christensen, *pr* (2) 34 41)

Manganese hydrogen tetrachloride (chloromanganic acid), $\text{MnCl}_4 \cdot 2\text{HCl}$

Sol in ether, decomp by H_2O (Frank (2) 36 31)

Manganese heptachloride, $\text{MnCl}_7(?)$

Decomp by H_2O (Dumas, Berz *J B* 112)

Has the formula MnO_3Cl (?) (Aschoff, J pr 81 29)

Manganous mercuric chloride, $\text{MnCl}_2, \text{HgCl}_2 + 4\text{H}_2\text{O}$

Deliquescent in moist air Easily sol in H_2O (v Bonsdorff)
 $\text{MnCl}_2, 2\text{HgCl}_2$ (Varet, C R 1896, 123, 422)

Manganous potassium chloride, $\text{MnCl}_2, \text{KCl} + 2\text{H}_2\text{O}$

Deliquescent Very sol in H_2O , but is decomp thereby (Remsen and Saunders, Am Ch J 14 129)

$\text{MnCl}_2, 2\text{KCl} + 2\text{H}_2\text{O}$ (Suss, Z Kryst 1912, 51 262)

Manganic potassium chloride, $\text{MnCl}_3, 2\text{KCl} + \text{H}_2\text{O}$

Decomp by H_2O Sol in HCl apparently without decomp (Rice, Chem Soc 1898, 73 261)

$\text{MnCl}_4, 2\text{KCl}$ Very easily decomp (Meyer and Best, Z anorg 1899, 22 186)

$\text{MnCl}_4, \text{MnCl}_3, 5\text{KCl}$ Easily decomp (Meyer and Best, Z anorg 1899, 22 185)

Manganous rubidium chloride, $\text{MnCl}_2, 2\text{RbCl}$

(Godeffroy)
 $+ 3\text{H}_2\text{O}$ Easily sol in H_2O Insol in alcohol, conc $\text{HCl} + \text{ppt}$ anhydrous salt from aqueous solution (Godeffroy, Arch Pharm (3) 12 40)

Contains only $2\text{H}_2\text{O}$ (Saunders, Am Ch J 14 139)

Manganous thalic chloride, $\text{MnCl}_2, 2\text{TiCl}_3 + 6\text{H}_2\text{O}$

Can be crvst from H_2O (Gewecke, A 1909, 366 224)

Manganous stannic chloride

See Chlorostannate, manganous

Manganous chloride hydrazine, $\text{MnCl}_2, 2\text{N}_2\text{H}_4$

Ppt (Franzen, Z anorg 1908, 60 285)

Manganous chloride hydroxylamine, $\text{MnCl}_2, 2\text{NH}_2\text{OH}$

Very stable, insol in alcohol (Feldt, B 1894, 27 405)

Manganous fluoride, MnF_2

Only sol in H_2O containing HF (Berzelius)

Insol in H_2O , decomp by boiling with H_2O , sl sol in liquid NH_3 , easily sol in cold or hot conc HNO_3 and HCl , slowly sol in dil HCl , decomp by fused K_2CO_3 , KOH , KNO_3 , and KClO_3 , insol in alcohol and

ether Slowly sol in acetic acid (Moissan, C R 1900, 130 1160)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Insol in acetone (Naumann, B 1904, 37 4329)

Manganese trifluoride, MnF_3

Completely sol in a little H_2O , but decomp by dilution or boiling (Berzelius)

$+ 6\text{H}_2\text{O}$ Efflorescent (Christensen, J pr (2) 35 57)

Sol in H_2SO_4 , HCl , HNO_3 , decomp by H_2O , insol in most organic solvents (Moissan, C R 1900, 130 626)

Manganomanganic fluoride, $\text{Mn}_2\text{F}_7 + 10\text{H}_2\text{O}$

Sol in a little H_2O , but decomp by dilution (Nickles, C R 67 448)

Manganese tetrafluoride, MnF_4

Not isolated Sol in absolute alcohol or ether, decomp by H_2O (Nickles, C R 65 107)

Probably does not exist (Christensen, J pr (2) 35 161)

Manganese heptafluoride, MnF_7

Sol in H_2O with decomp (Wohler)

Manganese sesquifluoride with MF

See also Fluomanganate, M

Manganic nickel fluoride, $2\text{NiF}_2, \text{MnF}_2 - 8\text{H}_2\text{O}$

(Christensen, J pr (2) 34 41)

Manganic potassium fluoride, $\text{MnF}_2, 4\text{KF} - 2\text{H}_2\text{O}$

Decomp by H_2O Sol in conc $\text{HCl} - \text{Aq}$, dil $\text{HNO}_3 + \text{Aq}$, conc $\text{H}_2\text{SO}_4 + \text{Aq}$, $\text{H}_3\text{PO}_4 - \text{Aq}$, $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$, $\text{H}_2\text{C}_4\text{H}_4\text{O}_6 - \text{Aq}$, and an $\text{HF} + \text{Aq}$ (Christensen, J pr 2 35 72)

$\text{MnF}_4, 2\text{KF}$ Difficultly sol in H_2O Decomp by much H_2O (Nickles, C R 65 107)

True composition is $\text{MnF}_2, 4\text{KF}$, also with $2\text{H}_2\text{O}$ (Christensen, J pr 2 34 41)

$\text{MnF}_4, 4\text{KF}$ (Nickles)
See also Fluomanganate, potassium

Manganic rubidium fluoride

See Fluomanganate, rubidium

Manganic silver fluoride, $2\text{AgF}, \text{MnF}_2 - 14\text{H}_2\text{O}$

Sol in $\text{HF} + \text{Aq}$ (Christensen, J pr 2) 34 41)

Manganic sodium fluoride, $\text{MnF}_2, 4\text{NaF}$

Decomp by much H_2O Not as sol in $\text{HF} + \text{Aq}$ as the K salt (Christensen, J pr 2) 35 161)

Manganomanganic thalious fluoride, 5TlF, 2MnF₃, MnF₂Decomp by H₂O

Sl sol in dil, easily sol in conc HF

Sol in conc HCl, dil HNO₃, and cold or hot conc H₂SO₄Sol in warm H₂O₂ containing H₂SO₄

Sol in dil tartaric and oxalic acids (Ephraim, B 1909, 42 4458)

Manganous stannic fluoride

See Fluostannate, manganous

Manganic zinc fluoride, 2ZnF₂, Mn₂F₆+8H₂O

See Fluomanganate, zinc

Manganous zirconium fluoride

See Fluozirconate, manganous

Manganous fluoride ammonia, 3MnF₃, 2NH₃

(Moissan, C R 1900, 130 1161)

Manganous hydroxide, MnO₂H₂2.15 x 10⁻⁵ g-mol are sol. in 1 l H₂O at 18° (Sackur, Z Elektrochem, 1909, 15 846)Solubility in H₂O = 0.6 x 10⁻⁴ g mol (Herz, Z anorg 1899, 22 284)1 l H₂O dissolves 2 x 10⁻⁴ mol MnO₂H₂ (Tamm, Z phys Ch 1910, 74 500)Very sl sol in H₂O or alkalies (Fresenius) Easily sol in acids Insol in NaOH, or KOH+Aq Sol in NH₄ salts+Aq Insol in NH₄OH+Aq Sol in NaOH+Aq in presence of glycerine (Donath, Dingl 229 542)Not pptd by NH₄OH+Aq in presence of H₂C₄H₄O₆, by KOH+Aq in presence of cane sugar, by KOH+Aq in presence of Na citrateSolubility of MnO₂H₂ in organic Na salts+Aq (0.5 normal)

Na tartrate, 0.0068 mol per l

Na malate, 0.0042 " " "

Na citrate, 0.0126 " " "

(Tamm, Z phys Ch 1910, 74 496)

Min *Pyrochroite***Manganomanganic hydroxide, Mn₂O₄, xH₂O**Not attacked by boiling NH₄Cl+Aq Behaves towards acids as Mn₂O₃**Manganic hydroxide, Mn₂O₃, H₂O**Insol in hot or cold dil H₂SO₄+AqSol in conc H₂SO₄ at somewhat over 100° (Carius)

Sol in tartaric, oxalic, and malic acids, with subsequent decomp Insol in formic, acetic, benzoic, or hippuric acids (Hermann, Pogg 74 303)

Insol in NH₄Cl+Aq Insol in cane sugar +Aq (Pescher)Min *Manganite* Sol in conc HCl+Aq Sl sol in conc H₂SO₄**Manganese dihydroxide, MnO₂, H₂O**

See Manganous acid.

Manganous iodide, MnI₂*Anhydrous* Nearly insol in AsBr₃ (Walden, Z anorg 1902, 29 374)Sol in POCl₃ (Walden, Z anorg 1900, 25 212)Moderately sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 828)+4H₂O Very deliquescent, and sol in H₂O (Kuznetzoff, C C 1900, II 525)+9H₂O (Kuznetzoff)**Manganous mercuric iodide, MnI₂, 2HgI₂+6H₂O**Decomp by H₂O Sol without decomp in alcohol and acetone (Dobroserdoff, C C 1901, I 363)3MnI₂, 5HgI₂+20H₂OA sat solution in H₂O at 17° has composition 1.4 MnI₂, HgI₂+10.22 H₂O and sp gr = 2.98 (Duboin, C R 1906, 142 1338)Very sol without decomp in methyl, propyl, isopropyl, isobutyl, and allyl alcohols, ethyl acetate and ethyl cyanide Somewhat less sol in amyl, propyl and isobutyl acetates, acetone, acetic acid, formic acid (with ppt of HgI₂), ethyl benzoate, ethyl oxalate, butyl alcohol, amyl alcohol and nitrobenzene Sl decomp by glycerine Insol in ethyl nitrate, ethylene bromide, toluene, benzene, CHCl₃, CCl₄, ethyl iodide, monobrom- and monochlorobenzene (Duboin, A ch 1909, (8), 16 278)**Manganese nitride, Mn₃N₂**Sol in HNO₃ only on heating HCl+Aq dissolves only in presence of Pt Aqua regia dissolves slowly H₂SO₄ acts only when hot and conc Insol in acetic acid (Prelinger, M 1894, 15 398)Mn₃N₂ Sol in NH₄Cl+Aq and NH₄OH+Aq, insol in HCl, sol in HNO₃+Aq with decomp (Prelinger, M 1894, 15 398)Mn₃N₂ Easily attacked by acids and alkalies (Wedekind, B 1908, 41 3772)**Manganous oxide, MnO**Insol in H₂O Easily sol in acids Readily sol in NH₄Cl+Aq**Manganic oxide (Manganese sesquioxide), Mn₂O₃**Decomp by boiling with HNO₃+Aq into MnO, which dissolves, and MnO₂, which is insol (Berthier), also by boiling with dil H₂SO₄+Aq (Turner) Sol in hot conc H₂SO₄ or HCl+Aq Sol in cold HCl+Aq without decomp If perfectly pure, is insol in dil H₂SO₄+Aq, but if it contains any MnO, it dissolves (Rose) Insol in boiling NH₄Cl+Aq

Insol in acetone (Naumann, B 1904, 37 4329)

Solubility in (calcium succate+sugar)+Aq

1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 0.50 g MnO₂, containing 296.5 g sugar and 24.2 g CaO dissolves 0.37 g MnO₂, containing 174.4 g sugar and 14.1 g CaO dissolves 0.32 g MnO₂. (Bodenbender, J B 1865 600)

Min Braumate

Colloidal Solution in H₂O containing 0.21 g to a litre is precipitated by KNO₃+Aq (1 1000), K₂SO₄+Aq (1 1100), (NH₄)₂SO₄+Aq (1 1500), NaCl+Aq (1 1580), MgSO₄+Aq (1 40,983), BaCl₂+Aq (1 58,823), MnSO₄+Aq (1 147,929), (NH₄)₂Al₂(SO₄)₄+Aq (1 362,318), K₂Cr(SO₄)₄+Aq (1 416,668), HCl+Aq (1 61,350), HC₂H₃O₂ (1 17,262), H₂SO₄ (1 62,500) (Spring and de Boeck, Bull Soc (2) 48 170)

Manganomanganic oxide, Mn₂O₄

Insol in H₂O Boiling dil or conc HNO₃+Aq dissolves out MnO (Berthier), also boiling dil H₂SO₄+Aq (Turner) Sol in hot HCl+Aq (Otto) NH₄Cl+Aq dissolves out MnO (Rose) Sol without decomp in hot very conc H₃PO₄+Aq, and cold conc H₂SO₄, HCl, oxalic, and tartaric acids+Aq

Min Hausmannite

Manganese dioxide, MnO₂

Min Pyrolusite Insol in H₂O Very slowly sol in conc H₂SO₄ with evolution of O₂ Sol in cold HCl+Aq, decomp by hot HCl+Aq Sol in aqua regia Sol in SO₂+Aq or N₂O₃+Aq (Karsten)

Insol in HNO₃, or dil H₂SO₄+Aq, except in presence of organic reducing substances Decomp by citric acid, and more easily by oxalic acid (Bolton)

Sl sol in hot conc, but insol in dil HNO₃+Aq (Deville) When pure it is insol in cold dil H₂SO₄+Aq, but if a small quantity of MnO is added much MnO dissolves (Carius)

Not decomp by boiling NH₄Cl+Aq

Easily sol in a mixture of nitrososulphuric acid and conc HCl+Aq (Borntrager, Rep anal Ch 1887 741)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Manganese oxides, Mn₂O₃, Mn₂O₁₁, etc

See Manganite, manganous

Manganese trioxide, MnO₃

Deliquescent Sol in H₂O, with subsequent decomp Decomp by ether Sol in conc H₂SO₄ (Franke, J pr (2) 36 31)

Manganese tetroxide, MnO₄ (?)

Sl sol in H₂O with decomp Decomp by H₂SO₄ or ether (Franke, J pr (2) 36 166)

Manganese hexoxide, MnO₆

Very unstable takes up H₂O from air and in H₂O with evolution of heat and rapid decomposition Sol in conc H₂SO₄ without decomp (Aschoff)

Manganese oxychloride, (MnO)₂ MnCl₂

Insol in H₂O Saint-Gilles (C R 85 329) MnCl₂, MnO Gorgeu, A ch 6 4, 515)

MnO₂Cl *See* Manganyl chloride

Manganic oxyfluoride, MnOF

Sol in absolute ether MnOF₂·2HF = fluoxymanganic acid (Nickles, C R 659 107)

Manganic oxyfluoride potassium fluoride

See Fluoxymanganate, potassium.

Manganic sesquioxo-fluoride potassium fluoride

See Sesquifluoxymanganate, potassium

Manganous oxyiodide, MnI MnO + HOI

Sol in H₂O with decomp Kahlert F, C C 1913, I 1004

Manganese oxysulphide, MnO MnS

Sol in acid Arvesen P 22 1

Manganese phosphide, MnP

Insol in dil acids Wedekind B 1907 40 128 Sol in aqua regia er C P 1897 124

MnP HC + Aq leaves MnP Wohler a M A 86

Not sol in HNO₃ Eshw sol in HNO₃ (Wedekind B 1907 40)

2MnP, MnP partly sol in H₂SO₄ pr 79 521

MnP H₂SO₄ + Aq Schrotter W A 1849 1

Manganous phosphoselenide

Insol in H₂O Sol in HCl + Aq Insol in conc H₂SO₄ + Aq Hahn J pr 93 40 2MnSe, PSe Insol in hot HCl+Aq Not sol in 2MnSe, PSe Easily

(Hahn)

Manganese selenide, MnSe

Decomp by H_2O and min acids (Wedekind, B 1911, 44 2667)

Cryst Sl decomp by H_2O at 100° , easily sol in dil acids (Fonzes-Diacon, C R 1900, 130 1025)

Manganese silicide

Sol in HF, only very sl sol in other acids (Warren, C N 1898, 78 319)

Mg_3Si_2 Sol in $HCl + Aq$ with evolution of SiH_4 (Wohler, A 106 54)

Mn_3Si Insol in H_2O (Vigouroux, C R 1895, 121 772)

Easily sol in HF (Wedekind, B 1911, 44 2668)

Easily sol in dil acids, HF and HNO_3 , Insol in $KOH + Aq$ (Vigouroux, A ch 1897, (7) 12 179)

Easily sol in HF when heated, in HCl when red hot Sol in dil min acids with decomp (Vigouroux, C R 1895, 121 772)

Insol in HNO_3 , sol in dil or conc HCl Slowly decomp by alkali hydroxides (Lebeau, C R 1903, 136 91)

Mn_2Si Easily sol in molten alkali (Vigouroux, C R 1895, 121 772)

$MnSi$ Slowly attacked by hot conc HCl Not acted upon by dil or conc HNO_3 or H_2SO_4 (Lebeau, C R 1903, 136 91)

$MnSi$ Not attacked by HNO_3 or H_2SO_4 , Easily sol in cold HF, decomp by conc alkalis + Aq (Lebeau, C R 1903, 136 233)

Manganous sulphide, MnS

Anhydrous Insol in H_2O Sol in weak acids, even in acetic acid

1 l H_2O dissolves 71.60×10^{-6} moles MnS at 18° (Weigel, Z phys Ch 1907, 58 294)

Insol in acetone (Naumann, B 1904, 37 4329)

Min *Alabandite* Sol in $HCl + Aq$ + $\frac{1}{2}H_2O$ *Green* Decomp by boiling with H_2O Sol in weak acids, as acetic or sulphurous acid Very sl sol in $(NH_4)_2S + Aq$ (Wackenroder)

Sol in NH_4 salts + Aq 100 ccm of sat $NH_4Cl + Aq$ at 12° dissolve 0.43 g MnS (Clermont and Guyot, C R 85 37)

+ $\frac{3}{2}H_2O$ *Flesh colored* Less sol in NH_4 salts, or acetic acid + Aq than the preceding salt 100 ccm of sat $NH_4Cl + Aq$ at 12° dissolve 0.088 g (Clermont and Guyot)

Neither green nor flesh-coloured MnS contains H_2O (Antony and Donnini, Gazz ch it 23 560)

MnS is not pptd in presence of alkali citrates, tartrates, or grape sugar, cane or milk sugar do not prevent precipitation (Spiller) Not pptd in presence of $Na_4P_2O_7$ (Rose)

Manganese sulphide, Mn_3S_4

Decomp by H_2O Sol in cold dil acids (Gautier and Hallopeau, C R 1889, 108 809)

Manganese disulphide, MnS_2

(Senarmont, J pr 51 385)

Min *Hauerite* Decomp by hot $HCl + Aq$ with separation of S

Manganous phosphorus sulphide, MnS, P_2S

Sol in $HCl + Aq$ with decomp (Berzelius, A 46 147)

Manganous potassium sulphide, $3MnS, K_2S$

Nearly insol in water, alcohol, or ether Easily sol in acids (Völcker, A 59 35)

Manganous sodium sulphide, $3MnS, Na_2S$

Insol in H_2O , alcohol, or ether Sol in dil acids, and $SO_2 + Aq$ (Völcker)

$2MnS, Na_2S$ Decomp by H_2O (Schneid er, Pogg 151 446)

Manganese telluride, $MnTe$

Decomp by H_2O and min acids (Wedekind, B 1911, 44 2667)

Manganic acid, H_2MnO_4

Known only in solution, which decomposes rapidly (Franke, J pr (2) 36 31)

Barium manganate, $BaMnO_4$

Insol in H_2O , decomp by acids (Mitscherlich)

Didymium manganate, $D_{12}(MnO_4)_3$

Insol in H_2O Sol in $H_2SO_4 + Aq$ (Frerichs and Smith, A 191 331)

Does not exist (Cleve, B 11 912)

Lanthanum manganate, $La_2(MnO_4)_3$

Ppt (Frerichs and Smith, A 191 331)

Does not exist (Cleve, B 11 912)

Manganese manganate, $Mn_2O_3, MnO_3 = 3MnO_2$

See *Manganese dioxide*

Lead manganate, $PbMnO_4 + 2H_2O$

Ppt (Jolles, C C 1888 58)

Potassium manganate, K_2MnO_4

Sol in water containing alkalis without decomp, but decomp by pure H_2O Can be recrystallised from dil $KOH + Aq$

Solubility in KOH+Aq at t°

Solvent	t°	Mol K_2MnO_4 in 1 l of sat solution
2-N KOH	0	0 907
	10	1 013
	20	1 140
	30	1 252
	45	1 424
4-N KOH	0	0 554
	17	0 681
	25	0 733
	30	0 772
	40	0 852
	45	0 889
	51	0 938
	60	1 003
	70	1 074
	80	1 143
6-N KOH	0	0 155
	15	0 224
	23	0 261
	30	0 303
	40	0 362
	45	0 388
	60	0 469
	70	0 528
	80	0 587
8-N KOH	0	0 063
	10	0 070
	20	0 078
	30	0 096
	40	0 119
	50	0 142
	60	0 167
	70	0 196
	80	0 222
10-N KOH	0	0 0145
	10	0 0152
	20	0 0160
	30	0 0215
	40	0 0305
	50	0 0462
	63	0 0620
	70	0 0700
	80	0 0830

(Sackur, Z Elektrochem 1912, 18 724)

Sol in ethyl acetate (Naumann, B 1910, 43 314)

Potassium manganate permanganate,
 $K_2MnO_4, KMnO_4$

Sol without decomp in 20% KOH+Aq (Gorgeu, A ch (3) 61 355)

Sodium manganate, $Na_2MnO_4 + 10H_2O$ Sol in H_2O , with partial decomp (Gen-tele, J pr 82 58)**Strontium manganate,** $SrMnO_4$ Insol in H_2O (Fromherz)**Permanganic acid**

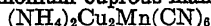
See Permanganic acid

Manganicyanhydric acid, $H_3Mn(CN)_6$

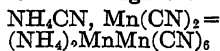
Not known in the free state

Barium manganicyanide, $Ba_3[Mn(CN)_6]_2$ Sol in H_2O (Fittig and Eaton)**Barium potassium manganicyanide barium cyanide,** $2KBaMn(CN)_6, 3Ba(CN)_2 + 8H_2O$ Decomp by H_2O (Lehmann, Dissert 1898)**Calcium manganicyanide,** $Ca_3[Mn(CN)_6]_2$ Sol in H_2O (Fittig and Eaton)**Potassium manganicyanide,** $K_3Mn(CN)_6$ Sol in H_2O (Christensen, J pr (2) 31 163)**Sodium manganicyanide,** $Na_3Mn(CN)_6 + 2H_2O$ Sol in H_2O (Fittig and Eaton)**Manganumanganic acid****Barium manganumanganate,** $Ba_3Mn_2O_8 + H_2O$ Insol in H_2O Identical with Rosenstiehl's "basic barium manganate," (J Pharm 1864, 46 344) (Auger and Billy, C R 1904, 138 501)**Lithium manganumanganate,** $Li_3Mn_2O_8 + H_2O$ Insol in H_2O (Auger and Billy)**Manganoperiodic acid,** H_2O, Mn_2O_3, I_2O_7 Wholly insol in H_2O , in hot dil or conc HNO_3 and in hot dil H_2SO_4 (Price, Am Ch J 1903, 30 182)**Potassium manganoperiodate,** K_2O, Mn_2O_3, I_2O_7 Apparently entirely insol and unchanged when boiled with H_2O , dil or conc HNO_3 , or dil H_2SO_4 (Price)**Sodium manganoperiodate,** Na_2O, Mn_2O_3, I_2O_7 Apparently insol and unchanged when treated with boiling H_2O , boiling dil or conc HNO_3 and boiling dil H_2SO_4 (Price)**Manganocyanhydric acid,** $H_4Mn(CN)_6$

Most easily decomp Sl sol in alcohol Insol in ether (Descamps, A ch (5) 24 185)

Ammonium cuprous manganocyanide,

Sol in H_2O , decomp by acids and alkalis, very unstable (Straus, Z anorg 1895, 9 14)

Ammonium manganous manganocyanide,

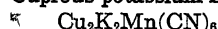
Sol in $\text{NH}_4\text{CN} + \text{Aq}$ (Fittig and Eaton, A 145 157)

Barium manganocyanide, $\text{Ba}_2\text{Mn}(\text{CN})_6$

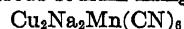
Sol in cold H_2O (Fittig and Eaton)

Calcium manganocyanide, $\text{Ca}_2\text{Mn}(\text{CN})_6$

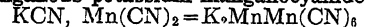
Very deliquescent Sol in H_2O , insol in alcohol (Fittig and Eaton)

Cuprous potassium manganocyanide,

Sol in H_2O with sl decomp Easily decomp by acids and alkalis (Straus, Z anorg 1895, 9 12)

Cuprous sodium manganocyanide,

Sol in H_2O with only sl decomp Partially decomp by acids (Straus)

Manganous potassium manganocyanide,

Ppt Sol in $\text{KCN} + \text{Aq}$

Potassium manganocyanide, $\text{K}_4\text{Mn}(\text{CN})_6 + 3\text{H}_2\text{O}$

Very efflorescent Sol in H_2O , decomp by boiling

Potassium manganocyanide chloride,

Easily sol in H_2O (Descamps)

Sodium manganocyanide, $\text{Na}_4\text{Mn}(\text{CN})_6 + 8\text{H}_2\text{O}$

Very efflorescent Easily sol in H_2O (Fittig and Eaton)

Strontium manganocyanide, $\text{Sr}_2\text{Mn}(\text{CN})_6$

As the Ba comp (Descamps)

Permanganomolybdic acid

See Permanganomolybdic acid

Permanganotungstic acid

See Permanganotungstic acid

Manganosulphuric acid

See Sulphate, manganic

Manganous acid, $\text{H}_2\text{MnO}_3 = \text{MnO}_2, \text{H}_2\text{O}$

Insol in H_2O (Franke, J pr (2) 36 451)
 $2\text{MnO}_2, \text{H}_2\text{O}$ (?) Min Wad

Barium manganite, $\text{BaO}, 5\text{MnO}_2$

Sl sol in $\text{HCl} + \text{Aq}$, less sol in $\text{HNO}_3 + \text{Aq}$ (Rissler, Bull Soc (2) 30 111)

$\text{BaO}, 7\text{MnO}_2$ (Rousseau, C R 104 786)

$\text{BaO}, 2\text{MnO}_2$ Insol in H_2O

BaO, MnO_2 Insol in H_2O (Rousseau, C R 102 425)

$\text{Ba}(\text{H}_2\text{Mn}_2\text{O}_{10})_2$ (Morawski and Stengl, J pr (2) 18 92)

Calcium manganite, $\text{CaO}, 5\text{MnO}_2$

Easily sol in $\text{HCl} + \text{Aq}$, less in $\text{HNO}_3 + \text{Aq}$ (Rissler)

$3\text{CaO}, \text{MnO}_2$ (?) Decomp by H_2O Sol in $\text{HCl} + \text{Aq}$ with evolution of Cl Scarcely sol in cold HNO_3 , but sol on heating (Du fau, A ch 1897, (7) 12 275)

$2\text{CaO}, \text{MnO}_2$ Sol in dil mm acids (Rousseau, C R 116 1060)

$\text{CaO}, 2\text{MnO}_2$ (Rousseau, C R 102 425)

$\text{CaO}, 3\text{MnO}_2$

CaO, MnO_2 Sol in fuming $\text{HCl} + \text{Aq}$, but not in dil $\text{HNO}_3 + \text{Aq}$ (Rousseau, C R 116 1060)

Chromium manganite, $\text{Cr}_2\text{O}_3, 3\text{MnO}_2 = \text{Cr}_2(\text{MnO}_3)_3$

Slowly decomp by acids (Groger, Z anorg 1905, 44 458)

Cobaltous manganite, $\text{CoO}, \text{MnO}_2 + 2\text{H}_2\text{O}$

Ppt (Salinger, Z anorg 1903, 33 352)
 $+ 4\text{H}_2\text{O}$ Ppt (Salinger)

Cobalt copper manganite, $\text{CoO}, \text{CuO}, 2\text{MnO} + 4\text{H}_2\text{O}$

Min *Asbolite* Sol in $\text{HCl} + \text{Aq}$, with evolution of Cl

Cupric manganite, $\text{CuO}, 4\text{MnO}$

(Gorgeu, Bull Soc 1903, (3) 29 1167)

$\text{CuO}, 8\text{MnO}_2 + 3\text{H}_2\text{O}$ (Baubigny, C R 1897, 124 955)

Cupric manganous manganite, $4\text{CuO}, \text{MnO} 7\text{MnO}_2 + 8\text{H}_2\text{O}$

Ppt (Salinger, Dissert 1902)

$\text{Mn}_2\text{O}_3, 3\text{CuO}$ Sol in $\text{HCl} + \text{Aq}$ (Schneider, Am Ch J 9 269)

Lead manganite, $\text{PbO}, 5\text{MnO}_2$

Not attacked by conc acids, sol in aqu regia (Rissler)

Magnesium manganite, $2\text{MgO}, \text{MnO}_2$

(Lemone, Ann Min (7) 3 5)

$+ x\text{H}_2\text{O}$ (Vollard)

Manganous manganite, $\text{Mn}_2\text{O}_3 = \text{MnO}, 2\text{MnO}_2$

(Reissig, A 103 27)

$\text{Mn}_2\text{O}_{11} = \text{MnO}, 5\text{MnO}_2$ (Veley, Chen Soc 38 581)

$3\text{MnO}_2, 2\text{MnO}$ Decomp by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Franke, J pr (2) **36** 166)
 $3\text{MnO}_2, \text{MnO} + \text{H}_2\text{O}$ Min *Varnvite*

Manganous zinc manganite, $\text{MnO}, \text{ZnO}, \text{MnO}_2$
 (Gorgeu, Bull Soc 1903, (3) **29** 1168)
 $2\text{MnO}, \text{ZnO}, 2\text{MnO}_2$ (Gorgeu)

Potassium manganite, $\text{K}_2\text{O}, 2\text{MnO}_2$
 Insol in H_2O
 $\text{K}_2\text{O}, 5\text{MnO}_2$
 $\text{K}_2\text{O}, 7\text{MnO}_2 + 3\text{H}_2\text{O}$
 $\text{K}_2\text{O}, 8\text{MnO}_2 + 3\text{H}_2\text{O} = \text{KH}_3\text{Mn}_4\text{O}_{10}$ (Morawski and Stingl, J pr (2) **13** 91)
 Does not exist (Wright and Menke, Chem Soc **37** 22)
 $\text{K}_2\text{O}, 10\text{MnO}_2$
 $\text{K}_2\text{O}, 16\text{MnO}_2 + 6\text{H}_2\text{O}$ Sol in conc $\text{HCl} + \text{Aq}$ (Rousseau, C R **114** 72)

Silver manganite, $\text{AgH}_3\text{Mn}_4\text{O}_{10}$
 (Morawski and Stingl, J pr (2) **13** 92)
 Ag_2MnO_3 Ppt (Gorgeu, C R **110** 958)

Silver (argenteous) manganite, $\text{Ag}_4\text{O}, \text{Mn}_2\text{O}_3$ (?)
 Insol in cold dil $\text{HNO}_3 + \text{Aq}$, and separates Mn_2O_3 on warming. Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rose, Pogg **101** 229)

Silver (argentoargentic) manganite, $\text{Ag}_4\text{O}, 2\text{Ag}_2\text{O}, \text{Mn}_2\text{O}_3$ (?)
 (Rose)

Sodium manganite, $\text{Na}_2\text{O}, 5\text{MnO}_2$
 Insol in H_2O (Rousseau, C R **103** 261)
 $\text{Na}_2\text{O}, 12\text{MnO}_2$ Insol in H_2O (Rousseau)
 $+ 4\text{H}_2\text{O}$ (Rousseau, C R **112** 525)
 $\text{Na}_2\text{O}, 8\text{MnO}_2 + 5\text{H}_2\text{O}$ (Rousseau)
 $\text{Na}_2\text{O}, 16\text{MnO}_2 + 8\text{H}_2\text{O}$ (Rousseau)

Strontium manganite, MnO_2, SrO
 Insol in H_2O
 $2\text{MnO}_2, \text{SrO}$ Insol in H_2O (Rousseau, C R **101** 167)
 $\text{MnO}_2, 5\text{SrO}$ Sol in HCl , or $\text{HNO}_3 + \text{Aq}$ (Russler, Bull Soc (2) **30** 110)

Zinc manganite, $\text{ZnO}, 5\text{MnO}_2$
 Insol in H_2O (Russler)
 $\text{ZnO}, 4\text{MnO}_2$ (Gorgeu, Bull Soc 1903, (3) **29** 1168)
 $3\text{ZnO}, \text{MnO}_2 + 7\frac{1}{2}\text{H}_2\text{O}$ (Salinger, Dissert **1902**)
 $27\text{ZnO}, 2\text{MnO}_2 + 25\text{H}_2\text{O}$ Insol in H_2O (Salinger)

Manganyl chloride, MnO_3Cl
 Decomp by H_2O (Aschoff, J pr **81** 29)

Melanocobaltic chloride,
 $\text{Co}_2(\text{NH}_3)_6\text{Cl}_4\text{NH Cl}$, or
 $\text{Co}_2(\text{NH}_3)_6\text{Cl}_5\text{NH}_2$

Very sl sol in cold H_2O or very dil $\text{HCl} + \text{Aq}$. Decomp by long standing or warming. Cold conc HCl or dil $\text{H}_2\text{SO}_4 + \text{Aq}$ does not attack, but decomp on warming. $\text{HNO}_3 + \text{Aq}$ decomp on warming. Sol in cold H_2SO_4 or $\text{NH}_4\text{OH} + \text{Aq}$, from both solutions it can be precipitated by $\text{HCl} + \text{Aq}$ (Vortmann, B **10** 1455)

— **chloroplatinate**, $\text{Co}_2(\text{NH}_3)_6\text{NH}_2\text{Cl}_5$, PtCl_4
 Ppt (Vortmann, B **15** 1902)
 $\text{Co}_2(\text{NH}_3)_6\text{NH}_2\text{Cl}_5(\text{OH})_2$, PtCl_4 Ppt (Vortmann)

— **mercuric chloride**,
 $\text{Co}_2(\text{NH}_3)_6(\text{NH}_2)\text{Cl}_5(\text{OH})_2$, $3\text{HgCl}_2 + \text{H}_2\text{O}$

Ppt. Difficultly sol in cold H_2O , quite easily in warm H_2O acidified with HCl (Vortmann)

— **chloride chromate**,
 $\text{Co}_2(\text{NH}_3)_6\text{NH}_2\text{Cl}_5\text{Cr}_2\text{O}_7 + \text{H}_2\text{O}$
 Sol in hot H_2O (Vortmann)

Mercuriammonium comps

See Mercury ammonium comps

Mercuriammonium bromide, $\text{Hg}(\text{NH}_2)\text{Br}$
 See Dimercuriammonium ammonium bromide

Mercuriammonium chloride, $\text{Hg}(\text{NH}_2)\text{Cl}$
 See Dimercuriammonium ammonium chloride

Mercuriammonium oxydimercuriammonium chloride, $4\text{Hg}(\text{NH}_2)\text{Cl}, \text{NH}_2(\text{HgOHg})\text{Cl}$ (Millon)

Correct composition is Dimercuriammonium ammonium chloride, $\text{NHg}_2\text{Cl}, \text{NH}_4\text{Cl}$, which see (Balestra, Gazz ch it **21**, **2** 294)

$\text{Hg}(\text{NH}_2)\text{Cl}, 2\text{NH}_2(\text{HgOHg})\text{Cl}$ (Millon)
 Correct composition is Dimercuriammonium mercuric chloride, $2\text{NHg}_2\text{Cl}, \text{HgCl}_2 + \text{H}_2\text{O}$, or Dimercuriammonium hydrogen chloride, $\text{NHg}_2\text{Cl}, \text{HCl}$ (Balestra)

Mercuriammonium nitrate, $2\text{NH}_3, 2\text{HgO}, \text{N}_2\text{O}_5 = \text{NH}_2\text{HgNO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Easily decomp by HCl , or alkali sulphides + Aq . Sl sol in $\text{HNO}_3 + \text{Aq}$. Insol in H_2SO_4 , NH_4OH , or $\text{KOH} + \text{Aq}$ (Mitscherlich)

Is dimercuriammonium ammonium nitrate, $\text{NHg}_2\text{NO}_3, \text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$ (Pesci, Gazz ch it **20** 485)

Dimercuriammonium chloride, NH_2Cl

Not attacked by boiling H_2O . Sol attacked by cold dil $\text{HCl} + \text{Aq}$, but is gradually dissolved thereby. Decomp by hot $\text{KOH} + \text{Aq}$ (Weyl)

Sol in KI , or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ with evolution of NH_3

+ H_2O Nearly insol in H_2O , easily sol in HNO_3 , and $\text{HCl} + \text{Aq}$. Not decomp by $\text{KOH} + \text{Aq}$. Decomp by KCl , NaCl , or $\text{KI} + \text{Aq}$ (Rammelsberg, Pogg 48 181)

— hydrogen chloride, NH_2Cl , 2HCl

Correct composition of mercuric chloramide chloride (Balestra, Gazz ch it 21, 2 299)

Decomp by H_2O

NH_2Cl , HCl Decomp by H_2O (Balestra, l c)

NH_2Cl , 4HCl Sol in H_2O (Ray, Proc Chem Soc 1901, 17 96)

— ammonium chloride, NH_2Cl , NH_4Cl (Infusible white precipitate)

Correct composition of what has been called mercuric chloramide, $\text{Hg}(\text{NH}_2)\text{Cl}$ (Rammelsberg, J pr 38 558)

Insol in cold, decomp by hot H_2O (Milton, A ch (3) 18 413). Sol in 600 pts H_2O (Wittstein). Sol in 719.98 pts H_2O at 18.75° (Abt). Insol in alcohol

Sol in acids, even in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, also in NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, and $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Pelouze and Fremy)

Sol in warm NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Sl sol in alkali chlorides + Aq , which partially decomp (Miahle, A ch (3) 5 180)

Decomp by $\text{KOH} + \text{Aq}$. Sol in KI , or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$, with evolution of NH_3 (Balestra)

When freshly prepared is sol in conc, $\text{NH}_4\text{OH} + \text{Aq}$ (Schn and Choudhuri, Z anorg 1910, 67 359)

Sol in excess of $(\text{NH}_4)_2\text{HPO}_4 + \text{Aq}$. Insol in excess of $\text{Na HPO}_4 + \text{Aq}$ (Carnegie and Burt, C N 1897, 76 175)

Insol in excess of $\text{NH}_4\text{OH} + \text{Aq}$ (Carnegie and Burt)

 NH_2Cl , $3\text{NH}_4\text{Cl}$ (Fusible white precipitate)

Correct composition of what has been called mercuridammonium chloride, $\text{Hg}(\text{NH}_2)\text{Cl}_2$ (Rammelsberg, J pr (2) 38 558)

Decomp by hot H_2O . Sol in acids, even $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$. Not decomp by cold, but by boiling $\text{KOH} + \text{Aq}$ (Weyl)

Sol in warm, less in cold $\text{NH}_4\text{OH} + \text{Aq}$ (Mitscherlich)

Sol in KI , or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$, with evolution of NH_3 (Balestra)

Sol in 10% HNO_3 , H_2SO_4 and acetic acid (Hofmann and Marburg, A 1899, 305 198)

Dimercuriammonium mercuric chloride, $2\text{NH}_2\text{Cl}$, HgCl_2

Insol in, and not decomp by boiling H_2O , alkalies, conc HNO_3 , or dil $\text{H}_2\text{SO}_4 + \text{Aq}$. Sol in boiling $\text{HCl} + \text{Aq}$ (Mitscherlich, J pr 19 453)

Sl decomp by H_2O , readily by $\text{KOH} + \text{Aq}$ (Gaudechon, A ch 1911, (8) 22 212)

Ppt Sol in HBr (Ray, Proc Chem Soc 1902, 18 86)

— chloride ammonia, NH_2Cl , $\frac{1}{2}\text{NH}_3$

Decomp by water and by $\text{NH}_4\text{OH} + \text{Aq}$ (Gaudechon, A ch 1911, (8) 22 212)

— chromate

See Oxydmercuriammonium chromate

— hydroxide, NH_2OH

Takes up H_2O to form $\text{NH}_2\text{OH} + \text{H}_2\text{O}$ or $(\text{NH}_2\text{OH})_2\text{OH}$, oxydmercuriammonium hydroxide, which also see

Sol in warm HCl or $\text{HNO}_3 + \text{Aq}$

— iodate, NH_2IO_3 , $2\text{NH}_4\text{IO}_3$

Insol in HNO_3 (Rammelsberg, J pr (2) 38 568)

— iodide, NH_2I

Insol in H_2O . Sol in $\text{HCl} + \text{Aq}$. Decomp by boiling with $\text{KOH} + \text{Aq}$ or $\text{KCl} + \text{Aq}$ (Weyl, Pogg 121 601). Decomp by hot KI , or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Balestra)

Decomp by dilute HCl . Sol in ammonium salts + Aq (Franklin, Z anorg 1905, 46 21)

+ H_2O See Oxydmercuriammonium iodide

— ammonium iodide, NH_2I , $3\text{NH}_4\text{I}$

Correct composition of mercuridammonium iodide, $\text{Hg}(\text{NH}_2)_2\text{I}_2$ (Pesci, Gazz ch it 20 485)

$3\text{NH}_2\text{I}$, $8\text{NH}_4\text{I}$, 4HgI_2 Correct formula for mercuridammonium mercuric iodide, $\text{Hg}(\text{NH}_2)_2\text{I}_2$, HgI_2 (Pesci)

— nitrate, NH_2NO_3

Insol in H_2O (Rammelsberg, J pr (2) 38 566)

Sol in KI , or $\text{N}_2\text{S O}_3 + \text{Aq}$, with evolution of NH_3 (Balestra, Gazz ch it 22, 2 560)

+ H_2O (Hofmann and Marburg, A 1899, 305 212)

Sl sol in HNO_3 (Ray, Z anorg 1902, 33 209)

— ammonium nitrate, NH_2NO_3 , NH_4NO_3 + H_2O

Correct formula for mercuridammonium nitrate, $\text{NH}_2\text{HgNO}_3 + \frac{1}{2}\text{H}_2\text{O}$ (Pesci, Gazz ch it 20 485)

NH_2NO_3 , $2\text{NH}_4\text{NO}_3 + 2\text{H}_2\text{O}$ Correct for-

Mercuriammonium oxydimercuri ammonium nitrate, 3HgO , 2NH_3 , $\text{N}_2\text{O}_5 = \text{NH}_2\text{HgNO}_3$ (NH_4OH) $_2\text{NO}_3 + \text{H}_2\text{O}$

Decomp by boiling with H_2O , which dissolves out NH_4NO_3 . Sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ containing NH_4OH (Mitscherlich)

Is *dimercuri ammonium ammonium nitrate*, $3\text{NH}_4\text{NO}_3$, $\text{NH}_4\text{NO}_3 + 2\text{H}_2\text{O}$ (Pesci, Gazz ch it 20 485)

Mercuriammonium oxydimercuri ammonium sulphate, $(\text{NH}_2\text{Hg})_2\text{SO}_4$, $3(\text{NH}_4\text{OH})_2\text{SO}_4$

Boiling H_2O dissolves out H_2SO_4 . Gradually decomp by boiling $\text{KOH} + \text{Aq}$. Completely sol in $\text{NH}_4\text{Cl} + \text{Aq}$. Sol in conc or dil HCl , or very dil $\text{H}_2\text{SO}_4 + \text{Aq}$. Insol in conc or dil $\text{HNO}_3 + \text{Aq}$ or conc H_2SO_4 (Schneider)

Correct formula is $7(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{SO}_4 + 12\text{H}_2\text{O}$, *dimercuri ammonium ammonium sulphate* (Pesci, Gazz ch it 20 485)

Mercuridiammonium chloride (fusible white precipitate), $\text{Hg}(\text{NH}_4)_2\text{Cl}_2$

Is *dimercuri ammonium ammonium chloride*, Hg_2NCl , $3\text{NH}_4\text{Cl}$, which see (Rammelsberg J pr 38 558)

Mercuridiammonium mercuric chloride,

$\text{Hg}(\text{NH}_4)_2\text{Cl}_2$, HgCl

Insol in H_2O , but gradually decomp by boiling therewith (Rose, Pogg 20 158)
Partly sol in H_2O (Kane)

Mercuridiammonium iodide, $\text{Hg}(\text{NH}_4)_2\text{I}_2$

H_2O extracts all the NH_3 . Partly sol in little alcohol. Partly sol in ether without decomp (Nessler)

Correct composition is *dimercuri ammonium ammonium iodide*, NH_4I , $3\text{NH}_4\text{I}$ (Pesci, Gazz ch it 20 485)

Mercuridiammonium cupric iodide, 4NH_3 , CuI_2 , HgI_2

Decomp by H_2O . Sol in alcohol + $\text{HC H}_3\text{O}_2$ (Jorgensen, J pr (2) 2 347)
 $2\text{Hg}(\text{NH}_4)_2\text{I}$ CuI (Decomp by H_2O) (Jorgensen)

Mercuridiammonium iodide, $\text{Hg}(\text{NH}_4)_2\text{I}$

Decomp by H_2O . Partly sol in a little alcohol. Partly sol in ether (Nessler)

Correct composition is *dimercuri ammonium ammonium iodide* NH_4I , $3\text{NH}_4\text{I}$ (Pesci)

Mercuridiammonium mercuric iodide,

$\text{Hg}(\text{NH}_4)_2$, HgI_2 , or NH_3 , HgI_2

Decomp by H_2O or dil acids (Caillot and Corniol, J Pharm 9 381)

Correct composition is *dimercuri ammonium ammonium mercuric iodide*, $3\text{NH}_4\text{I}$, $8\text{NH}_4\text{I}$, 4HgI (Pesci, Gazz ch it 20 485)

Mercuridiammonium sulphate, $\text{Hg}(\text{NH}_4)_2\text{SO}_4$

Decomp with H_2O

Does not exist (Pesci, Gazz ch it 20 485)

+ H_2O Decomp, by H_2O . Easily sol in HCl , very dil $\text{H}_2\text{SO}_4 + \text{Aq}$, or $\text{HNO}_3 + \text{Aq}$. Insol in conc $\text{HNO}_3 + \text{Aq}$. Sol in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ or $\text{NH}_4\text{Cl} + \text{Aq}$. Decomp by $\text{KOH} + \text{Aq}$ (Schneider, J pr 75 136)

Correct composition is $(\text{NH}_4)_2\text{SO}_4$, $3(\text{NH}_4)_2\text{SO}_4 + 12\text{H}_2\text{O}$, *dimercuri ammonium ammonium sulphate* (Pesci)

Dimercuri ammonium acetate,

$\text{NH}_2\text{C}_2\text{H}_3\text{O}_2$

Insol in H_2O or alcohol. Sol in HCl or $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Balestra, Gazz ch it 22, 2 563)

Dimercuri ammonium ammonium acetate

$\text{NH}_2\text{C}_2\text{H}_3\text{O}_2$, $3\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{H}_2\text{O}$

Deliquescent, sol in a little H_2O without decomp, but decomp into $\text{NH}_2\text{C}_2\text{H}_3\text{O}_2$ and $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ by excess of H_2O (Balestra)

— **arsenate**, $\text{NH}_2\text{H}_2\text{AsO}_4$

(Hirzel, Zeit Pharm 1863 3)

— **bromate**, $\text{NH}_2\text{BrO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$

Ppt (Rammelsberg, Pogg 55 82)

Is *oxydimercuri ammonium bromate*, $(\text{NH}_2\text{Hg O})\text{BrO}_3$

— **bromide**, NH_2Br

Insol in H_2O or HNO_3 . Sol in $\text{HCl} + \text{Aq}$ (Pesci, Gazz ch it 19 509)

Sol in KI , or $\text{Na}_2\text{S O}_3 + \text{Aq}$ with evolution of NH_3 (Balestra, Gazz ch it 22, 2 558)

Sol in ammoniacal solutions of ammonium salts and in aq acids (Franklin J Am Chem Soc 1905, 27 839)

— **ammonium bromide**, NH_4Br , NH_4Br

Decomp by H_2O (Pesci, Gazz ch it 19 511)

$4\text{NH}_4\text{Br}$, $5\text{NH}_4\text{Br}$. Decomp by H_2O . Insol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$. Sol in conc or dil $\text{HCl} + \text{Aq}$. Insol in $\text{HNO}_3 + \text{Aq}$ (Pesci)

NH_4Br , $3\text{NH}_4\text{Br}$. Decomp by H_2O . Easily sol in $\text{HCl} + \text{Aq}$. Insol in alcohol (Pesci)

Sol in NH_4Br , NH_4Cl , or $\text{NH}_4\text{I} + \text{Aq}$ sol in KI , or $\text{Na}_2\text{S O}_3 + \text{Aq}$

— **mercuric bromide**, $2\text{NH}_4\text{Br}$, HgBr_2

Ppt. Sol in HBr and in HCl (Ray Chem Soc 1902, 81 649)

— **carbonate**, $(\text{NH}_4)_2\text{CO}_3 + 2\text{H}_2\text{O}$

Ppt. Not decomp by $\text{KOH} + \text{Aq}$, but easily by K_2S , or $\text{KI} + \text{Aq}$ (Rammelsberg J pr (2) 38 567)

mula for oxydmercuriammonium ammonium nitrate, $(\text{NHg}_2\text{OH}_2)\text{NO}_3$, $2\text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$ (Pesci)

NHg_2NO_3 , $3\text{NH}_4\text{NO}_3$ Decomp by cold H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Pesci)

$3\text{NHg}_2\text{NO}_3$, $\text{NH}_4\text{NO}_3 + 2\text{H}_2\text{O}$ Correct formula for mercuriammonium oxydmercuriammonium nitrate, NH_2HgNO_3 , $(\text{NHg}_2\text{OH}_2)\text{NO}_3 + \text{H}_2\text{O}$ (Pesci)

Dimercuriammonium nitrite, NHg_2NO_2

Readily sol in warm HCl or HBr (Rây, Chem Soc 1902, 81 648)

$+ \frac{1}{2}\text{H}_2\text{O}$ Ppt Sol in HCl (Rây, Proc Chem Soc 1902, 18 85)

$+ \text{H}_2\text{O}$ (Hofmann and Marburg, A 1899, 305 214)

— oxide, $(\text{NHg}_2)_2\text{O}$

Slowly decomp by H_2O Sol in HCl , or $\text{HNO}_3 + \text{Aq}$ Decomp by hot KOH , or $\text{KCl} + \text{Aq}$ (Weyl, Pogg 121 601)

Sol in $\text{KCN} + \text{Aq}$ by heating 4-5 hours at 130° Not completely sol in HCl owing to formation of Hg_2Cl_2 (Gaudechon, C R 1907, 144 1419)

— phosphate, $(\text{NHg}_2)_2\text{PO}_4$, $2\text{NHg}_2\text{OH} +$

sberg, J pr (2) 38 567)

mercuriammonium phosphate

— ammonium salicylate,

$2\text{NHg}_2\text{C}_6\text{H}_4\text{OHC}\text{O}_2$, $5\text{NH}_4\text{C}_6\text{H}_4\text{OHC}\text{O}_2$

Decomp by H_2O Sol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$, HCl , or $\text{KI} + \text{Aq}$ (Balestra)

— selenate, $(\text{NHg}_2)_2\text{SeO}_4 + 2\text{H}_2\text{O}$

Ppt Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Cameron and Davy, C N 44 63)

— sulphate, $(\text{NHg}_2)_2\text{SO}_4 + 2\text{H}_2\text{O}$

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$ (Rammelsberg, J pr (2) 38 565) Sol (Kane), insol (Hirzel) in $\text{HNO}_3 + \text{Aq}$

Sol in KI , or $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ with evolution of NH_3 (Balestra)

$+ \text{H}_2\text{O}$ Insol in H_2O , sol in HCl (Rây, Chem Soc 1905, 87 9)

— ammonium sulphate, $(\text{NHg}_2)_2\text{SO}_4$,

$3(\text{NH}_4)_2\text{SO}_4 + 4\text{H}_2\text{O}$

Correct formula for mercuridiammonium sulphate, 2NH_3 , HgO , $\text{SO}_3 + \text{H}_2\text{O}$ (Pesci, Gazz ch it 20 485)

$5(\text{NHg}_2)_2\text{SO}_4$, $14(\text{NH}_4)_2\text{SO}_4 + 16\text{H}_2\text{O}$ (Pesci)

$7(\text{NHg}_2)_2\text{SO}_4$, $(\text{NH}_4)_2\text{SO}_4 + 12\text{H}_2\text{O}$ Correct formula for mercuriammonium oxydmercuriammonium sulphate, $(\text{NHg}_2)_2\text{SO}_4$, $3(\text{NHg}_2\text{OH}_2)_2\text{SO}_4$ (Pesci)

Dimercuriammonium tartrate,

$(\text{NHg}_2)_2\text{C}_4\text{H}_4\text{O}_6 + 2\frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O Sol in HCl , KI , $\text{Na}_2\text{S}_2\text{O}_3$, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$, or $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6 + \text{Aq}$ (Balestra, Gazz ch it 22, 2 563)

— ammonium tartrate, $2(\text{NHg}_2)_2\text{C}_4\text{H}_4\text{O}_6$, $(\text{NH}_4)_2\text{C}_4\text{H}_4\text{O}_6 + \text{H}_2\text{O}$

As above (B)

Trimercuriammonium sulphate,

$(\text{NHg}_2)(\text{NHg}_2\text{Hg})\text{SO}_4 + 2\text{H}_2\text{O}$

Decomp by H_2O (Millon)

Does not exist (Pesci, Gazz ch it 20 485)

Dimercuriarsonium mercuric chloride,

$\text{AsHg}_3\text{Cl}_3 = \text{AsHg}_2\text{Cl}$, HgCl_2

Decomp by H_2O Decomp by warm $\text{HNO}_3 + \text{Aq}$ (Rose, Pogg 51 423)

Mercurimidosulphonic acid,

$(\text{HO}_2\text{S})_2\text{N}_2\text{Hg}$

Very unstable (Berglund, B 9 256)

Barium mercurimidosulphonate,

$\text{Ba}_2(\text{SO}_3)_4\text{N}_2\text{Hg} + 5\text{H}_2\text{O}$

(Berglund, B 9 256)

Cadmium —, $\text{Cd}_2\text{HgN}_2(\text{SO}_3)_4 + 12\text{H}_2\text{O}$

Unstable, sl sol in H_2O (Berglund, Bull Soc (2) 25 452)

Cobalt —, $\text{Co}_2\text{HgN}_2(\text{SO}_3)_4 + 15\text{H}_2\text{O}$

Sol in H_2O (B)

Copper —, $\text{Cu}_2\text{HgN}_2(\text{SO}_3)_4 + 15\text{H}_2\text{O}$

Very sol in H_2O (B)

Magnesium —, $\text{Mg}_2\text{HgN}_2(\text{SO}_3)_4 + 15\text{H}_2\text{O}$

Very sol in H_2O (B)

Manganous —, $\text{Mn}_2\text{HgN}_2(\text{SO}_3)_4 + 10\text{H}_2\text{O}$

Unstable (B)

Mercuric —, $(\text{Hg}_2\text{O})_2\text{HgN}_2(\text{SO}_3)_4$

Nearly insol in H_2O (B)

Nickel —, $\text{Ni}_2\text{HgN}_2(\text{SO}_3)_4 + 15\text{H}_2\text{O}$

(B)

Potassium —, $(\text{KO}_2\text{S})_4\text{N}_2\text{Hg} + 4\text{H}_2\text{O}$

Precipitate (Raschig, A 241 161)

Potassium silver —, $(\text{AgSO}_3)_2(\text{KSO}_3)_2\text{HgN}_2 + 3\text{H}_2\text{O}$

Sl sol in H_2O (Berglund)

Sodium —, $(\text{NaSO}_3)_4\text{HgN}_2 + 5\text{H}_2\text{O}$

More sol in H_2O than K salt (Berglund)

Strontium —, $\text{Sr}_2(\text{SO}_3)_4\text{HgN}_2 + 15\text{H}_2\text{O}$

More sol than Ba salt (B)

Zinc mercuriodisulphonate,
 $\text{Zn}_2(\text{SO}_3)_4 \cdot \text{HgN}_2 + 15\text{H}_2\text{O}$

Very sol in H_2O (B)

Dimercuriphosphonium mercuric bromide, $2\text{PHg}_2\text{Br}$, HgBr_2
 (Lemoult, C R 1907, 145 1176)

Dimercuriphosphonium mercuric chloride,
 HgCl_2 , PHg_2Cl
 (Lemoult, C R 1907, 145 1176)
 $+1\frac{1}{2}\text{H}_2\text{O}$ Decomp by hot, slowly by cold H_2O into Hg , HCl , and H_3PO_3 . Decomp by acids or alkalis (Rose, Pogg 40 75)

Dimercuriphosphonium mercuric iodide,
 HgI_2 , PHg_2I

Slowly decomp by cold or warm H_2O , quickly by $\text{MOH} + \text{Aq}$. Not attacked by HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$. Rapidly attacked by HNO_3 and aqua regia (Lemoult, C R 1904, 139 479)

Dimercuriphosphonium mercuric nitrate,
 P_2Hg_3 , 6HgO , $3\text{N}_2\text{O}_5 = 2[\text{PHg}_2\text{NO}_3]$,
 $\text{Hg}(\text{NO}_3)_2$, 3HgO
 (Rose, Pogg 40 75)

Dimercuriphosphonium mercuric sulphate,
 P_2Hg_3 , 6HgO , $4\text{SO}_3 + 4\text{H}_2\text{O} = (\text{PHg}_2)_2\text{SO}_4$,
 3HgSO_4 , $2\text{HgO} + 4\text{H}_2\text{O}$
 Sol in aqua regia (Rose, Pogg 40 75)

Mercuric acid

Calcium mercurate (?)

(Berthollet, A ch 1 61)

Potassium mercurate, K_2O , 2HgO

Gradually decomp by H_2O , less rapidly by absolute alcohol (St Meumer, C R 60 557)

Sodium mercurate, Na_2O , HgO

(Bettokoff, Bull Soc (2) 34 328)

Mercuroammonium chloride,

$\text{Hg}(\text{NH}_3)\text{Cl}$

(Rose, Pogg 20 158)

Mixture of Hg , HgNH_2Cl , and NH_4Cl
 (Barfoed, J pr (2) 39 201)

— **nitrate,** $(\text{NHg}_2\text{H}_2)\text{NO}_3$, "*Hahnemann's soluble mercury*"

Sol in hot HCl , and $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$. Decomp by $\text{NH}_4\text{OH} + \text{Aq}$, or NH_4 salts + Aq . Probably mixture of mercurous salts and Hg

Mercurodiammonium chloride,

$\text{Hg}_2(\text{NH}_3)_2\text{Cl}_2$

Easily decomp (Rose, Pogg 20 158)

Mixture of Hg , NH_2HgCl , and NH_4Cl
 (Barfoed, J pr (2) 39 201)

Mercurodiammonium fluoride,
 $\text{Hg}_2(\text{NH}_3)_2\text{F}_2$ (?)

Decomp by H_2O (Finkener, Pogg 110 147)

Mercurosulphonic acid

Mercurosulphonates, $\text{Hg}(\text{SO}_3\text{M})_2$

Correct composition for the double sulphates, HgSO_3 , M_2SO_3 (Divers and Shimidzu, Chem Soc 49 583, Barth, Z phys Ch 9 195)

Mercuroxy-comps

See Oxymercur-comps

Mercury, Hg

Not attacked by H_2O . Not attacked by boiling conc HCl or dil $\text{H}_2\text{SO}_4 + \text{Aq}$. Easily sol in dil or conc $\text{HNO}_3 + \text{Aq}$, also in HBr or $\text{HI} + \text{Aq}$

Not attacked by pure HNO_3 unless heated, but readily attacked by cold dil $\text{HNO}_3 + \text{Aq}$ containing NO (Millon)

Anhydrous H_2SO_4 attacks Hg gradually at ord temp (Berthelot, C R 1897, 125 749)

H_2SO_4 attacks only when hot and conc (Ditte, A ch 1890, (6) 19 68)

Conc H_2SO_4 does not attack dry or moist Hg either with or without air (Pitman, J Am Chem Soc 1898, 20 100)

H_2SO_4 attacks Hg at 20° if it contains 99.7%, does not attack if it contains only 95.6% (Baskerville, J Am Chem Soc 1898, 20 515)

Insol in $\text{H}_2\text{SO}_3 + \text{Aq}$ alone or in presence of HCl or dil H_2SO_4 (Berthelot, A ch 1898, (7) 14 198)

Not attacked by $\text{HF} + \text{Aq}$ at any temp (Gay-Lussac)

HI dissolves Hg rapidly at ord temp (Norris and Cottrell, Am Ch J 1896, 18 99)

More rapidly attacked by $\text{HBr} + \text{Aq}$ than by $\text{HCl} + \text{Aq}$. Rapidly acted upon by HI in absence of O (Bailey, Chem Soc 1888, 53 760)

Not attacked by pure $\text{HCl} + \text{Aq}$, but in presence of O , $\text{Hg}_2\text{OCl} + \text{H}_2\text{O}$ is formed. Action is apparently less in sunlight than in the dark (Bailey, Chem Soc 1888, 53 759)

Small amts of ferric salts hinder action of HNO_3 on Hg , but it is hastened by presence of $\text{Mn}(\text{NO}_3)_2$ or NaNO_3 (Rav, Chem Soc 1911, 99 1015)

HNO_3 under 33% does not attack Hg if metal and acid are kept in motion and HNO_2 is absent (Veley, B 1895, 28 928)

Rapidly sol in HClO (Balard, Dissert 1834)

Alkali chlorides + Aq in presence of air decomp Hg , action is not increased by heat (Miahle)

Insol in alkali chlorides + Aq in neutral or

alkaline solution (Bhaduri, Z anorg 1897, 13 407)

Very sol in conc solution of I in KI+Aq (Varet, Bull Soc 1897, (3) 17 451)

Slowly sol in KCl or KI+Aq in presence of air (Palmaer, Z phys Ch 1907, 59 136)

Slowly sol in Na_2S +Aq in presence of air (Palmaer, Z phys Ch 1907, 59 137)

Hg is appreciably sol in the sulpho salts of Mo, W, V, As, Sb and Sn (Storch, B 1883, 16 2015)

Persulphates in alkali or neutral solution attack Hg (NH_4)₂S₂O₈ in NH_4OH solution has strongest action This dissolves Hg by repeated shaking at high temp (Tarugi, Gazz ch it 1903, 33, (1) 127)

Insol in KCN+Aq (Elmer, J pr 1888, (2) 37 442)

Slowly sol in KCN+Aq in presence of air (Palmaer, Z phys Ch 1907, 59 136)

Sol in considerable quantity in 6% KCN+Aq (Goyder, C N 1894, 69 268)

Most sol in $\text{K}_4\text{Fe}(\text{CN})_6$ +Aq when KOH is present (Smith, J Am Chem Soc 1905, 27 544)

Hg dissolves in Br_2 in the presence of KBr sl faster than in I_2 but in CuBr_2 much more slowly (Van Name and Edgar, Am J Sci 1910, (4) 29 255)

Not attacked by PCl_3 even at 350° (Moissan, A ch 1885 (6) 6 457)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0075 g Hg in 6 days (Gates, J phys Chem 1911, 15 143)

Mercurous acetylde, $\text{Hg}_2\text{C}_2+\text{H}_2\text{O}$

(Burkard and Travers, Chem Soc 1902, 81 1271)

Mercuric acetylde, basic, 2HgO , $3\text{HgC}_2+2\text{H}_2\text{O}$

(Burkard and Travers, Chem Soc 1902, 81 1272)

Mercuric acetylde, HgC_2

Very sol in HCl with evolution of H_2C_2 (Keiser, Am Ch J 1893, 15 535)

$+\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , alcohol and ether Sol in NH_4 acetate+Aq, and in KCN+Aq Sl attacked by cold HCl, easily by hot Easily sol in HNO_3 Dil H_2SO_4 attacks slowly, conc causes explosion (Plimpton and Travers, Chem Soc 1894, 65 267)

Mercuric acetylde chloride, HgC_2 , $\text{HgCl}_2+\frac{1}{2}\text{H}_2\text{O}$

Not acted upon by dil HCl Decomp by fuming HNO_3 or aqua regia Insol in alcohol and ether (Keiser, Am Ch J 1893, 15 538)

Mercuric acetylde mercuromercuric chloride, HgC_2 , HgCl , $\text{HgCl}_2+\text{H}_2\text{O}$

Insol in all ordinary solvents (Biltz and Mumm, B 1904, 37 4420)

Mercurous amidofluoride, HgNH_2F

Insol in H_2O , HNO_3 and H_2SO_4 Sol in dil HCl

Probably *dimercuriammonium ammonium fluoride*, NH_2F , NH_4F (Bohm, Z anorg 1904, 43 327)

Mercury ammonium comps

See—

Mercurioammonium comps, NH_2HgR

Dimercuroammonium comps, $\text{NH}_2\text{Hg}_2\text{R}$

Mercurous chloramide, $\text{Hg}(\text{NH}_2)\text{Cl}$

Dimercuriammonium comps, NH_2GR

Mercuric chlor-, brom-, etc, amide, $\text{Hg}(\text{NH}_2)\text{R}$

Mercuridiammonium comps, $\text{Hg}(\text{NH}_2)_2\text{R}$

Mercuriammonium comps, HgNH_2R

Dimercuridiammonium comps, $\text{Hg}_2\text{N}_2\text{H}_4\text{R}$

Trimercuriammonium comps, $\text{N}_2\text{H}_2\text{Hg}_3\text{R}$

Oxydimercuriammonium comps, $(\text{NH}_2\text{Hg}_2\text{O})\text{R}$

Mercurous arsinchloride, AsHgCl

Decomp by H_2O (Capitaine, J Pharm 25 559)

Mercurous arsinchloride chloride, $\text{AsHg}_2\text{Cl}_2=2\text{AsHgCl}$, Hg_2Cl_2 (?)

Decomp by H_2O (Capitaine)

Mercurous azoimide, HgN_3

Wholly insol in H_2O (Curtius, B 24 3324)

1 l H_2O dissolves 0.25 g (Wohler and Krupko, B 1913 46 2050)

Mercuric azoimide, HgN_6

Sol in H_2O especially when hot (Berthelot and Vieille, Bull Soc 1894, (3) 11 747)

Moderately sol in H_2O (Wohler and Krupko, B 1913, 46 2050)

Mercuric bromamide, $\text{Hg}(\text{NH}_2)\text{Br}$

Insol in H_2O and alcohol Sl sol in NH_4OH +Aq (Mitscherlich, J pr 19 455)

Correct composition is *dimercuriammonium ammonium bromide*, Hg_2NBr , NH_4Br , which see (Pesci, Gazz ch it 19 511)

Mercurous bromide, Hg_2Br_2

Solubility in $\text{H}_2\text{O}=9.1\times 10^{-7}$ g equiv per l (Bodlander, Z phys Ch 1898, 27 61)

Solubility in $\text{H}_2\text{O}=7\times 10^{-8}$ mols per liter at 25° (Sherrill, Z phys Ch 193, 430 735)

Solubility in H_2O at $25^\circ = 1.4 \times 10^{-7}$ equivalents per l (Thompson, J Am Chem Soc 1906, 28 762)

Insol in H_2O and dil acids Decomp by $HCl + Aq$ Sol in hot conc H_2SO_4 with evolution of SO_2 Sl sol in hot $HNO_3 + Aq$ of 1.42 sp gr (Stromann, B 20 2818)

Decomp into Hg and $HgBr_2$ by boiling with NH_4Br , or $NH_4Cl + Aq$, also by ammonium carbonate or succinate, but not by ammonium sulphate or nitrate (Wittstein)

Sol in $Hg(NO_3)_2 + Aq$ (Wackenroder, A 41 317)

Partially decomp by alkali chlorides + Aq , when out of contact of air this decomp is slight and $HgBr_2$ is formed, while in the air $HgCl_2$ is the resulting product Much more rapidly decomp in hot than cold solutions (Miahle, A ch (3) 5 177)

A solution of $HgBr$ in 0.1-N KBr contains about 1 mg Hg ions in 1300 l

Insol in alcohol

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Naumann, B 1904, 37 4329), (Eidmann, C C 1899, II 1014)

Mercuric bromide, $HgBr_2$

Sol in 250 pts H_2O at ordinary temp and 25 pts boiling H_2O (Wittstein) Sol in 240 pts H_2O at 18.75° (Abt)

Sol in 94 pts H_2O at 9° , and in 4-5 pts at 100° (Lassagne, J chim méd 12 177)

Solubility in g-equivalents per litre = 2×10^{-2} (Bodlander, Z phys Ch 1893, 27 61)

1 l H_2O dissolves about 4 g at ord temp (Morse, Z phys Ch 1902, 41 731)

1 l H_2O dissolves 0.017 mol at 25° (Jander, Dissert 1902)

Solubility in H_2O at $25^\circ = 0.017$ mol liter (Sherrill, Z phys Ch 1903, 43 735)

Solubility at ord temp = 0.8%, at bpt = 8-9% (Larinc, J Pharm 1904, (6) 20 450)

Solubility in cold $H_2O = 4\%$, but solution prepared by heating contains more Hg on account of decomp into HBr and oxybromide (Vicario, C C 1907, II 1224)

1 l H_2O dissolves about 5-6 g at ord temp (Gaudechon, A ch 1911, (8) 22 212)

1 l aqueous solution at 25° contains 0.017 mol (Herz and Paul Z anorg 1913, 83 431)

Decomp by warm HNO_3 , or $H_2SO_4 + Aq$ Sol in warm H_2SO_4 (Ditte, A ch (5) 17 124)

1 mol is sol in 1 mol warm $HI + Aq$ in 1 mol cold conc HCl and in $\frac{1}{2}$ mol hot conc HCl (Lówig)

Solubility of $HgBr_2$ in $KBr + Aq$ at 25°

Mols per liter	
KBr	$HgBr_2$
0	0 017
0 05	0 055
0 10	0 088
0 5	0 0359
0 866	0 611
2	1 407
3	2 096
4	2 339

(Sherrill, Z phys Ch 1903, 43 705)

Solubility in various salts + Aq at 25°

Salt	In 10 cc of the solution	
	Millimols $HgBr_2$	Millimols salt
NaBr	0 17	0
	0 78	1 18
	2 85	5 96
	5 40	11 42
	12 76	24 48
	15 50	29 97
KBr	23 06	52 46
	0 17	0
	0 98	2 09
	4 72	7 70
	13 60	23 80
	19 30	34 70
CaBr	0 17	0
	1 17	0 72
	6 76	6 45
	13 58	18 92
	27 66	24 79
	36 66	37 54
SrBr ₂	0 17	0
	1 04	0 62
	4 71	3 28
	9 02	6 68
	17 70	14 01
	22 38	18 72
BaBr	0 17	0
	3 70	2 74
	5 40	3 96
	7 59	5 79
	14 78	10 96

(Herz and Paul, Z anorg 1913, 82 434)

Solubility in 0.1-N $Hg(NO_3)_2 + Aq$ is about 20 g per liter (Morse, Z phys Ch 1902, 41 731)

Sol in KBr or $NaBr + Aq$ (Jander, Dissert 1902)

Solubility in 10 cc $Br_2 + Aq$ at 25°

Millimol Br_2 0 753 1 797 2 231
 " Hg 0 1844 0 1947 0 2120

(Herz and Paul, Z anorg 1914, 85 215)

Sat solution in liquid SO_2 contains about 1.5% HgBr_2 at 159.4° (Niggl, Z anorg 1912, 75 182)

Moderately sol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84 27)

1 ccm of sat solution in abs alcohol at ord temp contains 0.0958 g HgBr_2 , at bpt contains 0.1262 g (Hamper, Ch Z 1887, 11 905)

Solubility of HgBr_2 in alcohols + Aq at t°

Alcohol	t°	G HgBr_2 per 100 g alcohol
Methyl alcohol	0	41 15
	10	49 5
	19	66 3
	22	60 9
	39	71 3
	65	90 8
	97	139 1
Ethyl alcohol	0	25 2
	10	26 3
	19	29 7
	39	31 9
	65	44 5
	89	66 9
alcohol	0	14 6
	10	15 6
	19	15 5
	39	20 8
	65	31 3
	86 5	42 7
Isobutyl alcohol	0	4 61
	10	5 63
	23	6 65
	39	9 58
	65	15 80

(Timofeev, Dissert 1894)

Much more sol than HgI_2 in alcohol
100 g of solution sat at 0° contain 13.33–13.05 g HgBr_2 , 16.53 g at 25° , 22.63 g at 50° (Renders, Z phys Ch 1900, 32 522)

Solubility of HgBr_2 in methyl alcohol + Aq at 25°

P = g alcohol in 100 g alcohol + Aq
 HgBr_2 = millimols HgBr_2 in 10 cc of the solution

P	HgBr_2	Sp gr	P	HgBr_2	Sp gr
0	0 167	1 0022	47 06	0 700	0 9401
10 60	0 201	0 9857	64 00	1 90	0 9386
30 77	0 358	0 9588	78 05	4 07	0 9744
37 21	0 422	0 9508	100	13 96	1 2275

(Herz and Anders, Z anorg 1907, 52 165)

Solubility of HgBr_2 in ethyl alcohol + Aq at 25°
P = g alcohol in 100 g alcohol + Aq
 HgBr_2 = millimols HgBr_2 in 10 cc of the solution

P	HgBr_2	Sp gr
0	0 167	1 0022
20 18	0 187	0 9717
40 69	0 440	0 9435
70 01	1 829	0 9214
100	6 337	0 9873

(Herz and Anders)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgBr_2 in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	5 02	1 227
11 11	4 728	1 1954
23 8	4 153	1 1524
65 2	2 530	1 0257
91 8	1 635	0 9437
93 75	1 586	0 9368
96 6	1 466	0 9275
100	1 873	0 9213

(Herz and Kuhn, Z anorg 1908, 60 158)

Solubility in mixtures of ethyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgBr_2 in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	2 28	0 9873
8 1	2 225	0 9802
17 85	2 106	0 9740
56 6	1 763	0 9487
88 6	1 476	0 9269
91 2	1 464	0 9239
95 2	1 406	0 9227
100	1 378	0 9213

(Herz and Kuhn, Z anorg 1908, 60 161)

Solubility of HgBr_2 in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the mixtures
 HgBr_2 = g HgBr_2 in 10 ccm of the solution
S $25^\circ/4^\circ$ = sp gr of the sat solution

P	HgBr_2	S $25^\circ/4^\circ$
0	2 28	0 9873
4 37	2 31	0 9932
10 4	2 54	1 009
41 02	3 33	1 080
80 69	4 57	1 185
84 77	4 68	1 193
91 25	4 86	1 211
100	5 02	1 227

(Herz and Kuhn, Z anorg 1908, 58 163)

Cold sat solution in anhydrous ether contains 0.00567 g in 1 cc, hot solution contains 0.032 g (Hampe, Ch Z 1887, 11 905)

Solubility in organic solvents at 18°-20°
100 g chloroform dissolve 0.126 g HgBr₂
100 g tetrachlormethane dissolve 0.003 g HgBr₂

100 g bromoform dissolve 0.679 g HgBr₂
100 g ethyl bromide dissolve 2.310 g HgBr₂

100 g ethylene dibromide dissolve 2.340 g HgBr₂

(Sulc, Z anorg 1900, 25 401)

Solubility in CS₂ at t°

t°	100 pts sat solution contain pts HgBr ₂
-10	0.049
5	0.068
0	0.087
+ 5	0.105
10	0.122
15	0.140
20	0.187
25	0.232
30	0.274

(Aretowski, Z anorg 1894, 6 267)

100 g boiling methyl acetate (bpt 56.2-56.7°) dissolves 24 g HgBr₂ (Schroeder and Steiner, J pr 1909, (2) 79 49)

1 g HgBr₂ is sol in 4.56 g methyl acetate at 18° Sp gr 18°/4° of sat solution=1.09 (Naumann, B 1909, 42 3795)

100 g anhydrous ethyl acetate or sat with H₂O at 18° dissolve 130.5-135 g HgBr₂ (Hamers, Dissert 1906)

Solubility of HgBr₂ in ethyl acetate+Aq at 25°

P=g ethyl acetate in 100 g ethyl acetate +Aq
HgBr₂=millimols HgBr₂ in 10 cc of the solution

P	HgBr ₂	Sp gr
0	0.167	1.0022
4.39	0.159	1.0018
96.76	7.42	1.1159
100	3.93	1.0113

(Herz and Anders, Z anorg 1907, 52 172)

1 pt HgBr₂ sol in 7.66 pts ethyl acetate at 18° (Naumann, B 1910, 43 315)

Easily sol in acetone (Oppenheim, B 2 572)

Sol in acetone (Eidmann, C C 1899, II 1014)

Acetone dissolves much more HgBr₂ than HgI₂. 100 g sat solution at 25° contain 34.58 g HgBr₂ (Reinders, Z phys Ch 1900, 32 514)

Solubility in diethyl oxalate is much greater than that of HgI₂ and is equal to 12% at 100° (Reinders, Z phys Ch 1900, 32 507)

Solubility in benzene=0.0194 mol per l at 25° (Sherrill, Z phys Ch 1903, 43 735)

Sol in allyl mustard oil (Mathews, J phys Chem 1905, 9 647)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Solubility in aniline

S=temp of solidification

Mols HgBr ₂ per 100	S	Mols HgBr ₂ per 100	S	Mols HgBr per 100	S
4.9	9°	25.4	115.5°	49.6	123
10	43.5	33.9	117	54.9	124
12.5	57	39.5	108	58.8	134
14.9	68	41.9	113	64.0	133
19.7	89	43.9	118		
23.4	106	46.2	121		

(Staronka, Anz Ak Wiss Krakau, 1910, 372)

Solubility of HgBr₂ in quinoline

S=temp of solidification

Mols HgBr ₂ per 100	S	Mols HgBr ₂ per 100	S	Mols HgBr ₂ per 100	S
4.4	88°	8.9	111°	14.3	127°
				17.6	134°

(Staronka, Anz Wiss Krakau, 1910 372)

Mol weight determined in ethyl sulphide (Werner, Z anorg 1897, 15 30)
+4H₂O (Thomsen)

Mercuric perbromide, HgBr₄

(Heiz and Paul, Z anorg 1914, 85 216)

Mercuric hydrogen bromide (Bromomercuric acid), HgBr₂, HBr=HHgBr₃

Decomp by H₂O (Neumann, M 10 236)

Mercuric nickel bromide, basic, HgBr₂, NiBr₂, 6NiO+20H₂O

(Mailhe, A ch 1902, (7) 27 369)

Mercuric platinum bromide

See Bromoplatinate, mercuric

Mercuric potassium bromide, HgBr₂, KBr

Sol in H₂O, but decomp by a large amount, with separation of one half of the HgBr₂ (v Bonsdorff, Pogg 19 339)

2HgBr₂, KBr+2H₂O Permanent Sol in H₂O and alcohol (v Bonsdorff)

Mercuric sodium bromide, HgBr₂, NaBr

Deliquescent (v Bonsdorff)
(Varet, C R 1890, 111, 527)

HgBr₂, 2NaBr Very sol in H₂O (Vicario, J Pharm 1907, (6) 26 145) 2HgBr₂, NaBr+3H₂O Sol in H₂O and alcohol (Berthelot)	Mercuric chloramide, Hg(NH₂)Cl Composition is <i>dimercuriammonium ammonium chloride</i>, Hg₂NCl, NH₄Cl, see
Mercuric strontium bromide, HgBr₂, SrBr₂ Sol in all proportions of H₂O (Löwig, Mag Pharm 33 7) 2HgBr₂, SrBr₂ Decomp by H₂O into HgBr₂ and HgBr, SrBr₂ (Löwig)	Mercuric chloramide oxymercuriammonium chloride, 4Hg(NH₂)Cl, (NH₂OH Cl (Milon) Correct composition is <i>dimercuriammonium ammonium chloride</i>, NH₂Cl, NH₄Cl, see (Balestra, Gazz ch it 21 (2) 294) Hg(NH₂)Cl, (NH₂OH₂)Cl (Milon) True composition is <i>dimercuriammonium mercuric chloride</i>, 2Hg₂NCl, HgCl₂+H₂O, or <i>dimercuriammonium hydrogen chloride</i>, NH₂Cl, HCl (Balestra)
Mercuric zinc bromide Deliquescent in moist air (v Bonsdorff)	Mercuric chloramide chloride, Hg(NH₂)Cl, HgCl₂
Mercuric zinc bromide cyanide ammonia See Cyanide zinc bromide ammonia, mercuric	Properties as mercuric chloramide decomp by cold HCl+aq (Milon) True composition is <i>dimercuriammonium hydrogen chloride</i>, NH₂Cl, 2HCl (Balestra, Gazz ch it 21 (2) 294)
Mercuric bromide ammonia, HgBr₂, 2NH₃ Decomp by boiling H₂O Sol in min acids and acetic acid (Naumann, B 1910, 43 316)	Mercuric chloramide chromate, 2Hg(NH₂)Cl, HgCrO₄ Decomp by hot H₂O Easily sol in H₂O, or HCl+aq (Jugic and Kruss, B 22 203)
Mercuric bromide cadmium oxide, HgBr₂, CdO+H₂O Mailhe, A ch 1902, (7) 27 371)	Mercurous chloride, Hg₂Cl
Mercuric bromide cupric oxide, HgBr₂, CuO+3H₂O (Mailhe, Bull Soc 1901, (3) 25 791)	Almost absolutely insol in cold, but gradually sol decomp by boiling H₂O Calculated from electrical conductivity of Hg₂Cl₂+aq, 1 l H₂O dissolves 31 mg Hg₂Cl₂ at 18° (Kohlrausch and Rose, Z phys 12 241)
Mercuric bromide hydrazine, HgBr₂, N₂H₄ (Hofmann and Marburg, A 1899, 305 215)	1 l H₂O dissolves 2 mg Hg₂Cl₂ at 18° (Kohlrausch, Z phys 11 1901 50 356) 1 l H₂O dissolves 14 mg at 0.5, 21 mg at 18°, 28 mg at 21.6°, 7 mg at 15° (Kohlrausch, Z phys 11 1901 64 150)
Mercuric bromide potassium chloride, HgBr₂, 2KCl Decomp by H₂O (Harth, Z anorg 1897, 14 345)	When finely divided is 10% more sol than when coarsely crystalline (Sauer, Z phys 11 1901 47 181) Solubility in H₂O = 0.5 × 10⁻⁴ g/mol (I, Z Elektrochem 1904, 10 301)
Mercuric bromide zinc oxide, HgBr₂, ZnO+8H₂O (Mailhe, C R 1901, 132, 1274)	Sol with decomp in boiling H₂O from air, 20 cm H₂O affording 0.002 g HgCl₂ after boiling 1 hour with Hg₂Cl₂ (Mahl, A ch (3) 5 176) Hg₂(NO₃)₂+aq containing 1 pt Hg₂(NO₃)₂ to 250, 10 pts H₂O give ppt of Hg₂Cl₂ with HCl+aq Sol with decomp in conc HCl+aq, HNO₃+aq, aqua regia, or Cl₂+aq (I, sensus) Insol in cold dil acids, but slowly sol on heating
Mercuric bromoiodide, HgBrI Sol in alcohol and ether Can be recrystallised from ether without decomp (Oppenheim, B 2 571)	The solubility of Hg₂Cl₂ in HCl+aq increases slowly with time, and finally reaches a point where it increases very rapidly, which takes place sooner the more dil the aq Presence of Hg₂(NO₃)₂+aq helps the solubility (Why not oxidation to HgCl₂) (Varenne, C R 92 1161)
Mercurous chloramide, Hg₂(NH₂)Cl Insol in boiling H₂O or NH₄OH+aq (Kane, A ch (2) 72 215) Mixture of Hg and HgNH₂Cl (Barfoed, J pr (2), 39 201)	

Solubility of Hg_2Cl_2 in $\text{HCl} + \text{Aq}$ at 25° Solid phase = $\text{Hg}_2\text{Cl}_2 + 0.1 \text{ g Hg}$

G per l		Sp gr of solutions
HCl	Hg_2Cl_2	
31.69	0.034	
36.46	0.048	
95.43	0.207	1.042
158.4	0.399	1.069
209.2	0.548	1.091
267.3	0.654	1.114
278.7	0.675	1.119
317.3	0.670	1.132
364.6	0.673	1.153

(Richards and Archibald, *Z phys Ch* 1902, 40 385)

Cold conc H_2SO_4 does not dissolve or decompose. Boiling H_2SO_4 dissolves with evolution of SO_2 (Vogel)

Solubility of Hg_2Cl_2 in chlorides + Aq at 25° Solid phase = $\text{Hg}_2\text{Cl}_2 + 0.1 \text{ g Hg}$

Salt	G per liter		Sp gr of solutions
	NaCl	Hg_2Cl_2	
NaCl	5.85	0.0041	
	58.50	0.041	1.040
	119	0.129	1.078
	148.25	0.194	1.093
	222.3	0.380	1.142
	292.5	0.643	1.188
BaCl_2	104.15	0.044	1.088
	156.22	0.088	1.134
	208.30	0.107	1.174
	312.54	0.231	1.263
CaCl_2	39.96	0.022	
	55.5	0.033	
	111	0.081	1.064
	138.75	0.118	1.105
	195.36	0.231	1.151
	257.52	0.322	1.205
	324.67	0.430	1.243
	432.9	0.518	1.315
	499.5	0.510	1.358

(Richards and Archibald, *Z phys Ch* 1902, 40 385)Sol in cold $\text{HCN} + \text{Aq}$ with separation of Hg

Sol in alkali chlorides + Aq $\text{NH}_4\text{Cl} + \text{Aq}$ dissolves out Hg_2Cl_2 at ord temp, much more at $40-50^\circ$. Dil $\text{NH}_4\text{Cl} + \text{Aq}$ decomposes more slowly than conc. Access of air hastens reaction (Miahle)

When heated several hours to $40-50^\circ$, 100 pts $\text{NH}_4\text{Cl} + 833$ pts H_2O form 0.75 pt Hg_2Cl_2 from 25 pts Hg_2Cl_2 , 100 pts $\text{NaCl} + 833$ pts H_2O form 0.33 pt Hg_2Cl_2 from 25 pts Hg_2Cl_2 , 100 pts $\text{KCl} + 833$ pts H_2O form

0.25 pt Hg_2Cl_2 from 25 pts Hg_2Cl_2 , 100 pts $\text{BaCl}_2 + 833$ pts H_2O form 0.33 pt Hg_2Cl_2 from 25 pts Hg_2Cl_2 (Miahle, *J Pharm* 26 108)

Other chlorides act as NH_4Cl , only less vigorously (Pettenkofer)By boiling 1 pt Hg_2Cl_2 10 times with a solution of 1 pt NaCl each time, the Hg_2Cl_2 is finally completely decomposed (Henne)Boiling $\text{BaCl}_2 + \text{Aq}$ or $\text{CaCl}_2 + \text{Aq}$ dissolve traces $\text{K}_2\text{SO}_4 + \text{Aq}$, $\text{KNO}_3 + \text{Aq}$, or $\text{KHC}_4\text{H}_4\text{O}_6 + \text{Aq}$ do not dissolve (Pettenkofer)Sol in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ Insol in NH_4 nitrate, or succinate + Aq (Wittstein)Sol in hot $\text{Hg}_2(\text{NO}_3)_2 + \text{Aq}$, and still more in hot $\text{Hg}(\text{NO}_3)_2 + \text{Aq}$, on cooling it crystallizes out completely. 25 g Hg_2Cl_2 dissolve in 15 l H_2O containing 50 g $\text{Hg}(\text{NO}_3)_2$ (Debray, *C R* 70 995)Sol in $\text{PtCl}_2 + \text{Aq}$ Decomposed by $\text{NH}_4\text{OH} + \text{Aq}$ Decomposed by KOH , or $\text{NaOH} + \text{Aq}$ Sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Faktor, *C C* 1905, I 1524)Very sl sol in NH_4 succinate (Wittstein)Insol in SbCl_3 (Klemensiewicz, *C C* 1903, II 1850)Very sl sol in liquid NH_3 (Franklin, *Am Ch J* 1898, 20 829)Insol in alcohol or ether. More sol in H_2O containing pepsin and an acid than in H_2O , and is not converted thereby into HgCl_2 (Torsellini, *Ann Chim Ch farm* (4) 4 105)Small amts are sol with decomposition in alcohol, ether and CHCl_3 . 1 g CHCl_3 dissolves 0.0046 g Hg_2Cl_2 (MacLagan, *Arch Pharm* 1884, 222, 788)Formic acid (95%) dissolves at 16.5° , 0.02%, at 18° , 0.0003% (Aschan, *Ch Z* 1913, 37 1117)Insol in methyl acetate (Naumann, *B* 1909, 42 3790), ethyl acetate (Hamers, *Dissert* 1906, Naumann, *B* 1904, 37 3602)Somewhat sol in hydroxylamine hydrochloride (Adams, *Am Ch J* 1902, 28 1216)Insol in benzonitrile (Naumann, *B* 1914, 47 1370)Insol in acetone and in methylal (Eidmann, *C C* 1899, II 1014)Solubility in organic solvents at $18-20^\circ$ 100 g chloroform dissolve traces of HgCl_2 100 g bromoform dissolve 0.055 g HgCl_2 100 g ethyl bromide dissolve traces of HgCl_2 100 g ethylene dibromide dissolve traces of HgCl_2 (Sulc *Z anorg* 1900, 25 401)Mercuric chloride, HgCl_2

Permanent

Sol in 18.5 pts H_2O at 13.8° and 2-3 pts at 100 (*J Davy* 1822) Sol in 3 pts boiling H_2O (Wenzel) Sol in 18.23 pts H_2O at 10° and 3 pts at 100° (M R and P) Sol in 18.46 pts at 18.75° (Abt) Sol in 16 pts cold and 3 pts warm H_2O (Dumas)

100 pts H_2O dissolve pts HgCl_2 at t°

t°	Pts HgCl_2	t°	Pts HgCl_2	t°	Pts HgCl_2
0	5 73	40	9 62	80	24 30
10	6 57	50	11 34	90	37 05
20	7 39	60	13 86	100	53 96
30	8 43	70	17 29		

(Poggiale, A ch (3) 8 468)

Solubility of HgCl_2 in H_2O

t°	% HgCl_2	t°	% HgCl_2
+ 1	3 9	80	23 6
4 5	4 8	87	28 2
4 5	4 8	100	39 3
7 5	5 1	121	59 7
13 8	5 2	127	69 7
25 1	7 1	140	77 0
29 5	7 6	150	78 4
38 0	9 9	159	80 2
49	11 3	160	81 7
61	15 1	165	81 8

(Étard, A ch 1894, (7) 2 557)

71.17 g HgCl_2 are sol in 1 l H_2O at 25° (Morse, Z phys Ch 1902, 41 726)Solubility at $25^\circ = 0.267$ mol in 1 l H_2O (Jander, Z Elektrochem 1903, 8 688)Solubility in H_2O at $25^\circ = 0.263$ mol liter (Sherrill, Z phys Ch 1903, 43 735)Sat $\text{HgCl}_2 + \text{Aq}$ at 25° contains 6.9% HgCl_2 (Foote, Am Ch J 1906, 35 238) $\text{HgCl}_2 + \text{Aq}$ contains 3.95 g HgCl_2 in 100 g of solution at 0° , 7.67 g at 30° (Schreinemakers, Ch Weekbl 1910, 7 202) $\text{HgCl}_2 + \text{Aq}$ sat at $(?)$ contains 6.8% HgCl_2 (Abe, J Tok Chem Soc 1912, 33 1087) $\text{HgCl}_2 + \text{Aq}$ sat at 35° contains 8.51% HgCl_2 (Schreinemakers and Thonus, Ver K Akad Wet Amsterdam, 1912, 21 333)1 l aqueous solution sat at 25° contains 0.265 mol HgCl_2 (Herz and Paul, Z anorg 1913, 82 431) H_2O dissolves 7.39% at 20° (Aschan, Ch Z 1913, 37 1117) $\text{HgCl}_2 + \text{Aq}$ sat at 8° has 1.041 sp gr (Anthon 1837)Sp gr of $\text{HgCl}_2 + \text{Aq}$ at 20°

% HgCl_2	Sp gr	% HgCl_2	Sp gr
1	1 0072	4	1 0323
2	1 0148	5	1 0411
3	1 0236		

(Schroder, calculated by Gerlach, Z anal 27 306)

Sp gr of $\text{HgCl}_2 + \text{Aq}$ at 15°

% HgCl_2	Sp gr	% HgCl_2	Sp gr
8	1 071	11	1 1035
9	1 0815	12	1 115
10	1 095	13	1 127

(Mendelejeff, calculated by Gerlach, Z anal 27 306)

Sp gr of $\text{HgCl}_2 + \text{Aq}$

% HgCl_2	Sp gr			
	at 0°	at 10°	at 20°	at 30°
4 72	1 04070	1 04033	1 03856	1 03566
3 57	1 03050	1 03022	1 02885	1 02577
2 42	1 02035	1 02018	1 01856	1 01585
1 22	1 01008	1 00990	1 00835	1 00575

(Schroder, B 19 161 R)

Sp gr of $\text{HgCl}_2 + \text{Aq}$ at room temp containing

0 226	3 55% HgCl_2
1 0233	1 0328

(Wagner, W Ann 1883, 18 266)

Sp gr of $\text{HgCl}_2 + \text{Aq}$ at 25°

Concentration of $\text{HgCl}_2 + \text{Aq}$	Sp gr
$\frac{1}{4}$ -normal	1 0275
$\frac{1}{8}$ -normal	1 0138

(Wagner, Z phys Ch 1890, 5 39)

Sp gr at $16\frac{1}{4}^\circ$ of $\text{HgCl}_2 + \text{Aq}$ containing 4.5256% $\text{HgCl}_2 = 1.03806$ Sp gr at $16\frac{1}{4}^\circ$ of $\text{HgCl}_2 + \text{Aq}$ containing 4.2224% $\text{HgCl}_2 = 1.03491$ (Schonrock, Z phys Ch 1893, 11 768) $\text{HgCl}_2 + \text{Aq}$ containing 6.04% HgCl_2 has sp gr $20^\circ/20^\circ = 1.0523$ $\text{HgCl}_2 + \text{Aq}$ containing 6.08% HgCl_2 has sp gr $20^\circ/20^\circ = 1.0526$

(Le Blanc and Rohland, Z phys ch 1890, 19 292)

Sat $\text{HgCl}_2 + \text{Aq}$ boils at 101.1° (Cuthbert)B-pt of $\text{HgCl}_2 + \text{Aq}$

% HgCl_2	B-pt	% H_2Cl	B-pt
4 8	100 10°	11 04	100 20°
9 0	100 16	15 2	100 275

(Skinner, Chem Soc 61 340)

Solubility in $\text{HCl} + \text{Aq}$ is greater than in H_2O (Dumas)Sol in 0.5 pt $\text{HCl} + \text{Aq}$ of 1.158 sp gr at 23° forming a solution of 2.412 sp gr (Davy 1822)

Solubility of HgCl_2 in $\text{HCl} + \text{Aq}$

Pts HCl in 100 pts H_2O	Pts HgCl_2 dissolved by 100 pts liquid	Pts HCl in 100 pts H_2O	Pts HgCl_2 dissolved by 100 pts liquid
0 0	6 8	21 6	127 4
5 6	46 8	31 0	141 9
10 1	73 7	50 0	148 0
13 8	87 8	68 0	154 0

(Ditte, A ch (5) 22 551)

Solubility in $\text{HCl} + \text{Aq}$ at 0° $\frac{\text{HgCl}_2}{2} = \frac{1}{2} \text{ mols}$

HgCl_2 (in mgs) in 10 cem solution, HCl
= mols HCl ditto, H_2O = grms H_2O
present

$\frac{\text{HgCl}_2}{2}$	HCl	Sp gr	H_2O
9 7	4 3	1 117	9 704
19 8	9 9	1 238	9 340
35 5	17 8	1 427	9 816
55 6	26 9	1 665	8 135
68 9	32 25	1 811	7 714
72 37	34 25	1 874	7 679
85 5	41 5	2 023	7 131
88 65	48 1	2 066	6 893
95 675	70 875	2 198	6 431

(Engel, A ch (6) 17 362)

Not decomp by H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ Sol in 630 pts H_2SO_4 and in more than 500 pts hot $\text{HNO}_3 + \text{Aq}$ of 1.41 sp gr without decomp (J Davy)Sol in H_2SO_4 , HNO_3 , HIO_3 , or H_2CrO_4 without decomp (Millon, A ch (3) 18 373)Very sl sol in HNO_3 , but not decomp thereby (Wurtz)Solubility of HgCl_2 in $\text{NH}_4\text{Cl} + \text{Aq}$ at 30°

Composition of liquid phase			Solid phase
% HgCl_2	% NH_4Cl	% H_2O	
0	29 5	70 5	NH_4Cl
15 68	27 56	56 76	
22 80	26 91	50 29	
31 96	26 16	41 88	
42 45	25 05	32 50	
50 05	24 79	25 16	$\left\{ \begin{array}{l} \text{NH}_4\text{Cl} + \text{H}_2\text{O} \\ \text{H}_2\text{O} \end{array} \right.$
50 60	24 31	25 09	H_2O
53 08	22 77	24 15	
55 97	21 42	22 61	
58 91	20 06	21 03	HgCl_2
58 89	19 98	21 13	$2\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
56 83	18 86	24 61	HgCl_2
56 38	18 50	25 12	$\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
55 83	17 70	26 47	
55 70	17 13	27 17	
55 58	16 82	27 60	

Solubility of HgCl_2 in $\text{NH}_4\text{Cl} + \text{Aq}$
at 30° — Continued

Composition of liquid phase			Solid phase
% HgCl_2	% NH_4Cl	% H_2O	
55 55	15 94	28 51	HgCl_2
55 85	15 35	28 80	$\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
56 71	14 22	29 07	
57 04	14 10	28 86	HgCl_2
56 98	14 14	28 88	$\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
56 83	13 90	29 27	$3\text{HgCl}_2 + 2\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
56 26	13 04	30 70	$3\text{HgCl}_2 + 2\text{NH}_4\text{Cl} + \text{H}_2\text{O}$
56 43	11 88	31 69	
56 70	11 05	32 23	
57 05	9 92	33 02	
58 55	9 23	32 22	
58 65	9 20	32 15	$\left\{ \begin{array}{l} 3\text{HgCl}_2 + 2\text{NH}_4\text{Cl} + \text{H}_2\text{O} + \\ 9\text{HgCl}_2 + 2\text{NH}_4\text{Cl} \\ 9\text{HgCl}_2 + 2\text{NH}_4\text{Cl} \end{array} \right.$
51 83	8 76	39 41	
46 00	7 52	46 48	
39 02	6 28	54 70	
35 60	5 26	59 14	
35 10	5 18	59 72	
32 90	5 06	62 04	
29 65	3 62	66 73	$9\text{HgCl}_2 + 2\text{NH}_4\text{Cl} + \text{HgCl}_2$
40 12	5 13	54 75	HgCl_2
21 00	2 29	76 71	
7 67	0	92 33	

(Meerburg, Z anorg 1908, 59 139)

1 pt sat $\text{NaCl} + \text{Aq}$ dissolves 1.29 pts HgCl_2 at 14° (Voit, A 104 354)Sat $\text{NaCl} + \text{Aq}$ (20 grains $\text{H}_2\text{O} + 7$ grains NaCl) dissolves 32 grains HgCl_2 at 15.5° and 3 grains more on warming. Sp gr of solution = 2.14 (Davy 1822)Sat $\text{KCl} + \text{Aq}$ (21 grains $\text{H}_2\text{O} + 7$ grains KCl) dissolves 8 grains HgCl_2 on being gently heated (Davy)Sat $\text{BaCl}_2 + \text{Aq}$ (20 grains $\text{H}_2\text{O} + 8.7$ grains $\text{BaCl}_2 + 2\text{H}_2\text{O}$) dissolves 16 grains HgCl_2 at 15.5° and 4 grains more on heating. Sp gr of solution = 1.9 (Davy) $\text{MgCl}_2 + \text{Aq}$ (31 grains $\text{HCl} + \text{Aq}$ of 1.55 sp gr neutralised with MgO) dissolves 40 grains HgCl_2 and more on gently heating. Sp gr of solution = 2.1 (Davy)Sol in sat KCl , $\text{NaCl} + \text{Aq}$ and in MnCl_2 , 7NCl_2 , CoCl_2 , FeCl_2 , NiCl_2 and $\text{CuCl}_2 + \text{Aq}$ (v Bonsdorff Pogg 17 123)

The solubility in H_2O is greatly increased by the addition of cupric chloride. 8.5% HgCl_2 is sol in pure H_2O and 52.8% HgCl_2 is sol in 18.06% $\text{CuCl}_2 + \text{Aq}$ (Schreiner, C C 1913, I 1858)

Solubility of $\text{HgCl}_2 + \text{KCl}$ at 25°

Composition of solution		Composition of undissolved residue			Solid phase
% KCl	% HgCl_2	% KCl	% HgCl_2	% H_2O	
26 46	0	100	0		KCl
26 24	15 04		3 63		KCl+2KCl HgCl_2 H_2O
26 23	15 02		26 15		
26 33	15 02		52 01		
26 33	14 92		61 04		
23 74	18 91	34 61	61 66	3 73	2KCl HgCl_2 H_2O
22 36	21 39	34 77	62 02	3 21	
21 39	23 88	34 05	61 84	3 85	2KCl HgCl_2 $\text{H}_2\text{O} + \text{KCl}$ HgCl_2 H_2O
20 32	27 62		65 24		
20 26	27 38		73 98		
17 85	25 34	21 89	75 10	3 01	KCl HgCl_2 H_2O
9 26	18 95	21 02	73 36	5 62	
7 80	19 56	20 76	73 06	6 18	
6 84	22 81	20 75	74 54	4 71	
6 66	24 32	20 54	73 99	5 47	KCl HgCl_2 $\text{H}_2\text{O} + \text{KCl}$ 2 HgCl_2 2 H_2O
6 52	25 13		76 46		
6 64	25 16		80 60		
6 27	25 11	12 09	83 20	4 71	KCl 2 HgCl_2 2 H_2O
5 77	24 73	11 87	83 18	4 95	
4 68	24 75		84 46		KCl 2 HgCl_2 2 $\text{H}_2\text{O} + \text{HgCl}_2$
4 66	25 17		93 58		
4 69	24 82		98 50		
0	6 90	0	100	0	HgCl_2

(Foote and Levy, Am Ch J 1906, 35 239)

Solubility of $\text{HgCl}_2 + \text{KCl}$ at 20°

G per 100 g H_2O		Solid phase
KCl	HgCl_2	
0	7 39	HgCl_2
1 12	11 63	"
2 39	15 72	"
4 05	22 17	"
4 84	25 16	$\text{HgCl}_2 + 2\text{HgCl}_2$, KCl
5 60	25 13	2 HgCl_2 , KCl
6 71	25 66	"
7 39	26 41	2 HgCl_2 , KCl + HgCl_2 , KCl
7 46	24 70	HgCl_2 , KCl
8 95	19 93	"
15	22 87	"
17 57	26 12	"
20 35	29	"
26 31	34 83	"
30 32	39 10	"
34 12	42 82	HgCl_2 , KCl + HgCl_2 , 2KCl
34 18	39 34	HgCl_2 , 2KCl
34 34	35 16	"
34 54	30 63	"
37 72	24 30	"
41 13	19 33	HgCl_2 , 2KCl + KCl
39 66	15 76	KCl
37 87	10 28	"
35 32	2 1	"

(Tichomiroff, J russ Phys Chem Soc 1907
39 731)Solubility of $\text{HgCl}_2 + \text{RbCl}$ in H_2O Solubility data are given showing double salts formed at 25° (Foote and Levy, l c)Solubility in $\text{NaCl} + \text{Aq}$ 100 pts $\text{NaCl} + \text{Aq}$ containing given % NaCl dissolve g HgCl_2

% NaCl	g HgCl_2 at 15	g HgCl_2 at 65°	g HgCl_2 at 100°
26	128	152	208
25	120	142	196
10	58	68	110
5	* 30	36	64
1	14	18	48
0 5	10	13	44

(Homeyer and Ratsert, Pharm Ztg 33 738)

Solubility of $\text{HgCl}_2 + \text{NaCl}$ at 25°

Composition of solution		Composition of undissolved residue			Solid phase
% NaCl	% HgCl_2	% NaCl	% HgCl_2	% H_2O	
26 5	0	100	0	0	NaCl
18 66	51 35		16 39		NaCl + NaCl HgCl_2 2 H_2O
18 71	51 32		21 98		
18 64	51 42		65 45		
18 87	51 26		71 25		
14 97	57 74	16 38	74 18	9 44	NaCl HgCl_2 2H O
14 03	59 69	16 36	74 21	9 43	
13 25	62 16	16 16	74 70	9 14	
13 17	62 59	15 96	74 76	9 28	
12 97	62 50		78 20		NaCl HgCl_2 2H O + HgCl_2
13 14	62 48		88 64		
13 15	62 55		90 83		

(Foote and Levy, Am Ch J 1906, 35 239)

105.0 g HgCl_2 are sol in 1 l of 0.1-N $\text{Hg}(\text{NO}_3)_2 + \text{Aq}$ at 25° (Morse, Z phys Ch 1902, 4 726)Solubility in $\text{MCl} + \text{Aq}$ at 25°

Salt	In 10 ccm of the solution	
	Millimols H_2Cl	Millimols salt
LiCl	2 65	0
	3 51	4 14
	6 66	8 35
	10 21	12 71
	16 78	17 38
	22 14	22 65
	28 96	30 91
	30 62	35 27
NaCl	2 65	0
	3 72	2 12
	5 08	4 16
	7 48	6 71
	11 92	11 53
	20 22	19 41
	27 54	27 83
	34 34	31 62

Solubility in $\text{MCl} + \text{Aq}$ at 25° — *Continued*

Salt	In 10 ccm of the solution	
	Millimols HgCl_2	Millimols salt
KCl	2 65	0
	3 55	1 74
	3 81	2 21
	8 36	6 83
MgCl_2	2 65	0
	3 74	1 68
	7 19	4 15
	11 31	5 70
	18 64	9 97
	25 69	13 20
	32 06	17 28
CaCl_2	2 65	0
	3 64	1 90
	7 66	4 02
	11 08	6 56
	18 11	9 64
	26 45	14 29
	33 04	17 23
SrCl_2	2 65	0
	3 15	1 64
	5 63	3 11
	8 29	5 19
	13 42	7 24
	17 76	10 46
	22 93	13 86
BaCl_2	2 65	0
	6 97	3 85
	11 67	5 72
	16 20	7 76
	26 45	13 36
	53 48	30 30

(Herz and Paul, Z anorg 1913, 82 433)

Solubility in H_2O is increased by presence of I_2 (Herz and Paul, Z anorg 1914, 85 214)

Solubility in H_2O is increased by presence of hydroxylamine hydrochloride (Adams, Am Ch J 1902, 28 213)

Moderately sol in liq NH_3 (Franklin, Am Ch J 1898, 20 829)

Insol in liq CO_2 (Buchner, Z phys Ch 1906, 54 674)

Abundantly sol in $\text{H}_2\text{PtCl}_4 + \text{Aq}$ (Nilson, B 1876, 9 1146)

Sol in 2.5 pts cold alcohol (Richter) 3 pts (Karl) 2, pts alcohol of 0.833 sp gr at ordinary temp and 1.167 pts on boiling (Berzelius) 2 pts alcohol of 0.816 sp gr at 15.5° (sp gr of solution = 1.08) (J Davy Phil Trans 1822 358)

At 10° sol in 2.57 pts alcohol of 39° (Cartier) in 2.9 pts alcohol of 38 in 3.6 pts alcohol of 35 in 4.2 pts alcohol of 30° in 9.3 pts alcohol of 22 in 14.6 pts alcohol of 14° (N E Henry)

Sol in 25 mols methyl, 13.1 mols ethyl, and 20.3 mols propyl alcohol at 8.5° , in

16.2 mols methyl, 12.4 mols ethyl, and 18 mols propyl alcohol at 20° , in 6.8 mols methyl, 10.6 mols ethyl, and 14.6 mols propyl alcohol at 38.2° (Timofejew, C R, 112 1224)

100 pts absolute methyl alcohol dissolve 66.9 pts HgCl_2 at 25° , 100 pts absolute ethyl alcohol dissolve 49.5 pts HgCl_2 at 25° (de Bruyn, Z phys Ch 10 783)

At 15° , 1 pt by weight is sol in —

13.53 pts H_2O

1.5 " methyl alcohol of sp gr 0.7990

2.5 " ethyl " " " 0.8100

6.3 " propyl " " " 0.8160

(Rohland, Z anorg 1899, 18 323)

100 g $\text{HgCl}_2 + \text{CH}_3\text{OH}$ contain 1.2 g HgCl_2 at the critical temp (Centnerszwer, Z phys Ch 1910, 72 437)

Solubility of HgCl_2 in methyl alcohol + Aq at 25°

$P = \text{g alcohol in 100 g alcohol} + \text{Aq}$
 $\text{HgCl}_2 = \text{millimols HgCl}_2 \text{ in 10 cc of the solution}$

P	HgCl_2	Sp gr
0	2 67	1 0565
10 60	2 92	1 0441
30 77	4 18	1 0420
37 21	4 96	1 0507
47 06	7 27	1 0809
64 00	14 19	1 2015
78 05	21 11	1 3314
100	17 95	1 2160

(Herz and Anders, Z anorg 1907, 52 165)

100 cc 90% ethyl alcohol dissolve 27.5 g HgCl_2 at 15.5° Sp gr 15° of sat solution = 1.065 (Greenish and Smith, Pharm J 1903, 71 881)

100 g 99.2% ethyl alcohol dissolve 33.4 g HgCl_2 at 25° (Osaka)

Solubility of HgCl_2 in ethyl alcohol + Aq at 25°

$P = \text{g alcohol in 100 g alcohol} + \text{Aq}$
 $\text{HgCl}_2 = \text{millimols HgCl}_2 \text{ in 10 cc of the solution}$

P	HgCl_2	Sp gr
0	2 67	1 0565
20 18	2 49	1 0214
40 69	3 94	1 0180
70 01	8 70	1 0616
100	13 61	1 1067

(Herz and Anders, Z anorg 1907, 52 170)

Solubility of HgCl_2 in ethyl alcohol + Aq
at 25°

% $\text{C}_2\text{H}_5\text{OH}$	% HgCl_2	% $\text{C}_2\text{H}_5\text{OH}$	% HgCl_2
0	6 80	45 84	15 36
5 08	6 65	49 86	18 18
14 49	6 41	53 61	21 40
21	6 55	57 26	24 51
26 25	7 31	60 55	27 67
31 53	8 51	63 95	29 86
36 85	10 32	67 39	32 40
41 36	12 69		

(Abe, J Tok Chem Soc 1912, **33** 1087)

Solubility in alcohol is increased by presence of hydroxylamine hydrochloride (Adams, Am Ch J 1902, **28** 213)

Solubility of HgCl_2 in a mixture of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the mixture
G = g HgCl_2 in 10 ccm of the solution
S = sp gr of the sat solution

P	HgCl_2	S $25^\circ/4^\circ$
0	3 686	1 107
4 37	3 943	1 130
10 4	4 261	1 157
41 02	5 837	1 294
80 69	6 167	1 321
84 77	5 782	1 288
91 25	5 385	1 254
100	4 862	1 216

(Herz and Kuhn, Z anorg 1908, **58** 161)Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgCl_2 in 10 ccm of the solution
S = sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	4 862	1 2160
11 11	5 034	1 2278
23 8	5 714	1 2848
65 2	4 228	1 1568
91 8	2 509	1 0090
93 75	2 323	1 0029
96 6	2 152	0 9851
100	2 003	0 9720

(Herz and Kuhn, Z anorg 1908, **60** 157)Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgCl_2 in 10 ccm of the solution
S = sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	3 686	1 1070
8 1	3 667	1 0988
17 85	3 406	1 0857
56 6	2 711	1 0272
88 6	2 166	0 9854
91 2	2 160	0 9824
95 2	2 087	0 9772
100	2 003	0 9720

(Herz and Kuhn, Z anorg 1908, **60** 160)Sp gr of HgCl_2 + alcohol

% HgCl_2	Sp gr $25^\circ/20^\circ$
0	0 7948
5 44	0 8346
6 52	0 8431

(Le Blanc and Rohland, Z phys Ch 1896, **19** 283)Sp gr of alcoholic solution of HgCl_2

% HgCl_2	Sp gr			
	at 0°	at 10°	at 20	at 30
0 00	0 83135	0 82286	0 81435	0 80594
1 22	0 8397	0 8312	0 8228	0 8141
2 38	0 8484	0 8399	0 8314	0 8227
4 42	0 8635	0 8549	0 8463	0 8375
8 56	0 8966	0 8877	0 8789	0 8659
12 43	0 9306	0 9213	0 9119	0 9024
15 91	0 9629	0 9523	0 9425	0 9329
19 32	0 9951	0 9852	0 9753	0 9652
22 46	1 0285	1 0184	1 0083	0 9982

(Schroder, B **19** 161 R)

Sp gr at $16^\circ/4^\circ$ of HgCl_2 + ethyl alcohol containing 23 5489% HgCl_2 = 0 99855 containing 11 8801% (Schonrock, Z phys Ch 1893, **11** 768)

Sp gr at $16^\circ/4^\circ$ of HgCl_2 + alcohol containing 10 9948% HgCl_2 = 0 89550 (Schonrock, Z phys Ch 1893, **11** 769)

Sol in 4 pts ether (Karl), in 41 pts (Henry), in 286 pts (that of 0 745 sp gr (sp gr of solution = 1 08), the solvent power is not increased by elevating the temp, and b pt of ether is not raised (J Davy)

Ether extracts HgCl_2 from HgCl_2 + Aq (Orfila), very slightly if HgCl_2 + Aq is dil (Lassaigne)

Very sl sol in pure ether (Polis, B **20** 717)

6 35 pts are sol in 100 pts ether at 0°
6 44 " " " " 100 " " " 18
6 38 " " " " 100 " " " 35 5

(Laszczyński, B 1894, **27** 2286)

Sol in $7\frac{1}{2}$ –8 pts ether (Madsen, Ch Z Rept 1897, 21 169)

Solubility in 100 cc ether at $17^\circ = 4.1$ – 4.12 g (Stromholm, J pr 1902, (2), 66 450)

The solubility of HgCl_2 in H_2O is only sl affected by the presence of ether. An aqueous solution sat with ether and HgCl_2 contains about 10% less HgCl_2 than a pure sat aqueous solution. Partition coefficient for HgCl_2 $\frac{\text{ether}}{\text{H}_2\text{O}} = 4.9$ at 0° , 3.02 at 14.6° , 2.80 at 16.8° (Stromholm, Z phys Ch 1903, 44 70)

Solubility of HgCl_2 in ether+Aq at 25°

% Ether	% H_2O	% HgCl_2
87 86	5 22	6 92
1 2	93 6	5 2
5 2	90 5	4 3
5 4	91 8	2 8
5 4	93 1	1 5

(Abe, J Tok Chem Soc 1912, 33 1087)

Solubility of HgCl_2 in ether+ethyl alcohol at 25°

% Alcohol	% HgCl_2	% Alcohol	% HgCl_2
67 57	32 43	27 16	36 29
53 59	32 50	22 48	34 08
51 02	37 39	15 20	28 55
44 79	37 96	8 97	20 67
38 69	38 24	0	5 49
32 84	37 75		

(Abe)

4 pts ether dissolve 1 pt HgCl_2 , but 4 pts ether+1.33 pts camphor dissolve 1.33 pts HgCl_2 . 4 pts ether+4 pts camphor dissolve 2 pts HgCl_2 , 4 pts ether+8 pts camphor dissolve 1 pt HgCl_2 , 4 pts ether+16 pts camphor dissolve 8 pts HgCl_2 (Karls, Pogg, 10 608)

3 pts alcohol dissolve 1 pt HgCl_2 , but 3 pts alcohol+1 pt camphor dissolve 2 pts HgCl_2 , 3 pts alcohol+3 pts camphor dissolve 3 pts HgCl_2 , 3 pts alcohol+6 pts camphor dissolve 6 pts HgCl_2 (Karls, l c)

Solution can be obtained containing 25 pts camphor, 16 pts HgCl_2 , and only 4 pts alcohol. Sp gr of solution = 1.326 (Simon, Pogg 37 553)

100 pts acetone dissolve 60 pts HgCl_2 at 25° (Krug and M'Elroy, J Anal Appl Ch 184)

98.35 pts HgCl_2 are sol in 100 pts acetone at 0°

110.95 pts HgCl_2 are sol in 100 pts acetone at 10°

126.80 pts HgCl_2 are sol in 100 pts acetone at 18° (Lasczynski, B 1894, 27 2287)

1 g HgCl_2 is sol in 0.70 g acetone at 18° . Sp gr of sat solution $18^\circ/4^\circ = 1.956$ (Naumann, B 1904, 37 4334)

Sat solution in acetone contains 57.74 g HgCl_2 in 100 g solution at 25° (Foote and Haigh, J Am Chem Soc 1911, 33 461)

Sp gr at $26.7^\circ/4^\circ$ of HgCl_2 +acetone containing 36.25% $\text{HgCl}_2 = 1.1585$ (Schonrock, Z phys Ch 1893, 11 769)

Sp gr of HgCl_2 +acetone

% HgCl_2	Sp gr $20^\circ/20^\circ$
0	0.8003
10 94	0.8847
21 05	0.9799

(Le Blanc and Rohland, Z phys Ch 1896, 19 283)

100 g methyl acetate dissolve 46 g at bpt (56.5°) (Schroeder and Steiner, J pr 1909, (2) 79 49)

1 g HgCl_2 is sol in 2.35 g methyl acetate at 18° . Sp gr $18^\circ/4^\circ$ of the sat solution = 1.251 (Naumann, B 1909, 42 3793)

Solubility in ethyl acetate

Pts sol in 100 pts ethyl acetate	
Pts HgCl_2	t°
28 92	0
29 03	13
30 71	35
31 87	48
32 77	60
35 98	83

(Iaszczyński, B 1894, 27 2286)

Solubility in ethyl acetate = 1.3466 at 18° (Alexander, Dissert 1899)

Solubility of HgCl_2 in ethyl acetate

Temp	0	13	30	40	50
Mol HgCl_2 in 100 mols $\text{C}_4\text{H}_8\text{O}_2$	15.4	15.9	16.0	16.1	16.3

(Linebarger, Am Ch J 1894, 16 214)

1 g HgCl_2 is sol in 3.5 g ethyl acetate at 18° . Sp gr of sat solution $18^\circ/4^\circ = 1.110$ (Naumann, B 1904, 37 3602)

Solubility of HgCl_2 in ethyl acetate and acetone at t°

t°	Molecules HgCl_2 sol in 100 molecules of ethyl acetate	Molecules HgCl_2 sol in 100 molecules of acetone	Solid present in acetone
-15	9 10	14 5	$\text{HgCl}_2, \text{CH}_3\text{COCH}_3$
0	9 25	14 3	
+10		18 7	
10		23 5	HgCl_2
17		23 2	"
25	9 15	22 8	"

(Aten, Z phys Ch 1906, 54 121)

Solubility of HgCl_2 in ethyl acetate+Aq at 25°

P=g ethyl acetate in 100 g ethyl acetate +Aq
 HgCl_2 =millimols HgCl_2 in 10 cc of the solution

P	HgCl_2	Sp gr
0	2 67	1 0565
4 39	2 72	1 0581
96 76	15 34	1 2371
100	9 75	1 1126

(Herz and Anders, Z anorg 1907, 52 172)

1 pt is sol in 2 05 pts ethyl acetate at 18°
 or 100 g ethyl acetate dissolve 48 7 g HgCl_2
 (Naumann, B 1910, 43 315)

Easily sol in glycerine, sol in 14 pts glycerine (Fairley, Monit Scient (3) 9 685)

100 g glycerine dissolve 80 g HgCl_2 at 25°
 (Moles and Maquina, Ann Soc Eshan fis quim 1914, 12 383)

Solubility in organic solvents

Solvent	t°	Sat solution contains % HgCl_2
Methyl alcohol	-34	7 6
	-20	11 5
	-15	12 8
	-2	18 7
	+ 4	23 2
	12	27 6
	36	53 1
	51	61 0
	62	63 6
	64	63 7
	74	64 3
	100	68 7
	127	75 2

Solvent	t°	Sat solution contains % HgCl_2
Ethyl alcohol	-60	3 0
	-55	7 8
	-43	8 8
	-40	9 8
	-30	14 3
	-23	18 6
	-21	19 1
	-20	21 9
	-17	22 1
	-11	24 7
	-9	27 0
	-5	29 7
	0	29 0
	+ 3	30 0
	7	30 9
	10	31 3
	14	31 3
	19	32 0
	31	34 2
	43	36 4
N-propyl alcohol	51	38 9
	62	42 1
	63	42 5
	68	44 7
	75	45 2
	80	48 0
	92	51 0
	93	51 1
	100	53 6
	115	60 6
	127	65 3
	138	67 8
Allyl alcohol	-32	14 7
	-22	15 1
	-14	15 6
	0	16 4
	0	16 5
	+ 16	18 2
	41	23 8
	53	27 9
	62	29 4
	67	32 7
	78	36 4
	100	43 8
Acetone	127	52 7
	21	20 6
	1	29 6
	+ 8	31 2
Acetone	22	48 7
	23	51 4
	18	52 9
	-15	56 6
	10	56 7
	8	58 4
	-4	59 1
	1	60 1
	+ 6	61 9
	12	61 4
	15	61 8
	27	62 0
	36	61 9
	54	62 1

Solubility in organic solvents—*Continued*

Solvent	t°	Sat solution contains % HgCl ₂
N-butyl alcohol	—21	12.4
	—6	13.0
	+9	14.3
	21	15.9
	59	25.8
	82	33.1
Isobutyl alcohol	—11	5.5
	—6	6.2
	0	6.7
	+11	7.5
	63	19.3
	98	32.1
	127	42.0
	145	47.2
	155	50.4
Amyl alcohol	—13	8.6
	+26	8.9
	50	14.0
	90	29.8
	106	35.1
Ether	—47	5.6
	—40	5.8
	—35	6.1
	—30	5.9
	—19	5.6
	0	5.8
	+13	5.8
	83	8.4
	100	8.7
	115	9.0
Ethyl formate	—20	29.6
	—3	29.2
	+24	30.0
	+46	31.0
Ethyl acetate	50	39.6
	20	40.5
	—14	40.2
	6	40.0
	0	39.5
	+7	39.9
	19	40.2
	45	41.6
	66	44.0
	100	47.8
	131	50.1
Methyl acetate	150	57.0
	180	59.3
Methyl acetate	—20	42.0
	+24	40.3
	55	41.5
Amyl acetate	+22	18.3
	48	18.5
Ethyl butyrate	+20	12.6
	55	13.5
	71	15.1

Solubility in organic solvents—*Continued*

Solvent	t°	Sat solution contains % HgCl ₂
Acetic acid	+21	2.7
	22	3.0
	33	5.0
	43	6.0
	50	6.7
	61	8.0
	87	11.0
	95	12.0
	95	12.5
	115	16.0
	116	17.0
	127	20.0
	145	26.3
Formic acid	182	44.8
	207	55.2
	21	2.0
	50	3.2
	90	7.3

Very sl sol in propionic and isobutyric acids

(Étard, A ch 1894, (7) 2 557 et seq.)

Solubility of HgCl₂ in organic solvents at t°

Solvent	t°	% HgCl ₂
CHCl ₃	—20.5	0.01
	+44.2	0.12
C ₆ H ₆	+6.5	0.26
	18.0	0.53
	34.1	0.64
	54.1	1.02
	69.0	1.39
C ₂ H ₄ Cl	0	1.33
	12.5	1.55
	20.8	1.68
	25.3	1.73
	30.2	1.92
	33.0	2.05
CH ₃ COOC ₂ H ₅	45.9	2.42
	0	22.8
	6.5	22.7
	26.1	22.8
	38.5	23.5
	45.3	26.4

Solubility of HgCl_2 in mixed organic solvents at t°

Solvent	t°	% HgCl_2
$\text{C}_6\text{H}_6 + \text{C}_2\text{H}_5\text{OH}$	-2 5	15 20
	0 0	15 40
	6 0	16 38
	20 5	18 40
	20 65	18 50
	24 5	19 33
	34 5	21 34
	54 4	24 84
	54 5	24 42
$\text{C}_6\text{H}_6 + 2\text{C}_6\text{H}_5\text{OH}$	-5 2	19 45
	0	20 13
	+9 1	21 65
	20 9	23 57
	24 4	24 19
	36 5	26 53
	53 7	31 27
	74 0	38 74
$\text{CHCl}_3 + \text{C}_2\text{H}_5\text{OH}$	-20 5	3 82
	-12 0	4 43
	0 0	4 89
	+8 0	5 37
	23 0	7 12
	38 5	8 51
	44 2	9 51
	45 6	9 98
$\text{CHCl}_3 + 2\text{C}_2\text{H}_5\text{OH}$	-20 5	6 60
	0 0	7 69
	+8 0	8 96
	23 0	10 66
	38 5	12 50
	44 2	14 40
$\text{CHCl}_3 + \text{CH}_3\text{OH}$	-12 0	1 73
	0 0	3 51
	+8 0	5 63
	23 0	10 15
	24 9	10 71
	30 6	11 40
	38 5	12 02
$\text{CHCl}_3 + 2\text{CH}_3\text{OH}$	-12 0	3 33
	0 0	6 73
	+8 0	8 21
	23 0	16 56
	24 9	18 45
	30 6	19 70
$\text{CCl}_4 + 2\text{CH}_3\text{OH}$	0 0	5 20
	7 7	6 69
	24 9	14 06
	30 6	19 40
	35 5	20 50
	36 1	21 80
	48 5	21 90

Solubility of HgCl_2 in mixed organic solvents at t° —Continued

Solvent	t°	HgCl_2
$\text{C}_2\text{H}_4\text{Cl}_2 + \text{CH}_3\text{OH}$	0 0	13 33
	12 5	21 30
	20 8	29 23
	25 3	34 78
	30 2	36 87
	33 0	37 01
	37 4	37 95
	45 9	39 36
$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{C}_6\text{H}_6$	0 0	9 62
	6 5	9 62
	25 7	9 78
	27 6	9 78
	35 5	10 81
$\text{CH}_3\text{COOC}_2\text{H}_5 + \text{CHCl}_3$	0 0	3 34
	26 1	4 07
	36 1	4 78
	46 0	5 38
	48 5	5 10
$2\text{CH}_3\text{COOC}_2\text{H}_5 + \text{CCl}_4$	0 0	9 24
	10 3	9 05
	25 7	9 32
	27 6	9 50
	38 5	9 89
	45 3	11 70

(Dukelski, Z anorg 1907, 53 335)

Solubility in organic solvents at $18^\circ/20^\circ$ 100 g chloroform dissolve 0.106 g HgCl_2 100 g tetrachloromethane dissolve 0.002 g HgCl_2 100 g bromoform dissolve 0.456 g HgCl_2 100 g ethyl bromide dissolve 2.010 g HgCl_2 100 g ethylene dibromide dissolve 1.530 g HgCl_2 (Sulc Z anorg 1900, 25 401)Solubility of HgCl_2 in various organic solvents at 25° G = g HgCl_2 dissolved in 1 mol of solvent

Solvent	(HgCl_2)
Ethylene chloride	1.216
Tetrachlorethane	0.146
Chloroform	0.120
Dichlorethylene	0.110
Pentachlorethylene	0.039
Trichlorethylene	0.036
Perchlorethylene	0.012
Carbon tetrachloride	Trace

(Hofman, et al, B 1910, 43 188)

Very sl sol in nitromethane at ord temp
Very sol on warming (Bruner, B 1903, 36 3298)

Solubility in CS_2 at t°

t°	100 pts sat solution contain pts HgCl_2
-10	0 010
-5	0 014
0	0 018
+5	0 022
10	0 026
15	0 032
20	0 042
25	0 053
30	0 063

(Arctowski, Z anorg 1894, 6 267)

0 030 g is dissolved in 100 g sat solution in CS_2 at 8° (Arctowski, Z anorg 1894, 6 256)

Formic acid (95%) dissolves 2 1% at 19° (Aschan, Ch Z 1913, 37 1117)

Sol in molten urethane (Castoro, Z anorg 1899, 20 61)

Sol in ethyl sulphocyanate (Kahlenberg, Z phys Ch 1903, 46 66)

Solubility of HgCl_2 in benzene

100 pts C_6H_6 dissolve at —

15° 41° 55° 84°
0 54 0 62 0 85 1 80 pts HgCl_2

(Iaszcynski, B 1594, 27 2287)

in C_4H_8 = 0 0197 mol/l at 25° (Z phys Ch 1903, 43 735)

Sol in C_4H_{10} , toluene, xylene, and other aromatic hydrocarbons. Insol or only sl sol in petroleum ether hexane decane and CS_2 (Galkwitsch, B 1904 37 1563)

Sol in p toluidine (Werner)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, 51 236)

Solubility of HgCl in pyridine

t = point of fusion

Solid Phase = HgCl , $2\text{C}_5\text{H}_5\text{N}$

t	HgCl	t	HgCl	t	HgCl
-32 8	2 76	40 90	29 29	78 0	49 72
-21 9	7 86	50 10	34 94	78 7	50 37
+ 0 02	13 14	60 03	40 36	80 2	51 52
12 58	17 34	70 15	46 44	82 5	52 40
18 78	19 78	70 8	45 77	89 0	56 45
23 60	21 59	74 6	48 00	90 5	57 01
27 23	22 65	75 2	48 38	94 1	60 09
31 05	24 46	76 4	49 15		

Solubility of HgCl_2 in pyridine—Continued

t = point of fusion

Solid Phase = HgCl_2 , $\text{C}_5\text{H}_5\text{N}$

t°	% HgCl_2	t	% HgCl_2	t°	% HgCl
74 7	48 38	90 61	53 50	104 1	60 09
83 5	50 53	75 0	56 45	104 2	60 72
86 5	52 37	99 5	56 07	104 7	58 97
87 3	52 02	99 5	57 01	107	63 06
		100 5	57 84		

Solid Phase = 3HgCl_2 , $\text{C}_5\text{H}_5\text{N}$

t°	% HgCl_2	t	% HgCl_2	t	% HgCl_2
94 7	60 72	113 6	63 06	124 2	65 00
95 2	60 77	114 0	63 18	129 4	65 63
106 4	61 93	115 7	63 37	145 5	69 66
109 8	62 58	118 2	64 09		

(McBride, Z phys Ch 1910, 14 196)

Solubility in pyridine

S = temp of solidification

Mols per 100	S	Mols per 100	S	Mols per 100	S
5 8	19	27 0	87	38 5	130
5 9	18 5	28 6	(98)	41 0	137
10 2	39 5	30 3	91 5	43 2	142
14 1	52	31 2	92	44 0	143,5
21 4	74 5	33 1	108	47 5	159
25 0	83	35 1	115 5	52 8	173

(Staronka, Anz Ak Wiss Krakau, 1910 372)

Sp gr at $16^\circ/4^\circ$ of HgCl_2 + pyridine containing 17 53% H_2C^{200} - 1 1523, containing 6 57% HgCl = 1 1523 (Schonrock, Z phys Ch 1893, 11 768)

Mol weight determined in benzonitrile, methyl- and ethylsulphide (Werner, Z anorg 1897, 15 31 26 und 30)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Easily sol in oil of turpentine and other essential oils, sl sol in cold benzene, but much more on heating, crystallising on cooling (Fruchimont, B 16 387)

Easily sol in boiling acetone

Insol in olive oil

Insol in oils and fats but sol when first dissolved in alcohol, free (ether or anhydrous ketones (Glock, Ch Z Repert 36 315)

Extracted from HgCl_2 + Aq by volatile oils

Mercuric hydrogen chloride (Chloromercuric acid), HgCl_2 , $\text{HCl} = \text{IIIHgCl}$,

Decomp by H_2O (Boullay, A ch 34 243)

Easily decomposed (Neumann, M 10 236)

$\text{HgCl}_2, 2\text{HCl} + 7\text{H}_2\text{O}$ Decomp by H_2O
(Ditte, A ch (5) 22 551)
 $3\text{HgCl}_2, 4\text{HCl} + 14\text{H}_2\text{O}$ As above
 $2\text{HgCl}_2, \text{HCl} + 6\text{H}_2\text{O}$ As above
 $4\text{HgCl}_2, 2\text{HCl} + 9\text{H}_2\text{O}$ As above
 $3\text{HgCl}_2, \text{HCl} + 5\text{H}_2\text{O}$ As above

**Mercuric hydrazine chloride, HgCl_2 ,
 $2(\text{N}_2\text{H}_4, \text{HCl})$**

Very sol in H_2O More sol in hot alcohol
than in cold, decomp by HNO_3 (Curtius,
J pr 1894, (2) 50 332)

**Mercuric nickel chloride, basic, HgCl_2 ,
 $6\text{NiO}, \text{NiCl}_2 + 20\text{H}_2\text{O}$, and $\text{HgCl}_2, 7\text{NiO},$
 NiCl_2**

(Mailhe, A ch 1902, (7) 27 369)

Mercuric nickel chloride

Deliquescent (v Bonsdorff)

Mercuric nitrosyl chloride, $\text{HgCl}_2, \text{NOCl}$

Sol in H_2O without effervescence (Sud-
borough, Chem Soc 59 659)

Mercuric phosphoric chloride, $3\text{HgCl}_2, 2\text{PCl}_5$

Decomp and dissolved by H_2O (Baudri-
mont, A ch (4) 2 45)

potassium chloride, $2\text{HgCl}_2, \text{KCl} +$

**asily sol in warm H_2O A clear
at 18° is filled with crystals at 15°
1 alcohol (v Bonsdorff, Pogg 17**

$\text{HgCl}_2, \text{KCl} + \text{H}_2\text{O}$ Easily sol in H_2O , sl
sol in alcohol (v Bonsdorff, Pogg 19 336)

$\text{HgCl}_2, 2\text{KCl} + \text{H}_2\text{O}$ As above
Solubility determinations show that the
double salts formed by mercuric and potas-
sium chlorides at 25° are

$2\text{KCl}, \text{HgCl}_2 + \text{H}_2\text{O}$
 $\text{KCl}, \text{HgCl}_2 + \text{H}_2\text{O}$ Can be recryst with-
out decomp

$\text{KCl}, 2\text{HgCl}_2 + 2\text{H}_2\text{O}$ Gives HgCl_2 on
recryst from H_2O (Foote and Levy, Am
Ch J 1906, 35 237)

Mercurous rhodium chloride

See Chlororhodite, mercurous

Mercuric rubidium chloride, $\text{HgCl}_2, \text{RbCl}$

Sol in H_2O
 $\text{HgCl}_2, 2\text{RbCl}$ Sol in H_2O and $\text{HCl} + \text{Aq}$
(Godeffroy, Arch Pharm (3) 12 47)
 $+ 2\text{H}_2\text{O}$ Sol in H_2O (Godeffroy)

$2\text{HgCl}_2, \text{RbCl}$ Sol in H_2O (Godeffroy)
Solubility determinations show that at 25°
there exist five double mercuric rubidium
chlorides with the following formulas

$\text{RbCl}, 5\text{HgCl}_2$ Gives HgCl_2 on recryst
from H_2O

$3\text{RbCl}, 4\text{HgCl}_2 + \text{H}_2\text{O}$ Gives RbCl ,
 5HgCl_2 on recryst from H_2O

$\text{RbCl}, \text{HgCl}_2 + \text{H}_2\text{O}$ Gives $3\text{RbCl}, 4\text{HgCl}_2$
on recryst from H_2O

$3\text{RbCl}, 2\text{HgCl}_2 + 2\text{H}_2\text{O}$ Gives 3RbCl ,
 4HgCl_2 on recryst from H_2O
 $2\text{RbCl}, \text{HgCl}_2 + \text{H}_2\text{O}$ Gives 3RbCl ,
 4HgCl_2 on recryst from H_2O
(Foote and Levy, Am Ch J 1906, 35 241)

Mercurous silver chloride, HgCl, AgCl

(Jones, J Soc Chem Ind 1893, 12 983)

$2\text{HgCl}, \text{AgCl}$ Min *Boradite* (Jones,
J Soc Chem Ind 1893, 12 983)

$3\text{HgCl}, \text{AgCl}$ (Jones, Chem Soc 1910,
97 338)

Mercuric sodium chloride, $\text{HgCl}_2, \text{NaCl}$

Sp gr at $16^\circ/4^\circ$ of aqueous solution con-
taining 14.937% salt = 1.13310, containing
11.0736% = 1.09528 (Schönrock, Z phys
Ch 1893, 11 782)

$+ \text{H}_2\text{O}$ (Linebarger, Am Ch J 1893, 15
344)

$+ 1\frac{1}{2}\text{H}_2\text{O}$ Sol in 0.33 pt H_2O at 15°
(Schindler, Repert 36 240)

Extremely easily sol in alcohol (Vort)

Sol in 275 pts ether. Ether dissolves the
undecomposed salt out of H_2O solution
(Lassaigne, A ch 64 104)

$\text{HgCl}_2, 2\text{NaCl}$ Deliquescent Very sol
in H_2O (Vort, A 104 351)

$2\text{HgCl}_2, \text{NaCl}$ Decomp by H_2O in dil
solution Sol in acetone and acetic ether
(Linebarger, Am Ch J 1893, 15 344)

Solubility determinations show that the
only double salt formed by mercuric and
sodium chlorides between 10° and 25° is
 $\text{NaCl}, \text{HgCl} + 2\text{H}_2\text{O}$ Can be recryst from
 H_2O (Foote and Levy, Am Ch J 1906, 35
237)

**Mercuric strontium chloride, basic, SrCl_2 ,
 $\text{HgO} + 6\text{H}_2\text{O}$**

Decomp by H_2O (Andr, C R 104 131)

**Mercuric strontium chloride, $2\text{HgCl}_2, \text{SrCl}_2$,
 $2\text{H}_2\text{O}$**

Easily sol in H_2O (v Bonsdorff)

$3\text{HgCl}_2, \text{SrCl}_2 + 5.6\text{H}_2\text{O}$ Very sol in
 H_2O (Swan, Am Ch J 1898, 20 6 2)

Mercurous sulphur chloride

See Mercurous sulphochloride

Mercuric thallous chloride, $\text{Hg}_2\text{Cl}_2, \text{TlCl}$

Easily sol in H_2O (Jorgensen, J pr 2)
6 83)

Mercurous stannous chloride, $\text{Hg}_2\text{Cl}_2, \text{SnCl}_2$

Decomp by H_2O (Capitane, J Pharm
25 549)

**Mercuric yttrium chloride, $3\text{HgCl}_2, \text{YCl}_3 +$
 $9\text{H}_2\text{O}$**

Deliquescent Very sol in H_2O (Popp,
A 131 179)

Mercuric zinc chloride, HgCl_2 , ZnCl_2

Very sol in H_2O (Harth, Z anorg 1897, 14 323)
 2HgCl_2 , ZnCl_2 (Varet, C R 1896, 123 422)

Mercuric zinc chloride ammonia, HgCl_2 , 4ZnCl_2 , $10\text{NH}_3+2\text{H}_2\text{O}$

Insol in boiling H_2O , but decomp thereby (André, C R 112 995)
 HgCl_2 , 2ZnCl_2 , $6\text{NH}_3+\frac{1}{2}\text{H}_2\text{O}$ As above (André)

Mercuric chloride ammonia, HgCl_2 , 12NH_3

Sl sol in ammonia (Franklin, Am Ch J 1900, 23 300)

Mercuric chloride cadmium oxide, HgCl_2 , $(\text{CdO}+\text{H}_2\text{O})$

(Mailhe, A ch 1902, (7) 27 371)

Mercuric chloride cobaltous oxide, HgCl_2 , $3\text{CoO}+\frac{1}{2}\text{H}_2\text{O}$

(Mailhe, C R 1901, 132 1274)

Mercuric chloride cupric oxide, HgCl_2 , $3\text{CuO}+\text{H}_2\text{O}$

(Mailhe, Bull Soc 1901, (3) 25 791)

Mercuric chloride hydrazine, HgCl_2 , N_2H_4

Very unstable. Decomp by H_2O . Pptd from alcohol solution by H_2O , very sol in min acids with decomp.

Easily sol in HCl or HNO_3 . Decomp by alkalis. Somewhat sol in acetic acid (Hofmann B 1897, 30 2020)

Mercuric chloride hydroxylamine, HgCl_2 , $2\text{NH}_2\text{OH}$

Completely sol in methyl and ethyl alcohol insol in ether, decomp by H_2O and $\text{NaOH}+\text{Aq}$. Sol in NH_4OH , $\text{HCl}+\text{Aq}$ (Adam, Am Ch J 1902 28 210)

Mercuric chloride lead oxide, HgCl_2 , $2\text{PbO}+2\text{H}_2\text{O}$

(Mailhe, A ch 1902 (7) 27 372)

Mercuric chloride strontium chromate, 2HgCl_2 , HCl , SrCrO_4

Sol in H_2O without decomp (Imbert, Bull Soc 1897 (2) 17 471)

Mercuric chloriodide, 2HgCl , HgI

Sol in H_2O (Liebig)
 HgCl , HgI . Sl sol in hot H_2O with partial decomp. More easily sol in alcohol (Köhler B 12 1187)

Mercurous fluoride, Hg_2F_2

Decomp by H_2O with separation of Hg_2O

Mercuric fluoride, HgF_2 , $+2\text{H}_2\text{O}$

Decomp by cold H_2O , with separation of Hg_2O . Sol in dil HNO_3+Aq , and $\text{HF}+\text{Aq}$ (Finkener, Pogg 110 628)

Mercurous hydrogen fluoride, Hg_2F_2 , $4\text{HF}+4\text{H}_2\text{O}$

Deliquescent. Easily sol in H_2O . Sol in dil acids and dil HF (Bohm, Z anorg 1905, 43 327)

Mercurous silicon fluoride

See Fluosilicate, mercurous

Mercurous fluoride ammonia, Hg_2F_2 , 2NH_3

Stable on air (Finkener, Pogg 110 142)

Mercurous hydroxide, Hg_2OH

Nearly insol in cold, sol in hot H_2O . Sol in $\text{NaOH}+\text{Aq}$ (Bhaduri, Z anorg 1897, 13 410)

Mercurous iodamide, $\text{Hg}_2(\text{NH}_2)\text{I}$

(Rammelsberg, Pogg 48 184)
 Is a mixture of Hg and $\text{Hg}(\text{NH}_2)\text{I}$ (Barfoed)

Mercurous iodide, Hg_2I_2

Sol in over 2375 pts H_2O (Saladin, J chim méd 7 530)

Solubility in $\text{H}_2\text{O}=2.6 \times 10^{-8}$ g-equiv per liter (calculated) (Bodlander, Z phys Ch 1898, 27 58)

Solubility in $\text{H}_2\text{O}=3 \times 10^{-10}$ mols per litre at 25° (Sherrill, Z phys Ch 1903, 43 735)

Sol in $\text{Hg}(\text{NO}_3)_2+\text{Aq}$ (Stromann, B 20 2915)

Sol in $\text{KI}+\text{Aq}$. Easily sol in $\text{Hg}_2(\text{NO}_3)_2+\text{Aq}$. Sl sol in $\text{NH}_4\text{OH}+\text{Aq}$. Sol in hot $\text{NH}_4\text{Cl}+\text{Aq}$, but less than HgI_2 . Less sol in NH_4NO_3 than in $\text{NH}_4\text{Cl}+\text{Aq}$ (Brett)

Partially sol with separation of Hg and formation of HgI , in cold $\text{KI}+\text{Aq}$, hot NaI , CaI_2 , SrI_2 , BaI_2 , MgI_2 , ZnI_2 , and $\text{NH}_4\text{I}+\text{Aq}$, in warm NaCl , KCl and $\text{NH}_4\text{Cl}+\text{Aq}$, and slowly in hot $\text{HCl}+\text{Aq}$ (Boullay, A ch (2) 34 355)

Decomp by alkali chlorides $+\text{Aq}$ (Mailhe, A ch (3) 5 177)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898 20 529)

Not wholly insol in alcohol, ether, or chloroform (M - I cp anal Ch 1884 375)

Decomp in alcohol, 1000 g boiling alcohol decomp about 3.15 g HgI_2 (François, C R 1896, 121 890)

Boiling alcohol decomp HgI_2 to Hg and HgI which dissolves until 0.220 g HgI_2 are contained in 100 g alcohol (François, C R 1896, 121 889)

Insol in cold ether (François, J Pharm 1897, (6), 6 445)

Insol in methylene iodide (Rutgers, Z anorg 3 345)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)

Phenol at 180° decomp it into Hg and HgI_2 until a state of equilibrium is reached with

275 g HgI_2 to 100 g phenol, above which point HgI_2 is sl sol (0.05 g in 100 g) in phenol- HgI_2 mixture. Decomp by cold aniline more rapidly than by hot. Equilibrium is reached when 26.35 g HgI_2 are present to 100 g aniline at bpt of aniline. Aniline containing more than 26 g HgI_2 to 100 g dissolves HgI_2 in considerable quantity (François, C C 1896, I, 470).

Sl sol in benzonitrile (Naumann, B 1914, 47 1369).

Sl sol in allyl mustard oil (Mathews, J phys Chem 1905, 9 647).

Mercuric iodide, HgI_2

Sol in 150 (?) pts H_2O (Wurtz)

1 l H_2O at 17.5° dissolves 0.0403 g HgI_2 (Bourgoin, A ch (6) 3 429).

Sol in about 6500 pts H_2O (Hager)

According to calculation from electrical conductivity of $\text{HgI}_2 + \text{Aq}$, HgI_2 is much less sol, 1 l H_2O dissolving only 0.5 mg HgI_2 at 18° (Kohlrausch and Rose, Z phys Ch 12 241).

1 l H_2O dissolves 0.054 g HgI_2 at 22° (Rohland, Z anorg 1898, 15 412).

1 l H_2O at 25° dissolves about 0.06 g (Morse, Z phys Ch 1902, 41 731).

1 l H_2O at 18° dissolves 4×10^{-6} mol (Abegg, Z Elektrochem 1903, 9 553).

Solubility in H_2O at 25° = 0.00013 mol liter (Sherrill, Z phys Ch 1903, 43 735).

) dissolves 0.4 mg HgI_2 at 18° h, Z phys Ch 1904, 50 356).

) at 18° dissolves 0.2 to 0.4 mg (Kohlrausch, Z phys Ch 1908, 64 168).

The yellow modification is always deposited from solution even in the presence of an excess of the red form (Gernez, C R 1903, 136 1323).

Sol in many acids, especially in HCl , and $\text{HI} + \text{Aq}$. Insol in $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ (Beithemot). Scarcely sol in dil $\text{HNO}_3 + \text{Aq}$.

Not attacked by cold H_2SO_4 decomp by hot (Ditte, A ch 1879, (5) 17 124).

Sat solution in $\text{H}_2\text{SO}_4 + \text{Aq}$ contains at critical temp (158.2°), 0.7% HgI_2 (Nikol'ski, Z anorg 1912, 75 152).

Sol in hot $(\text{NH}_4)_2\text{CO}_3$, $(\text{NH}_4)_2\text{SO}_4$, cold NH_4Cl , NH_4NO_3 , or ammonium succinate + Aq (Wittstein).

Sol in HgCl_2 , $\text{Hg}(\text{NO}_3)_2$ or $\text{Hg}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$. Easily sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$. Easily sol in soluble iodides + Aq . More sol in hot than in cold NaI or $\text{KI} + \text{Aq}$. When conc 1 mol KI in hot solution dissolves 3 mols HgI_2 , but a portion separates on cooling. BaI_2 , SrI_2 , MgI_2 , and CaI_2 act in the same way. Easily sol in cold, more sol in hot $\text{ZnI}_2 + \text{Aq}$, 2 mols HgI_2 being dissolved to 1 mol ZnI_2 . In $\text{NH}_4\text{I} + \text{Aq}$, 3 mols HgI_2 are dissolved to 2 mols NH_4I . Abundantly sol in hot KCl , NaCl , $\text{NH}_4\text{Cl} + \text{Aq}$, but separates out on cooling, and the trace remaining may be pptd by H_2O , 2 g KCl in solution dissolves 1.166 g HgI_2 . Sol in $\text{HgCl}_2 + \text{Aq}$, and very easily sol in

alcoholic solution of HgCl_2 (Boullay, A ch (2) 34 346).

Solubility in $\text{MI} + \text{Aq}$ at 25°

Salt	In 10 cc of the solution	
	Millimols HgI_2	Millimols salt
NaI	4 12	7 94
	6 22	13 85
	9 45	22 25
KI	1 27	3 03
	1 80	3 90
	5 10	10 34
	7 00	15 54
CaI_2	12 24	25 19
	0 50	0 53
	2 61	2 52
	4 40	1 68
	4 58	4 84
SrI_2	17 06	17 99
	2 12	2 51
	3 20	3 55
	5 82	5 39
BaI_2	6 94	6 08
	0 59	0 99
	7 42	7 18
	8 98	9 78
	14 62	15 08

(Herz and Paul, Z anorg 1913, 82 131)

Solubility of $\text{HgI}_2 + \text{KI}$ in H_2O

Temp 0		
% KI	HgI	Solubility
50.9	19.3	KI
44.4	32.4	
39	48	
37.4	53.6	KI + KHgI ₂
37.8	52.6	
35.1	52.2	KHgI ₂
35.5	51.2	
26.7	50.3	KHgI ₂ + H ₂ O
26.6	49.4	
23.7	40.2	
14.9	22.5	
Temp 50		
60.6		KI
40	53	
39.6	52.7	
40	52.2	KI + KHgI ₂
40.2	51.2	
39.3	50.3	KHgI ₂
33.7	49.8	
33	52	KHgI ₂ + H ₂ O
31.4	51.7	
29.1	52.2	

(Dunningham, Chem Soc 1914, 105 368)

Very sol in KSCN + Aq (Philipp, Pogg 1867, **131** 93)

Sol in 109 pts cryst $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Eder and Ulm, M 1882, **3** 197)

Very sol in hot $\text{CaCl}_2 + \text{Aq}$, less sol in BaCl_2 , KCl and $\text{NaCl} + \text{Aq}$ (Lea, Z anorg 1896, **12** 341)

Solubility in normal $\text{Hg}(\text{NO}_3)_2 + \text{Aq} = 48.0 \text{ g per litre}$ (Morse, Z phys Ch 1902, **41** 731)

Extremely sol in cold conc $\text{NH}_4\text{Br} + \text{Aq}$ (Grossmann, B 1903, **36** 1602)

Sol in alkali sulphites + Aq (Barth, Z phys Ch 1892, **9** 215)

Sol in $\text{Ca}(\text{OCl})_2 + \text{Aq}$, sol in $\text{KOH} + \text{Aq}$ (Melsen, A ch (3) **26** 222)

Sol in liquid SO_2 (Walden and Centnerszwa, C C 1902, **1** 344)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 829)

Sol in SOCl_2 , S_2Cl_2 , SO_2Cl_2 , warm AsCl_3 , PBr_3 , warm POCl_3 (Walden, Z anorg 1900, **25** 212)

Easily sol in AsBr_3 (Walden, Z anorg 1902, **29** 371)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, **54** 674)

More sol in alcohol than in H_2O 1 l H_2O containing 10% of 90% alcohol dissolves 0.08 g HgI_2 1 l of alcohol of 90° B dissolves 2.571 g HgI_2 , 1 l absolute alcohol dissolves 11.86 g HgI_2 (Boungoin, A ch (6) **3** 429)

Sol in 130 pts cold, and 15 pts hot 90% alcohol (HgI_2)

100 pts absolute methyl alcohol dissolve 3.16 pts at 19° 100 pts absolute ethyl alcohol dissolve 2.09 pts at 19° (de Bruyn Z phys Ch **10** 783)

0.00842 pt is sol in 1 pt alcohol at 15° (Gautier and Charpy C R 1890, **111** 647)

100 g methyl alcohol dissolve 3.7 g HgI_2 at 19° ethyl alcohol 1.86 g propyl alcohol, 1.2 g isobutyl alcohol, at 22°, 0.51 g (Lumfrow Dissert 1894)

At 15° 20 100 g methyl alcohol dissolve 3.24 g HgI_2 ethyl alcohol 1.42 g, propyl alcohol 0.826 g (Kohland, Z anorg 1898, **15** 412)

Solubility of HgI_2 in ethyl alcohol + Aq at 25°

A g alcohol in 100 g alcohol + Aq
 HgI_2 millimols HgI_2 in 100 cc of the solution

A	HgI_2	Sp gr
100	3.86	0.80325
95.82	2.36	0.80950
92.44	1.92	0.81536
86.74	1.38	0.82996
78.75	0.935	0.84651
67.63	0.45	0.87214

(Herz and Knoch, Z anorg 1905, **45** 266)

Solubility of HgI_2 in methyl alcohol + Aq at 25°

P = g alcohol in 100 g alcohol + Aq
 HgI_2 = millimols HgI_2 in 10 cc of the solution

P	HgI_2	Sp gr
0	0.0013	
47.06	0.0098	0.9187
64.00	0.0347	0.8834
78.05	0.0981	0.8519
100	0.571	0.8155

(Herz and Anders, Z anorg 1907, **52** 165)

Solubility of HgI_2 in ethyl alcohol + Aq at 25°

P = g alcohol in 100 g alcohol + Aq
 HgI_2 = millimols HgI_2 in 10 cc of the solution

P	HgI_2	Sp gr
70.01	0.061	0.8636
100	0.386	0.8032

(Herz and Anders, Z anorg 1907, **52** 170)

At 15°, 1 pt by weight is sol in —
24813 pts H_2O
30.8 pts methyl alcohol of sp gr at 0.7990
70.3 " ethyl " " " " 0.8100
121.0 " propyl " " " " 0.8160

(Rohland, Z anorg 1899, **18** 328)

Solubility of HgI_2 in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the mixtures
 HgI_2 = g HgI_2 in 10 cc of the solution
S 25°/1° = Sp gr of the sat solution

P	HgI_2	S 25°/1°
0	0.180	0.8038
4.37	0.193	0.8039
10.4	0.208	0.8046
11.02	0.232	0.8077
80.69	0.280	0.8131
81.77	0.296	0.8140
91.25	0.298	0.8146
100	0.316	0.8156

(Herz and Kuhn, Z anorg 1908, **58** 164)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgI₂ in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	0 316	0 8156
23 8	0 304	0 8155
91 8	0 169	0 8101
93 75	0 167	0 8110
96 6	0 153	0 8108
100	0 142	0 8116

(Herz and Kuhn, Z anorg 1908, 60 158)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g HgI₂ in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	0 180	0 8038
8 1	0 173	0 8036(?)
17 85	0 165	0 8043
56 6	0 155	0 8075
91 2	0 152	0 8099
95 2	0 144	0 8108
100	0 142	0 8116

(Herz and Kuhn, Z anorg 1908, 60 161)

Solubility in 100 pts amyl alcohol equals

0 66 pts at 13°
3 66 " " 71°
5 30 " " 100°
9 57 " " 133 5°

(Laszcynski, B 1894, 27 2287)

Sp gr at 16°/4° of HgI₂+alcohol containing 1 8358% HgI = 0 80718, containing 1 7119% = 0 80597 (Schonrock, Z phys Ch 1893, 11 770)

Somewhat sol in ether Sol in 77 pts ether (Saladin) Sol in 60 pts ether (Hager)

Sol in cold ether (François, J Pharm 1897, (6) 6 445)

Very sl sol in anhydrous ether (Hampe)

0 62 pt is sol in 100 pts ether at 0°

0 97 pt is sol in 100 pts ether at 36°

(Laszcynski, B 1894, 27 2286)

Solubility in ether = 0 3% at ord temp (Marsh, Chem Soc 1910, 97 2299)

Nearly insol in ether (Dunningham, Chem Soc 1914, 105 368)

Data are given on the system HgI₂+KI+ether (Dunningham)

Solubility at 23° in chloroform = 0 071%, in ether = 0 551%, in acetone = 2 005% in ethyl alcohol = 2%, in methyl alcohol = 3 975%, in benzene = 0 247% (Beckmann and Stock, Z phys Ch 1895, 17 130)

Solubility in organic solvents at t°

Solvent	t°	100 g of the solvent dissolve g HgI ₂
Chloroform	61	0 163
Tetrachlormethane	75	0 094
Ethylene dichloride	85 5	1 200
Isobutyl chloride	69	0 328
Ethyl bromide	38	0 773
Methyl alcohol	66	6 512
Ethyl alcohol	78	4 325
Isopropyl alcohol	81	2 266
Isobutyl alcohol	ca 100	2 433
Methyl formate	36-38	1 166
Ethyl formate	52-55	2 150
Methyl acetate	56-59	2 500
Ether	35	0 470
Acetone	56	3 249
Acetal	ca 100	2 000
Chloral	96	
Epichlorhydrin	ca 100	6 113
Hexane	67	0 072
Benzene	80	0 825
Ethyl acetate	74-78	4 200

(Sulc, Z anorg 1900, 25 402)

Solubility in organic solvents at 18-20°

100 g chloroform dissolve 0 040 g HgI₂

100 g tetrachlormethane dissolve 0 006 g HgI₂

100 g bromoform dissolve 0 486 g HgI₂

100 g ethyl bromide dissolve 0 643 g HgI₂

100 g ethyl iodide dissolve 2 041 g HgI₂

100 g ethylene dibromide dissolve 0 748 g HgI₂

(Sulc, Z anorg 1900, 25 401)

1 pt ethylene bromide dissolves 0 00553 pts HgI₂ at 15° (Gautier and Charpy, C R 1890, 111 647)

100 pts methylene iodide CH₂I₂ dissolve 2 5 pts HgI₂ at 15°, 16 6 pts at 100°, and 58 pts at 180° (Retgers, Z anorg 3 252)

1 l sat solution in CCl₄ at 15° contains 0 170 g HgI₂ (Dawson, Chem Soc 1909, 95 874)

Sol in 340 pts glycerine (Furley, Monit Scient (3) 9 685)

100 pts acetone dissolve 2 09 pts HgI₂ at 25° (Krug and M'Elroy, J Anal Ch 6 84)

Sol in acetone and in methyl al (Fidmann, C C 1899, II, 1014)

Solubility in 100 pts acetone equals

2 83 pts HgI₂ at — 1°
3 36 " " " 15°
4 73 " " " 40°
6 07 " " " 55°

(Laszcynski, B 1894, 27 2287)

100 g methyl acetate solution, sat at 18°, contain 1 10 g HgI₂ (Bezold, Dissert 1906)

100 g boiling methyl acetate slowly dissolve 2.3 g HgI_2 (Schroeder and Steiner, J pr 1909, (2) 79 49)

Solubility in ethyl acetate at t°

Pts sol in 100 pts ethyl acetate	t°
1 49	- 2
1 56	+17 5
1 64	21
2 53	40
3 19	55
4 31	76

(Laszczynski, B 1894, 27 2286)

100 g ethyl acetate anhydrous, or sat with H_2O at 18° , dissolve at 18° , 14.70 g HgI_2 . Solubility increases somewhat with temp (Hamers, Dissert 1906)

Solubility of HgI_2 in ethyl acetate + Aq at 25°

P = g ethyl acetate in 100 g ethyl acetate + Aq
 HgI_2 = millimols HgI_2 in 10 cc of the solution

l	HgI_2	ζ p gr
4 39	0 0028	0 9973
96 76	0 412	0 9063
100	0 241	0 9011

(Herz and Anders, Z anorg 1907, 52 172)

1 pt is sol in 68.03 pts ethyl acetate at 18° (Nunnn, B 1910, 43 316)

Solubility in diethyl oxalate is 12.5% at bpt and 2.5% at 100° (Reinders, Z phys Ch 1900, 32 507)

Solubility in CS_2 at t°

t	100 pts sat solution contain pts HgI_2
-10	0 107
- 5	0 141
0	0 173
+ 5	0 207
10	0 239
15	0 271
20	0 320
25	0 382
30	0 445

(Arctowski, Z anorg 1894, 6 267)

Solubility in CS_2

100 g of the sat solution contain at
 -86.5° -93° -116°
 0 024 0 023 0 017 g HgI_2
 (Arctowski, Z anorg 1896, 11 274)

0.0028 pt is sol in 1 pt CS_2 at 15° (Gautier and Charpy, C R 1890, 111 647)

1 l sat solution in CS_2 at 15° contains 3.127 g HgI_2 (Dawson, Chem Soc 1909, 95 874)

Very sol in liquid methylamine (Gibbs, J Am Chem Soc 1906, 28 1419)

Abundantly sol in methylamine (Fitzgerald, J phys Chem 1912, 16 633)

Somewhat sol in allyl mustard oil (Mathews, J phys Chem 1905 9 647)

Sol in $\text{Sb}(\text{CH}_3)_3 + \text{Aq}$

Very sl sol in Na citrate + Aq (Spiller)
 1 pt C_6H_6 dissolves 0.00217 pts HgI_2 at 15° (Gautier and Charpy, C R 1890, 111 647)

Solubility in 100 pts benzene equals

0.22 pts at 15°
 0.88 " " 60°
 0.95 " " 65°
 1.24 " " 84°

(Laszczynski, B 1894, 27 2284)

1 l C_6H_6 dissolves 0.00493 mol HgI_2 at 25° (Sherrill, Z phys Ch 1903, 43 735)

100 g boiling phenol dissolve 10 g HgI_2 (François, C R 1895, 121 769)

Sl sol in phenol with 20% H_2O . Not very sol in acetic acid at 119° , in amyl acetate at 133° , in amyl bromide at 119° . Rather sol in diethyl oxalate at 186° , in ethylene bromide at 131° , in amyl alcohol at 137° , in amyl iodide at 150° , in CHBr_3 at 151° , in iodo-benzol at 190° , in oil of turpentine at 160° . Very sol in benzaldehyde at 179° , in methylene iodide at 182° (Reinders, Z phys Ch 1900, 32 506)

1000 pts oil of bitter almonds dissolve 4 pts HgI_2 at ord temp, 1000 pts olive oil, 4 pts, 1000 pts poppy oil, 10 pts, 1000 pts nut oil, 15 pts, 1000 pts castor oil, 20 pts, 1000 pts lard oil, 4 5 pts, 1000 pts vaseline, 2 5 pts, 1000 pts benzene, 4 pts. Sol in phenol (Mehn, Pharm J 3 327, B 19 8 R)

Solubility in aniline

S = Temp of solidification

Mols per 100	S	Mols per 100	S	Mols per 100	S
5 9	12°	19 9	48.5°	33 0	128°
8 2	22.5	25 8	53.5	35 6	140
10 3	29	29 3	105	37 5	147
14 9	41.5	31 7	122	39 2	156
16 6	45	32 4	(55)		

(Staronka, Anz Ak Wiss Krakau, 1910 372)

Solubility of HgI_2 in aniline at t°

t°	g HgI_2 per 100 g aniline	Solid phase
-6 5	23 35	$\text{HgI}_2 \cdot 2\text{C}_6\text{H}_5\text{NH}_2$
+0 4	28 69	"
17 8	42 85	"
21 1	47 55	"
26 9	55 47	"
30 1	62 05	"
36 2	75 80	"
42 9	96 49	"
46 8*		" + $\text{HgI}_2(\text{red})$
48 8	128 1	$\text{HgI}_2(\text{red})$
63 6	163 8	"
70 82	184 1	"
76 2	201 6	"
95 9	246 7	"
108 *		$\text{HgI}_2(\text{red}) + \text{HgI}_2(\text{yellow})$
115 7	281 8	$\text{HgI}_2(\text{yellow})$
137 2	285 2	"
181 1	279	"
199 1	863 2	"

* Transition point

(Pearce and Fry, J phys Ch 1914, 18 667)

Very sol in boiling alcoholic solution of aniline (Vohl, Dissert 1871)

Abundantly sol in hot benzonitrile and other aromatic nitriles (Werner, Z anorg 1897, 15 7)

Sol in benzonitrile (0.98 g in 100 g at 18°) 20 times more sol by addition of 5 g KI to 100 cc benzonitrile (Naumann, B 1914, 47 1375)

Sol in pyridine (Naumann, B 1904, 37 4609)

Solubility of HgI_2 in pyridine

S = temp of solidification

Mols per 100	S	Mols per 100	S	Mols per 100	S
5	10°	34 6	107°	51 3	93 5°
9 8	42 5	38 0	103	51 6	96
15 14	66 5	43 0	97	52 7	108
19 3	83	46 7	88 5	53 2	109
26 3	102 5	48 5	89	55 4	122
29 6	107	50 6	89	57 9	135

(Staronka, Anz Ak Wiss Krakau, 1910 372)

Sp gr at $16^\circ/4^\circ$ of HgI_2 + pyridine containing 10.43% $\text{HgI}_2 = 1.1482$, containing 7.99% = 1.1053 (Schonrock, Z phys Ch 1893, 11 770)Solubility of HgI_2 in quinoline

S = temp of solidification

Mols per 100	S	Mols per 100	S	Mols per 100	S
4 7	100°	29 8	151°	43 0	165°
9 1	115 5	31 4	153	46 1	167
13 2	133 5	35 4	156	48 8	170
23 1	138	37 7	160	49 5	169 5
26 7	145	41 6	165	54 4	166 5

(Staronka, Anz Ak Wiss Krakau, 1910 372)

Mol weight determined in pyridine, methyl- and ethyl-sulphide (Werner, Z anorg 1897, 15 20)

More or less sol at high temp in petroleum (bpt $160-230^\circ$), bromnaphthalene, pyridine, toluene and amyl alcohol (Reinders, Z phys Ch 1900, 32 503)

Yellow modification

100 g of sat solution in acetone at 25° contain 3.0 g HgI_2 (Reinders, Z phys Ch 1900, 32 514)

Red modification

Solubility in alcohol equals

0.717-0.724 g in 100 g solution at 0° 1.044-1.084 g " " 25° 2.10-2.20 g " " 50°

(Reinders, Z phys Ch 1900, 32 522)

100 g of sat solution in acetone at 25° contain 1.95 g HgI_2 (Reinders, Z phys Ch 1900, 32 514) HgI_2 is moderately sol in abs alcohol at its b-pt. The solution has a decided yellow color. On cooling, yellow crystals separate out. They soon change to the red modification.

Readily sol in hot amyl alcohol. Yellow crystals separate from the solution when cooled.

Readily sol in allyl alcohol, forming a yellow solution, from which yellow crystals separate on cooling.

Sol in acetone, giving a yellow solution. On cooling yellow plates separate from the solution and rapidly turn red.

Sol in phenol at 150°C . Solution has yellow color and yellow crystals separate out on cooling.

Readily sol in boiling benzene. Saturated solution is yellow. The yellow iodide separates out on cooling, and changes rapidly to the red.

Sol in toluene giving yellow solution, from which yellow crystals separate on cooling. They rapidly change to red.

Readily sol in naphthalene at temperatures above its transition point. Solution is yellow and on cooling yellow crystals separate out.

Readily sol in hot pseudo-cumene giving a yellow solution. On cooling gives yellow crystals.

Readily sol in ethyl iodide giving very

yellow solution, from which yellow crystals separate on cooling, which change to red rapidly

Only sl sol in ethyl bromide, giving yellow solution from which yellow crystals separate on cooling, which change rather slowly to the red

Sparingly sol in isopropyl bromide

Moderately sol in isobutyl bromide, giving a pink solution from which yellow crystals separate on cooling, which change slowly to red

Sl sol in ethylidene chloride. On sudden cooling at 18° the iodide crystallizes out in yellow plates, which quickly change to red

Sparingly sol in propyl chloride, giving a pink solution, from which yellow crystals separate on cooling

Readily sol in ethyl cyanide, giving a yellow solution. On cooling yellow crystals separate and rapidly change to red

Moderately sol in benzene cyanide, giving a deep yellow solution. On sudden cooling the solution deposits yellow crystals, which rapidly turn red

Rapidly sol in benzoic acid at high temperatures

Sparingly sol in ethyl acetate, giving yellow solution

Sol in ethyl propionate

Very sol in ethyl butyrate, giving a yellow solution. On cooling the iodide crystallized from the solution

Sl sol in ethyl isobutyrate

Readily sol in methyl salicylate, giving a yellow solution

Sparingly sol in phenyl salicylate, giving yellow solution. On cooling yellow crystals separate out, which gradually change to red (Kastle, Am Ch J 1899, 22 474)

Mercuriomercuric iodide, $\text{Hg}_2\text{I}_2 = \text{Hg I}_2$, 2HIgI_2

Insol in H_2O or alcohol. Partially sol in $\text{KI} + \text{Aq}$, in hot NaCl , and $\text{NH}_4\text{Cl} + \text{Aq}$, and in hot $\text{HI} + \text{Aq}$, though very slowly (Boullay, A ch (2) 34 345)

Mercury periodide, HgI_2

Sol in $\text{KI} + \text{Aq}$. Decomp by cold H_2O or alcohol (Joergensen, J pr (2) 2 347)

Mercuric hydrogen iodide (Iodomeric acid), HI , $\text{HIgI}_2 = \text{HHgI}_2$

Crystallizes from $\text{HI} + \text{Aq}$ (Boullay)

Easily decomp (Neumann, M 10 236)

3HIgI_2 , $2\text{HI} + \text{HI}_2\text{O}$ (François, Dissert 1901)

Mercuric nickel iodide, HgI_2 , $\text{NiI}_2 + 6\text{H}_2\text{O}$

Sol in alcohol, ether, and acetone, not decomp by H_2O (Dobroserdoff, C C 1901, II 332)

2HIgI_2 , $\text{NiI}_2 + 6\text{H}_2\text{O}$. Hydroscopic, decomp by H_2O , sol in acetone and ether (Dobroserdoff, C C 1901, II 332)

Mercuric potassium iodide, HgI_2 , $\text{KI} + \frac{1}{2}\text{H}_2\text{O}$

Deliquescent (v Bonsdorff). Permanent, decomp by H_2O into 2KI , HgI_2 , and HgI_2 (Boullay), sol in alcohol, ether, and conc $\text{HC}_2\text{H}_3\text{O}_2$, but decomp by other acids (Berthelot, J Pharm 14 186). Sp gr of sat solution in $\text{H}_2\text{O} = 2.4$ to 3.1

$+\text{H}_2\text{O}$. Sol in H_2O with decomp. Can be cryst from alcohol. Very sl sol in dry ether. Very sol in wet ether (Marsh, Chem Soc 1910, 97 2297)

HgI_2 , 2KI . Sol in H_2O (Thomsen and Bloxam, Chem Soc 41 379)

Sat solution of $\text{KI} + \text{HgI}_2$ in H_2O at 22° contains 8.66% K, 22.49% Hg and 52.48% I, corresponding to 0.22 mol K, 0.11 mol Hg and 0.45 mol I (Dubois, C R 1905, 141 385)

Sp gr at 16°/4° of aqueous solution containing 12.2875% salt = 1.10148, containing 12.2371% = 1.1038, containing 7.9843% = 1.06491 (Schonrock, Z phys Ch 1893, 11 782)

Sol in methyl acetate (Bezold, Dissert 1906)

Sol in ethyl acetate (Alexander, Dissert 1899, Hamers, Dissert 1906)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Sol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

$+2\text{H}_2\text{O}$. Sol in alcohol, ether and acetone, decomp by H_2O (Pawlow, C C 1901, I 363)

Solubility determinations show that KHgI_2 and $\text{KHgI}_2 + \text{H}_2\text{O}$ are the only double salts formed at 20°–30°. See $\text{HgI}_2 + \text{KI}$ under HgI_2 (Dunningham, Chem Soc 1914, 105 368)

Mercuric rubidium iodide, HgI_2 , RbI

Sol in alcohol, decomp by H_2O

HgI_2 , 2RbI . Very easily sol in H_2O (Grossmann, B 1904, 37 1258)

Very sol in acetic acid and alcohol, decomp by H_2O . Stable in aq solution in the presence of an excess of RbI (Erdmann, Arch Pharm 1894, 232 30)

Mercuric silver iodide, HgI_2 , 2AgI

(Wegehus and Kilpi, Z anorg 1909, 61 416)

Mercuric sodium iodide, HgI_2 , NaI

Deliquescent, and decomp by much H_2O (v Bonsdorff, Pogg 17 266)

Sol in alcohol, decomp by H_2O

HgI_2 , 2NaI . Deliquescent, sol in H_2O and alcohol (Boullay)

Sat solution of $\text{NaI} + \text{HgI}_2$ in H_2O at 24.75° contains 4.59% Na, 25% Hg, and 58.25% I, corresponding to 0.20 mol Na,

0.12 mol Hg, and 0.45 mol I (Duboin, C R 1905, **141** 385)
 $+4\text{H}_2\text{O}$ Extremely deliquescent (Duboin, C R 1906, **143** 314)

Mercuric strontium iodide, HgI_2 , SrI_2 (?)

Sol in H_2O without decomp (Boullay)
 $+8\text{H}_2\text{O}$ As Ca salt (Duboin, C R 1906, **142** 573)
 2HgI_2 , SrI_2 (?) Decomp by much H_2O into sol HgI_2 , SrI_2 and insol HgI_2 (Boullay)

Mercuric thorium iodide, 5HgI_2 , $\text{ThI}_4 + 18\text{H}_2\text{O}$

Very deliquescent Easily decomp by H_2O (Duboin, A ch 1909, (8) **16** 282)
 5HgI_2 , $2\text{ThI}_4 + 21\text{H}_2\text{O}$ (Duboin)
 2HgI_2 , $\text{ThI}_4 + 12\text{H}_2\text{O}$ (Duboin)

Mercuric zinc iodide

Deliquescent Decomp by H_2O (v Bonsdorff)

Mercuric iodide ammonia, HgI_2 , 2NH_3

Decomp by NH_3 giving NH_4I and NH_4I (François, C R 1900, **130** 333)
 Stable only in the presence of excess of ammonia Gives off NH_3 in the air (François J Pharm 1897, (6) **5** 388, C C **1897**,

Mercuric iodide hydrazine, HgI_2 , N_2H_4

Decomp by H_2O (Hofmann and Marburg, A 1899, **305** 215)

Mercuric iodide rubidium bromide,

HgI_2 , 2RbBr
 Decomp by H_2O
 Sol in alcohol without decomp (Grosmann, B 1903, **36** 1603)

Mercuric iodide silver chloride, HgI_2 , 2AgCl

Insol in H_2O (Lea, Sil Am J (3) **7** 34)

Mercury iodoantimonide, $\text{Hg}_3\text{Sb}_42\text{HgI}_2$

Sol in HNO_3 aqua regia and hot H_2SO_4 , insol in HCl (Granger, C R 1901, **132** 1116)

Mercury nitride, Hg_3N_2

Gradually decomp by H_2O Decomp by conc HNO_3 , or $\text{HCl} + \text{Aq}$ (Hirzel, J B **1852** 419)

Not attacked by cold, but decomp by hot dil H_2SO_4

Sol in acids + Aq
 Sol in ammoniacal solutions of ammonium salts

Insol in excess of KNH_3 (Franklin, Z anorg 1905, **46** 18)

Sol in ammonia solutions of ammonium salts and in aq acid solutions

Very explosive (Franklin, J Am Chem Soc 1905, **27** 835)

HgN_2

See Mercurous azoimide

HgN_6

See Mercuric azoimide

Mercurous oxide, Hg_2O

Insol in H_2O Insol in dil HCl or HNO_3
 $+ \text{Aq}$ Sol in warm conc $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$
 Sol in 150,000 pts H_2O (Bhaduri Z anorg 1897, **13** 410)

Decomp by H_2O or weak bases (Rose), $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Wittstein), $\text{KNO}_3 + \text{Aq}$ (Rose), $\text{KI} + \text{Aq}$ (Berthelot), or conc $\text{NH}_4\text{Cl} + \text{Aq}$ (Pagenstecher) into HgO and Hg , or HgCl_2 , etc

SI decomp by alkali chlorides + Aq with formation of HgCl_2 , which dissolves (Miahle)

SI sol in alkali cyanides + Aq (Jahn)

Insol in KOH , and $\text{NaOH} + \text{Aq}$

Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 829)

Insol in alcohol and ether

Mercuric oxide, HgO

Sol in 20,000 to 30,000 pts H_2O (Bineau, C R **41** 509)

Sol in 200,000 pts H_2O (Wallace, Ch Gaz **1858** 345)

Ordinary coarse HgO is sol in H_2O to the extent of 50 mg per l at 25° , but when finely powdered the solubility increases to 150 mg per l (Hulett, Z phys Ch 1901, **37** 406)

Red modification is —

Sol in 19,500 pts H_2O at 25° , in 2,600 pts H_2O at 100° (Schick, Z phys Ch 1903, **42** 172)

1 l H_2O dissolves 50 mg red modification of HgO at 25° (Hulett, Z phys Ch 1901, **37** 406)

Yellow modification is —

Sol in 19,300 pts H_2O at 25° in 2,400 pts at 100° (Schick, Z phys Ch 1903, **42** 172)

Sol in acids Insol in H_3PO_4 or $\text{H}_2\text{AsO}_4 + \text{Aq}$ (Haack, A **262** 190)

Scarcely attacked by $\text{HClO}_4 + \text{Aq}$ (Millon, A ch (3) **18** 352)

Solubility of HgO in H_2O at 25°

$\text{Hg} = \text{g-atoms Hg}$ in 1 l of the solution

Hf normal	H_2O
0.12	0.01258
0.24	0.0247
0.57	0.0629
1.11	0.1168
2.17	0.2586

(Jaeger, Z anorg 1901, **27** 26)

Solubility of HgO in HF is decreased by the addition of KF , which proves the non-existence of complex fluorides (Jaeger)

Insol in H_3AsO_4 , H_3PO_4 and in primary and secondary alkali salts of these acids (Haack, in *hot* 1891, 262 190)

Sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$, less in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Insol in KOH , or $\text{NaOH} + \text{Aq}$

Decomp by alkali chlorides $+ \text{Aq}$ into HgCl_2 , which dissolves (Miahle, *A ch* (3) 5 177)

Sol in $\text{Fe}(\text{NO}_3)_3$, and $\text{Bi}(\text{NO}_3)_3 + \text{Aq}$ with pptn of oxides Sol in $\text{KI} + \text{Aq}$ (Persoz)

Very sol in acid sulphites $+ \text{Aq}$ (Barth, *Z phys Ch* 1892, 9 192)

Completely sol in conc CaCl_2 , BaCl_2 , MgCl_2 , and $\text{SrCl}_2 + \text{Aq}$ (André, *C R* 1887, 104 431)

Solubility in Ag salts $+ \text{Aq}$ 100 g Ag_2SO_4 in aqueous solution dissolve 13 g HgO Solubility in $\text{AgNO}_3 + \text{Aq}$ is 15.6 100, in Ag acetate $+ \text{Aq}$ is 1.137 100 (Finci, *Gazz ch it* 1911, 41 (2) 545)

Much less sol in KCl and $\text{NaCl} + \text{Aq}$ than in H_2O (Schoch)

Sol in $\text{U}(\text{NO}_3)_3$, $\text{Al}(\text{NO}_3)_3$ and $\text{Fe}(\text{NO}_3)_3 + \text{Aq}$ (Mailhe, *A ch* 1902, (7) 27 373)

Very sl sol in cold $\text{Hg}(\text{CN})_2 + \text{Aq}$, abundantly sol at 75° with evolution of HCN (Barthe, *J Pharm* 1896, (6) 3 183)

Sol in cold or hot alcoholic NH_4SCN in large amounts (Fleischer, *A* 1875, 179 225)

Completely sol in $\text{KI} + \text{Aq}$ (Jehn, *Arch Pharm* 1873, 201 97)

Solubility of red or yellow modification in $\text{N}/50 \text{ KCl} + \text{Aq}$ is about 25% greater than in pure H_2O (Schick, *Z phys Ch* 1903, 42 168)

Insol in liquid HF (Franklin, *Z anorg* 1905, 46 2)

Insol in liquid NH_3 (Gore, *Am Ch J* 1898, 20 829)

Insol in liquid NH_3 (Franklin, *Am Ch J* 1898, 20 829)

Sol in alcoholic solution of hydroxylamine hydrobromide below 0° (Adams, *Am Ch J* 1902, 28 216)

Insol in alcohol

Sol in trichloroacetic acid $+ \text{Aq}$ (Brand, *J pr* 1913, (2) 88 342)

Insol in acetone and in methylal (Eidmann, *C C* 1899, II 1014)

Insol in acetone (Naumann, *B* 1904, 37 4329)

When freshly pptd, is insol in acetone $+ \text{Aq}$ even on warming, but easily sol if liquid is made alkaline by NaOH Insol in acetophenone even after long warming at 100° Sol in acetaldehyde and much H_2O and a little NaOH (Auld and Hantzsch, *B* 1905, 38 2680)

Sol in formamide (Fischer, *Arch Pharm* 1894, 232 329)

Very sol in ethylene diamine For 1 mol

HgO , 7-10 mols ethylene diamine are necessary (Traube and Lowe, *B* 1914, 47 1910)

Easily sol in benzamide (Dessaignes, *A ch* 1852, (3) 34 146)

When freshly pptd, is sol in picric acid $+ \text{Aq}$ (Varet, *C R* 1894, 119 560)

Sol in alkaline solution of phenol disulphonic acid (Lumiére and Chevroter, *C R* 1901, 132 145)

Sol in nucleic acid $+ \text{Aq}$ when freshly pptd (Schweckerath, *Pat* 1899)

Sol in gum arabic $+ \text{Aq}$ (Peschier, *J Pharm* 1896, (6) 3 509)

Mercuric oxybromide, HgBr_2 , HgO

(André, *A ch* (6) 3 123)

HgBr_2 , 2HgO (André)

HgBr_2 , 3HgO (a) Yellow Insol in cold, sl sol in hot H_2O Easily sol in alcohol (Lowig)

(b) Brown Insol in alcohol (Rammelsberg, *Pogg* 55 248)

HgBr_2 , 4HgO (André)

Insol in ord solvents Decomp by alkalis and acids (Fischer and von Wartenburg, *Ch Z* 1902, 26 894)

2HgBr_2 , 7HgO Readily decomp by acids and alkalis (Fischer and von Wartenburg)

Mercurous oxychloride, Hg_2O , 2HgCl

Min *Eglestonite*

Decomp by hot HCl and by HNO_3 (Moses, *Am J Sci*, 1903, (4) 16 253)

Mercuric oxychloride,

HgO , HgCl_2 Less sol than HgCl_2 , but not isolated (Thummel) Decomp by cold H_2O (André, *A ch* (6) 3 118)

HgO , 2HgCl_2 Decomp by warm H_2O or cold alcohol into 2HgO , HgCl_2 (Thummel, *Arch Pharm* (3) 27 589)

Decomp by H_2O Not decomp by alcohol (Arcotowski, *Z anorg* 1895, 9 178)

2HgO , HgCl_2 *Two modifications*

A Red Insol in H_2O , decomp by alkali carbonates, or chlorides $+ \text{Aq}$ into 4HgO , HgCl_2

Acted upon by cold alkali carbonates and alkali chlorides $+ \text{Aq}$ (Schoch, *Am Ch J* 1903, 29 335)

Not decomp by H_2O at ord temp (Thummel)

Very sl sol in cold, completely sol in hot H_2O (Haack, *A* 1891, 262 189)

A small amt of HNO_3 converts it into a white powder, more HNO_3 dissolves it (Haack, *A* 1891, 262 189)

B Black Not decomp by alkali chlorides, or carbonates $+ \text{Aq}$ (Thummel)

Not affected by boiling alkali carbonates or alkali chlorides $+ \text{Aq}$ (Schoch, *Am Ch J* 1901, 29 335)

Insol in cold and hot H_2O and alcohol

Sol in acid (Van Nest, *Dissert* 1909)

Not changed by H_2O (Blaas, *Miner Mitt* (2) 2 177)

Sol in HNO_3 or $\text{HCl} + \text{Aq}$ (Blaas)
 Not changed by alcohol (Blaas)
 $+ \frac{1}{2} \text{H}_2\text{O}$ (Ray, A 1901, 316 255)
 3HgO , HgCl_2 Decomp by warm H_2O
 (Thummel)

Not attacked by cold H_2O (André)
 Ppt (Tarugi, Gazz ch it 1901, 31 313)
 Decomp by H_2O Not decomp by al-
 coh (Arctowski, Z anorg 1895, 9 178)

Three modifications

a Prisms Decomp by boiling H_2O

b Brick-red, amorphous

c Yellow plates

(Schoch, Am Ch J 1903, 29 337)

Yellow plates

Decomp by hot H_2O , Na_2CO_3 or $\text{NaOH} +$
 Aq Sol in $\text{KHCO}_3 + \text{Aq}$ Insol in cold dil
 HNO_3 (Tarugi)

4HgO , HgCl_2 Decomp by H_2O Not
 decomp by alcohol (Arctowski, Z anorg
 1895, 9 178)

Two modifications

A Yellow plates

Easily sol in acids Insol in alcohol and
 ether Decomp by KOH (Dukelski, Z
 anorg 1906, 49 336)

B Brown, amorphous

Easily sol in acids Decomp by KOH
 Insol in alcohol and ether (Dukelski,

Z anorg 1906, 49 336)

5HgO , HgCl_2 (Millon)

1st (Thummel)

2 Does not exist (T)

3 Insol in cold H_2O (Roucher, A
 353)

Does not exist (T)

7HgO , 4HgCl_2 (Roucher)

Does not exist (T)

Mercuromercuric oxychloride, Hg_2OCl

Min *Terlinguante*

Decomp by HCl and HNO_3

Slowly decomp by cold acetic acid when
 powdered (Hillebrand and Schaller, J
 Am Chem Soc 1907, 29 1190)

Mercuric strontium oxychloride, HgO , SrCl_2 $+ \text{H}_2\text{O}$

Decomp by H_2O (André, C R 104 431)

Mercuric oxyfluoride, HgO , $\text{HgF}_2 + \text{H}_2\text{O}$

Decomp by H_2O Sol in dil $\text{HNO}_3 + \text{Aq}$
 (Finkener)

Mercuric oxyiodide, 3HgO , HgI_2

Decomp by H_2O Sol in $\text{HI} + \text{Aq}$ (Weyl,
 Pogg 131 524)

Mercuric oxyphosphide, $\text{Hg}_3\text{P}_2\text{O}_4$

Decomp by H_2O (Parthell and van
 Haaren, Arch Pharm 1900, 238 35)

Mercuric oxyselenide, 2HgSe , HgO

Easily sol in aqua regia (Uelsmann, A
 116 122)

Mercury phosphide, Hg_3P_2

Insol in H_2O , HNO_3 , or $\text{HCl} + \text{Aq}$ Easily
 sol in aqua regia (Granger, C R 115 229)
 Hg_3P_4 (Granger, C N 1898, 77 229)

Mercury phosphochloride, P_2Hg_3 , 3HgCl , $+ \text{H}_2\text{O}$

See *Dimercuriphosphonium mercuric chloride*

Mercury phosphosulphide, 2HgS , P_2S

HgS , P_2S

2HgS , P_2S_3 (Berzelius)

3HgS , P_2S_3 (Baudrimont, C R 55 323)

2HgS , P_2S_5 (Berzelius, A 47 256)

Mercuric selenide, HgSe

Sol in cold aqua regia when crystalline
 When precipitated shows the same properties
 towards solvents as mercuric sulphide (Reeb
 J Pharm (4) 9 173)

Min *Tilmannite* Sol only in aqua regia

Mercuric selenochloride, 2HgSe , HgCl_2

Insol in boiling HCl , HNO_3 , or $\text{H}_2\text{SO}_4 +$
 Aq Easily sol in aqua regia and a mixture
 of H_2SO_4 and conc $\text{HNO}_3 + \text{Aq}$ (Uelsmann,
 J B 1860 92)

Mercurous sulphide, Hg_2S

Insol in H_2O , dil HNO_3 , hot NH_4OH , or
 $(\text{NH}_4)_2\text{S} + \text{Aq}$ Sol in $\text{KOH} + \text{Aq}$ with separa-
 tion of Hg (Rose)

Does not exist, only mixtures of Hg and
 HgS are formed (Barfoed, J pr 93 230)

See also Baskerville, J Am Chem Soc
 1903, 25 799)

Not attacked by HNO_3 below 0° , but at-
 tacked by dil HNO_3 and $\text{HCl} + \text{Aq}$ when
 temp is increased Sol in Na_2S or K_2S but
 Hg soon ppts (Antony and Sestini, Gazz
 ch it 1894, 24, (1) 194)

Mercuric sulphide, HgS

Insol in H_2O

Pptd as a brown coloration in presence of
 20,000 pts H_2O , and as a green coloration in
 presence of 40,000 pts H_2O (I asugne)

Much less sol in H_2O than Ag_2S or CuS
 (Bodlander, Z phys Ch 1898, 27 64)

1 l H_2O dissolves 0.05×10^{-6} mols HgS at
 18° (Weigel, Z phys Ch 1907 58 294)

Sol in cold conc., and in hot dil $\text{HI} + \text{Aq}$ or
 $\text{HBr} + \text{Aq}$ (Kekule, A Suppl 2 101) Very
 sl decomp by hot conc $\text{HCl} + \text{Aq}$ Not at-
 tacked by hot $\text{HNO}_3 + \text{Aq}$ Sol in cold aqua
 regia

Not attacked by 4-N HNO_3 or 4-N HNO_3
 $+ 4\text{-N H}_2\text{SO}_4$ at ord temp even after many
 days By action of a mixture of equal volumes
 of 4-N HNO_3 and conc H_2SO_4 , there was
 slight action on pptd HgS after 14, more
 action after 62 days If HgS is boiled with
 the 4-N acids, oxidation takes place most
 rapidly with 4-N HNO_3 , then the mixture
 66.7% 4-N $\text{H}_2\text{SO}_4 + 33.3\%$ 4-N HNO_3 , then

33 3% 4-N H_2SO_4 + 66 7% 4-N HNO_3 , and lastly 4-N H_2SO_4 alone (Moore, J Am Chem Soc 1911, **33** 1094)

Cold conc H_2SO_4 does not attack red or black HgS , but they are attacked by hot acid (Berthelot, A ch 1898, (7) **14** 198)

Freshly pptd HgS is insol in dil KCN + Aq (Berthelot)

Sol in K_2S + Aq , but readily only in presence of free alkali (Brunner, Pogg **15** 596)

Insol in boiling KOH + Aq

Sol in KSH or NaSH + Aq Very sl sol in cold yellow $(\text{NH}_4)_2\text{S}$ + Aq Insol in KCN or $\text{Na}_2\text{S}_2\text{O}_3$ + Aq (Fresenius)

Easily sol in conc Na_2S or K_2S + Aq , even in absence of KOH or NaOH Insol in $(\text{NH}_4)_2\text{S}$ + Aq Sol in CaS , BaS , or SrS + Aq Insol in NaSH or KSH + Aq (de Koninck, Z angew Ch **1891** 51)

Solubility in NaSH is very small in comparison with that in Na_2S + Aq (Knox, Trans Faraday Soc 1908, **4** 30)

Solubility in BaS is practically equal to that in Na_2S (Knox)

All cryst modifications are sol in conc K_2S and in conc Na_2S + Aq (Allen and Crenshaw, Am J Sci 1912, (4) **34** 368)

Sol in potassium thiocarbonate + Aq (Rosenblatt, Z anal **26** 15)

Sol in alkali sulpho-molybdates, -tungstates, -vanadates, -arsenates, -antimonates, and -stannates (Storch, B **16** 2015)

1 l BaS_2H_2 + Aq containing 50 g Ba dissolves no HgS in the cold, but 50-60 g at 40-50°

Insol in liquid NH_3 (Gore, Am Ch J **1898**, **20** 829)

Insol in acetone (Eidmann, C C **1899**, **II** 1014)

Insol in pyridine (Schroeder, Dissert **1901**)

Insol in ethyl acetate (Naumann, B **1910**, **43** 314)

Exists in a colloidal state, sol in H_2O (Winnsinger, Bull Soc (2) **49** 452)

Min *Cinnabar* Insol in H_2O , alcohol, dil acids or alkaline solutions

Decomp by hot dil HNO_3 + Aq Not decomp by HCl + Aq , but easily by hot H_2SO_4 or aqua regia Easily sol in CuCl_2 + Aq (Kersten)

Sol in a mixture of Na_2S and NaOH when present in the proportion of HgS $2\text{Na}_2\text{S}$

Sol in pure Na_2S + Aq or in mixtures of Na_2S and NaSH + Aq Insol in cold NaSH + Aq , but sol on warming with evolution of H_2S (Becker, Sill Am J (3) **33** 199)

Insol in acetone (Krug and M'Elroy)

Cinnabar is easily sol in 20% HBr + Aq (Rising and Lenher, J Am Chem Soc **1896**, **18** 96)

Sol in S_2Cl_2 (Smith, J Am Chem Soc **1898**, **20** 291)

Mercuric platinum sulphide

See Sulphoplatinate, mercuric

Mercuric potassium sulphide, K_2S , 2HgS

Decomp into its constituents by H_2O , decomp by HCl , and HNO_3 + Aq , and by hot KOH , and NH_4OH + Aq (Schneider, Pogg **127** 488)

K_2S , HgS + $5\text{H}_2\text{O}$ Decomp by H_2O or alkalies (Weber, Pogg **97** 76)

+ H_2O (Ditte)

+ $7\text{H}_2\text{O}$ Sol in K_2S + Aq (Ditte, C R **98** 1271)

K_2S , 5HgS + $5\text{H}_2\text{O}$ Easily decomp by H_2O (Ditte)

Mercuric sodium sulphide, HgS , Na_2S + $8\text{H}_2\text{O}$

Decomp by H_2O or alkalies

5HgS , $2\text{Na}_2\text{S}$ + $3\text{H}_2\text{O}$ Decomp by H_2O (Knox, Trans Faraday Soc 1908, **4** 36)

Mercuric sulphobromide, 2HgS , HgBr_2

Insol in H_2O Not attacked by boiling HNO_3 or H_2SO_4 (Rose)

Mercuric sulphochloride, 2HgS , HgCl_2

Insol in H_2O , cold or hot, dil or conc HNO_3 , H_2SO_4 , or HCl + Aq (Rose, Pogg **13** 59)

Decomp by hot aqua regia

By boiling with dil HNO_3 , H_2SO_4 , and HCl , Hg and Cl go into solution (Hamers, Dissert **1906**)

Insol in H_2O and H_2SO_4 Partly sol in HCl and HNO_3 , easily sol in aqua regia (Alexander, Dissert **1899**)

Sol in aqua regia (Deniges, Bull Soc **1915**, (4) **17** 356)

3HgS , HgCl_2 Properties as the above comp (Poleck and Goerck, B **21** 2415)

4HgS , HgCl_2 As above (P and G)

5HgS , HgCl_2 As above (P and G)

Insol in alkali sulphides and in fuming HNO_3 , decomp by NaOBr + Aq and by KOH (Bodroux, C R **1900**, **130** 1399)

Sl sol in solutions of alkali sulphides unless heated (Berzelius)

Easily sol in alkali sulphides + Aq , slowly sol in alkalies or alkali hydrosulphides + Aq (Atterberg, J B **1873** 258)

Mercurous sulphotetrachloride, $\text{Hg}_2\text{S}_2\text{Cl}_4$

Decomp by H_2O with separation of S , HgCl_2 going into solution (Capitaine, J Pharm **25** 525)

Mercuric sulphofluoride, 2HgS , HgF_2

Decomp by boiling H_2O Not decomp by hot HCl or HNO_3 + Aq , but gives HF with hot H_2SO_4 + Aq (Rose, Pogg **13** 66)

Mercury sulphonitride, $\text{Hg}_2\text{N}_2\text{S}$, NH_3

Ppt (Ruff, B **1904**, **37** 1585)

Mercuric sulphiodide, HgS , HgI_2

Ppt (Rammelsberg, Pogg **48** 175)

2HgS , HgI_2 (Palm, C C **1863** 121)

Insol in min acids with exception of aqua regia (Hamers, Dissert 1906)

Mercuric sulphiodide ammonia, 2HgS , HgI_2 , NH_3
(Foerster, Ch Z 1895, 19 1895)

Mercuric telluride, HgTe

Min *Coloradote* Sol in boiling HNO_3 +Aq with separation of H_2TeO_3

Metastannic acid

See Stannic acid.

Molybdatoiodic acid

See Molybdoiodic acid

Molybdenum, Mo

Not attacked by HCl, HF, or dil H_2SO_4 +Aq Sol in conc H_2SO_4 Very easily sol in aqua regia Oxidised by HNO_3 +Aq either to molybdenum oxide, which dissolves in HNO_3 , or, if HNO_3 is in excess, to molybdic acid, which remains undissolved

Attacked by HNO_3 +Aq containing 3-70% HNO_3 , but only slowly by 70% acid, with formation of insol white powder, much more vigorously by 50% acid, in which case a clear solution is formed (Montemartini, Gazz ch 22 384)

Not attacked by alkalis+Aq (Bucholz, Scher J 9 485)

With a sp gr 9.01, the metal is malleable and sol in a mixture of HF and HNO_3 , sol in fused KClO_3 (Moissan, Bull Soc 1895, (3) 13 966)

Ductile Mo is moderately quickly attacked by HNO_3 , H_2SO_4 and HCl (Fink, Met Chem Eng 1910, 8 341)

Not immediately attacked by cold dil HNO_3 Not attacked by dil and conc H_2SO_4 Boiling dil HCl+Aq does not attack, conc dissolves traces by long heating Sol in aqua regia (Lederer, Dissert 1911)

Dil HCl dissolves 20.3% Mo at 110° in 18 hrs More slowly sol in HCl (sp gr 1.15)

Insol in dil H_2SO_4 at 110° Slowly sol in conc H_2SO_4 (sp gr 1.82) at 110° , rapidly sol at 200° - 250°

Slowly sol in conc HNO_3 (sp gr 1.40), rapidly sol in dil HNO_3 (sp gr 1.15)

Rapidly sol in hot aqua regia Insol in hot or cold HF (Ruder, J Am Chem Soc 1912, 34 388)

Insol in KOH+Aq Sol in fused KOH (Ruder, J Am Chem Soc 1912, 34 389)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Molybdenum acichloride

See Molybdenyl chloride

Molybdenum amide, $\text{OH MoO}_2 \text{NH}_2$

Very unstable Insol in abs alcohol (Fleck, Z anorg 1894, 7 353)

Molybdenum amide nitride, $\text{Mo}_5\text{N}_{15}\text{H}_4 = 4\text{MoN}_2, \text{Mo}(\text{NH}_2)_2$

Not attacked by HCl, or dil HNO_3 +Aq (Uhrlaub)

Molybdenum amidochloride, $\text{Mo}_2(\text{NH}_2)_3\text{Cl}_3$

Insol in H_2O and dil acids (Rosenheim, Z anorg 1905, 46 317)

Molybdenum amidochloride ammonia, $\text{Mo}_2(\text{NH}_2)_3\text{Cl}_3, 10\text{NH}_3$

Unstable in the air (Rosenheim, Z anorg 1905, 46 319)

Molybdenum boride, Mo_3B_4

Moderately attacked by hot conc acids and vigorously by hot aqua regia (Tucker and Moody, Chem Soc 1902, 81 17)

Molybdenum dibromide, $\text{MoBr}_2 = \text{Mo}_2\text{Br}_4\text{Br}$

See Bromomolybdenum bromide

Molybdenum tribromide, MoBr_3

Not decomp by H_2O Boiling conc HCl, and cold dil HNO_3 +Aq do not attack appreciably Dil alkalis act slowly, but decomp with separation of Mo_2O_3 on boiling (Blomstrand, J pr 82 435)

Molybdenum tetrabromide, MoBr_4

Rapidly deliquescent, and easily sol in H_2O (Blomstrand, J pr 82 433)

Molybdenum bromochloride, etc

See Bromomolybdenum chloride, etc

Molybdenum bronze

See Molybdate molybdenum oxide, sodium

Molybdenum carbide, Mo_2C

Insol in HNO_3 (Moissan, Bull Soc 1895, (3) 13 967)

Mo_2C Does not decomp H_2O even at 500 - 600° Slowly attacked by hot HCl, HF and hot conc H_2SO_4 Easily decomp by HNO_3 Not attacked by NaOH +Aq or KOH +Aq (Moissan and Hoffmann, C R 1904, 138 1559)

Molybdenum carbonyl, $\text{Mo}(\text{CO})_6$

Quickly attacked by bromine Sol in ether or benzene (Mond, Hirtz and Cowap, Chem Soc 1910, 97 808)

Molybdenum dichloride, $\text{MoCl}_2 = \text{Mo}_3\text{Cl}_4\text{Cl}_2$

See Chloromolybdenum chloride

Molybdenum trichloride, MoCl_3

Insol in H_2O or boiling conc $\text{HCl} + \text{Aq}$
Easily sol, especially when heated, in $\text{HNO}_3 + \text{Aq}$ Sol in H_2SO_4 Decomp by NH_4OH , KOH , or $\text{NaOH} + \text{Aq}$

Sl sol in alcohol (Leicht and Kempe)
Practically insol in alcohol and ether (Hampe, Ch Z 1888, 12 5)

Molybdenum tetrachloride, MoCl_4

Deliquescent Hisses with little H_2O , but only partly sol in more H_2O Only sl sol in conc $\text{HCl} + \text{Aq}$ Sol in H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ Partly sol in alcohol and ether (Liechti and Kempe)

Molybdenum pentachloride, MoCl_5

Very deliquescent Sol in H_2O with extreme evolution of heat Sol in HCl , HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$

When freshly prepared, is incompletely sol in H_2O , but after standing is easily sol with hissing (Kalischer, Dissert 1902)

Sol in a small amt of conc HCl (Hampe, Ch Z 1888, 12 5)

Sol in absolute alcohol or ether (Liechti and Kempe)

Sol in CHCl_3 and in CCl_4 Sol with hissing in many organic solvents (ethers, alcohols, ketones, aldehydes, acids, acid esters, acid anhydrides, amines) Sol in cinnamic aldehyde (Kalischer, Dissert 1902)

Molybdenum hydroxyl chloride, $\text{Mo}(\text{OH})_2\text{Cl}_2$

Easily sol in H_2O (Debray, C R 46 1101)

Molybdenum tetrachloride phosphorus pentachloride, $\text{MoCl}_4, \text{PCl}_5$

Sol in H_2O
 $\text{MoCl}_4, 2\text{PCl}_5$ Sol in H_2O (Cronander, Bull Soc (2) 19 500)

Molybdenum phosphorus pentachloride, $\text{MoCl}_5, \text{PCl}_5$

Easily decomp (Smith and Sargent, Z anorg 1894, 6 385)

Molybdenum phosphoryl chloride, $\text{MoCl}_5, \text{POCl}_3$

Decomp by H_2O , insol in CS_2 , sol in C_6H_6 and CHCl_3

Molybdenum trichloride potassium chloride

Efflorescent Decomp with H_2O (Berzelius)

$\text{MoCl}_3, 3\text{KCl}$ Very sol in H_2O Nearly insol in alcohol and ether (Chilesotti, C C 1903, II 652)

$+2\text{H}_2\text{O}$ Fairly easily sol in cold H_2O without any apparent decomp Decomp in aqueous solution, slowly in the cold but rapidly on boiling This decomp is prevented by the presence of HCl

Sl sol in conc HCl (Henderson, Proc Chem Soc 1903, 19 245)

Molybdenum rubidium chloride, $\text{Rb}_2\text{MoCl}_6 + \text{H}_2\text{O}$

Sol in H_2O Nearly insol in alcohol and ether (Chilesotti, C C 1903, II 652)

Molybdenum pentachloride nitrogen sulphide, $\text{MoCl}_5, \text{N}_4\text{S}_4$

Decomp in moist air (Davis, Chem Soc 1906, 89, (2) 1575)

Molybdenum hexafluoride, MoF_6

Decomp by a little H_2O with separation of blue oxide Sol in large amount of H_2O forming a colorless solution

Absorbed by alkalis and $\text{NH}_4\text{OH} + \text{Aq}$ (Ruff, B 1907, 40 2930)

Molybdenum fluoride with MF

See Fluomolybdate, M

Molybdenum potassium trifluoride (?)

Precipitate Sol in $\text{HCl} + \text{Aq}$

Molybdenum potassium tetrafluoride (?)

Sl sol in H_2O (Berzelius)

Molybdenum sesquihydroxide, $\text{Mo}_2\text{O}_5\text{H}_6$

Difficultly sol in acids Insol in KOH , NaOH , NH_4OH , or $\text{K}_2\text{CO}_3 + \text{Aq}$ Somewhat sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, but pptd on boiling (Berzelius)

Molybdenum hydroxide, $\text{Mo}_2\text{O}_5, 5\text{H}_2\text{O}$

Easily sol in H_2O Insol in CaCl_2 , NH_4Cl , or $\text{NaCl} + \text{Aq}$ Sl sol in alcohol (Berzelius)

Molybdenum dihydroxide, $\text{MoO}_2, x\text{H}_2\text{O}$

Slowly and not abundantly sol in H_2O , from which it is precipitated by NH_4Cl and other salts Gelatinises by standing in closed vessels or by evaporating on the air Sol in the ordinary acids Insol in KOH , or $\text{NaOH} + \text{Aq}$ Sol in alkali carbonates $+ \text{Aq}$

Molybdenum dioxide, MoO_2

Insol in H_2O and alcohol Sl attacked by cold H_2SO_4 or HNO_3 (Guichard, A ch 1901, (7) 23 567)

Sl decomp H_2O at ordinary temp Slowly sol in H_2SO_4 and HNO_3 (Guichard, C R 1896, 123 822)

Molybdenum tetraiodide (?)

Completely sol in water (Berzelius)

Molybdenum nitride, Mo_5N_3 , and Mo_5N_4

(Uhrlaub)

See Molybdenum amide

Mo_5N_2 (Rosenheim, Z anorg 1905, 46 317)

Molybdenum monoxide, MoO

Known only as hydroxide (Blomstrand, J pr 77 90)

Molybdenum sesquioxide, Mo₂O₃

Insol in acids or alkalies

See **Molybdenum sesquihydroxide**

Molybdenum dioxide, MoO₂

Insol in HCl or HF + Aq Sl sol in conc H₂SO₄, HNO₃ oxidises to MoO₃. Not attacked by KOH + Aq (Ullrich, A 144 227)
Sl sol in KHC₄H₄O₆ + Aq

Molybdenum trioxide, MoO₃

Sol in 500 pts cold, and much less hot H₂O (Buchholz)

Sol in 960 pts hot H₂O (Hatchett)

Sol in 570 pts cold, and much less hot H₂O (Dumas)

Sol in acids before ignition Insol in acids, but sl sol in acid potassium tartrate + Aq after ignition Sol in alkalies or alkali carbonates + Aq

Sol in NH₄OH + Aq

See also **Molybdic acid**

Min *Molybdite* Sol in HCl + Aq

--

²e, Mo₂O₃

and HCl, only sl sol in B 1901, 34 151)

sol in H₂O (2 g in 1 l)

H₄Cl + Aq Insol in caustic alkalis, somewhat sol in NH₄OH Much more sol in M₂CO₃ + Aq and in (NH₄)₂CO₃ + Aq (Klason, B 1901, 34 150)

Mo₄O₁₀ + 3H₂O (Smith and Oberholtzer, Z anorg 1893, 4 243)

Mo₄O₁₁ + 6H₂O Sol in H₂O (Bailhache, C R 1901, 133 1212)

Mo₃O₁₄ + 6H₂O Very sol in H₂O (Guichard, C R 1900, 131 419)

Mo₇O₂₀ Sol in H₂O (Junius, Z anorg 1905, 46 447)

Mo₂₀O₄₁ + 21H₂O = Mo₂O₃, 18MoO₂ + 21H₂O Easily sol in H₂O Insol in NH₄Cl + Aq (Klason, B 1901, 34 160)

Mo₂₆O₇₇ + 24H₂O = Mo₂O₃, 24MoO₃ + 24H₂O (Klason, B 1901, 34 159)

3Mo₂O₃, 2Mo₇O₂₄ + 18H₂O Sol in H₂O (B)

It is probable that the five blue oxides of molybdenum described by Klason (B 34, 148 158) and Bailhache are either the blue oxide Mo₅O₁₄ prepared by the author or mixtures of this compd with molybdenum trioxide (Guichard, C R 1902, 134 173)

Mo₅O₁₂ Not attacked by ammonia, easily oxidised by HNO₃ + Aq Not attacked by HCl or H₂SO₄ + Aq (Wohler, A 110 275)
Formula is Mo₅O₈, according to Wohler, but Muthmann (A 238 108) has shown that correct formula is Mo₅O₁₂

Not attacked by boiling alkalies, HCl, or dil H₂SO₄ + Aq Sol in conc H₂SO₄, with

subsequent decomp Sol in aqua regia, and Cl₂ + Aq (Muthmann)

Mo₃O₈ Sol in H₂O (Muthmann, A 238 108)

Min *Ilsemanite* (?)

+ 5H₂O Moderately sol in H₂O (Marchetti, Z anorg 1899, 19 393)

Mo₅O₇ (v d Pfordten, B 15 1925)

Molybdenum trioxide ammonia, MoO₃, 3NH₃

Unstable in air Very sol in H₂O with evolution of ammonia (Rosenheim, Z anorg 1906, 50 303)

3MoO₃, NH₃ + 1/2 H₂O True composition of commercial molybdic acid (Klason, B 1901, 34 156)

NH₄H₂Mo₅O₁₂ Very sl sol in cold, easily sol in hot H₂O with partial decomp (Klason, B 1901, 34 156)

3MoO₃, 3NH₃ + 7H₂O = (NH₄)₃Mo₃O₁₂ + 4H₂O True composition of Rammelsberg's 3(NH₄)₂O, 7MoO₃ + 12H₂O (Klason, B 1901, 34 155)

4MoO₃, NH₃ + 6H₂O Very sl sol in cold, very easily sol in hot H₂O An insol modification with less H₂O gradually cryst out (Mylus, B 1903, 36 639)

4MoO₃, 2NH₃ + 3H₂O (Klason, B 1901, 34 156)

6MoO₃, 3NH₃ + 5H₂O Very sl sol in cold, more easily sol in hot H₂O, with partial decomp (Klason, B 1901, 34 156)

12MoO₃, 3NH₃ + 12H₂O (Klason, B 1901, 34 158)

12MoO₃, 3NH₃, 12H₂O + 3MoO₃, 8H₂O Moderately sol in boiling H₂O (Klason)

15MoO₃, 3NH₃ + 6H₂O Insol in H₂O (Klason)

4MoO₃, MoO₂, 2NH₃ + 7H₂O Slowly sol in H₂O, fairly stable, gradually decomp by dil acids (Hofmann, Z anorg 1890, 12 280)

Molybdenum trioxide ammonia hydrogen peroxide, 18MoO₃, 14NH₃, 3H₂O₂ + 18H₂O

Sol in H₂O Sp gr of sat solution = 1.486 at 17.4° (Baurwald, B 1884, 17 1206)

Molybdenum oxybromide

See **Molybdenyl bromide**

Molybdenum oxychloride

See **Molybdenyl chloride**

Molybdenum oxyfluoride

See **Molybdenyl fluoride**

Molybdenum oxyfluoride with MF

See **Fluoxymolybdate, M, and Fluoxyhypomolybdate, M**

Molybdenum phosphide, Mo₂P₂

Gradually sol in hot HNO₃ + Aq (Wohler and Rautenberg, A 109 374)

Molybdenum selenide, MoSe₂

Not obtained pure (Uelsmann, A 116 125)

Molybdenum silicide

Sol in HF, only very sl sol in other acids (Warren, C N 1898, 78 319)

MoSi₂ Insol in all min acids, sol in a warm mixture of HF+HNO₃ (Defacqz, C R 1907, 144 1425)

Insol in min acids, sol in HF+HNO₃ Unattacked by 10-20% KOH+Aq Decomposed by fused NaOH (Honigschmid, M 1907, 28 1020)

Not attacked by boiling HNO₃, aqua regia or HF (Watts, Trans Am Electrochem Soc 1906, 9 106)

Mo₂Si₃ (Vigouroux, C R 129 1238)

Molybdenum disulphide, MoS₂

Insol in H₂O Easily sol in aqua regia Easily oxidised by HNO₃ Sol in boiling H₂SO₄ Sl attacked by KOH+Aq (Berzelius)

Min Molybdenite Sol in HNO₃+Aq, with separation of MoO₃, sol in aqua regia, very sl sol in H₂SO₄

Molybdenum trisulphide, MoS₃

Somewhat sol in H₂O, especially if hot, but pptd by an acid Difficultly sol except when boiled with KOH+Aq Sl sol in solutions of alkali sulphides unless heated (Berzelius)

Easily sol in alkali sulphides+Aq, slowly sol in alkales or alkali hydrosulphides+Aq (Atterberg, J B 1873 258)

Molybdenum tetrakisulphide, MoS₄

Not decomp by hot H₂O or acids Sl sol in cold alkali sulphides+Aq, but easily by boiling (Berzelius)

Insol in liquid NH₃ (Gore, Am Ch J 1898, 20 828)

Molybdenum sesquisulphide, Mo₂S₃

Insol in HCl and H₂SO₄, sol in hot conc HNO₃ and aqua regia (Guichard, C R 1900, 130 138)

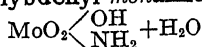
Molybdenum sulphide with MS

See Sulphomolybdate, M

Molybdenum sulphochloride, Mo₂S₂Cl₂

Insol in H₂O and alkales Slowly sol in conc HNO₃ (Smith and Oberholtzer, Z anorg 1894, 5 67)

Molybdenyl monamide, NH₄MoO₄ or



(Rosenheim, Z anorg 1905, 46 318)

Molybdenyl bromide, MoO₂Br.

Deliquescent, and sol in H₂O with slight evolution of heat

Mo₂O₃Br₄ Unstable in air (Smith and Oberholtzer, Z anorg 4 236)

Molybdenyl potassium bromide, MoOBr₃, 2KBr

(Weinland, Z anorg 1905, 44 109)

MoOBr₃, KBr+2H₂O (Weinland, Z anorg 1905, 44 110)

Molybdenyl rubidium bromide, MoOBr₃, 2RbBr

(Weinland, Z anorg 1905, 44 108)

Molybdenyl chloride, MoO₂Cl₂

Sol in H₂O and alcohol

Abundantly sol in abs alcohol Not very sol in abs ether (Hampe, Ch Z 1888, 12 23)

+H₂O Composition settled by mol wt determinations Dissociates in alcohol and in H₂O (Vaudenberghe, Z anorg 1895, 10 52)

Very hygroscopic Sol in acetone, ether and alcohol (Vaudenberghe, l c)

MoOCl₄ Deliquescent Sol in little H₂O with violent action More H₂O decomposes (Puttbach, A 201 123)

Formula is Mo₂O₃Cl₃, according to Blomstrand (J pr 71 460)

Mo₂O₃Cl₄ (Puttbach, l c)

Mo₂O₃Cl₅ Deliquescent Sol in H₂O with very slight evolution of heat and subsequent formation of precipitate (Blomstrand)

Sol in acids (Puttbach, A 201 129)

Mo₂O₃Cl₅ Deliquescent, and sol in H₂O (Blomstrand)

Mo₂O₃Cl₅ Insol in HCl and cold H₂SO₄ Sol in hot H₂SO₄ and HNO₃ (Puttbach, A 201 123)

Mo₂O₃Cl₇ Difficultly sol in HCl Easily sol in HNO₃, and alkalis+Aq (Puttbach)

Molybdenyl potassium chloride, MoO₂Cl₂, KCl+H₂O

(Weinland, Z anorg 1905, 44 97)

+2H₂O (Weinland, Z anorg 1905, 44 96)

6MoO₂Cl₂, 2KCl+6H₂O (Weinland, Z anorg 1905, 44 97)

MoOCl₃, 2KCl+2H₂O Sol in H₂O (Nordenskjöld, B 1901, 34 1573)

Ppt (Henderson, Proc Chem Soc 1903, 19 245)

Molybdenyl rubidium chloride, MoO₂Cl₂, RbCl+H₂O

MoO₂Cl₂, 2RbCl (Weinland, Z anorg 1905, 44 95)

MoOCl₃, 2RbCl Sl sol in H₂O Less sol than K salt (Nordenskjöld, B 1901, 34 1573)

Molybdenyl fluoride, MoO₂F₂

Decomp rapidly in moist air (Schulze, J pr (2) 21 442)

Very hygroscopic Sol in a little H₂O giving a blue solution, in more H₂O giving a colorless solution

Sol in AsCl₃, SiCl₄, SO₂Cl₂ and PCl₃ On warming these solutions, gas is evolved

Insol in toluene Nearly insol in ether, CHCl₃, CCl₄, and CS₂ Sol in warm pyridine and in ethyl and methyl alcohol (Ruff, B 1907, 40 2934)

MoOF₄ Very hygroscopic Decomp by H₂O and conc H₂SO₄ Decomp by alcohol Sol in ether and CHCl₃ with evolution of gas Insol in toluene Very sl sol in benzene and CS₂ (Ruff, B 1907, 40 2932)

Mo₂O₃F₄ Deliquescent Easily sol in HF +Aq, not in H₂O (Smith and Oberholtzer)

Molybdenyl fluoride with MF

See Fluoxymolybdate, M, and Fluoxyhypomolybdate, M

Molybdenyl hydroxide, MoO(OH)₃

2 g are sol in 1000 cc H₂O, insol in H₂O + NH₄Cl, only sl sol in NH₄OH and alkali carbonates +Aq (Klason, B 1901, 34 151)

Molybdic acid, H₂MoO₄

144 217)

insol in H₂O (Vivier, C R 106

very sparingly sol in cold H₂O, more sol in hot H₂O (Rosenheim and Berthelm, Z anorg 1903, 34 435)

***α*-modification**

Solubility of MoO₃, H₂O (*α*-modification) in H₂O at t°

1000 g H₂O dissolve g MoO₃

t°	G MoO ₃	t°	G MoO ₃
14 8	2 117	42 0	3 446
15 2	2 131	45 0	3 661
24 6	2 619	52 0	4 184
25 6	2 689	60 0	4 685
30 3	2 973	70 0	4 231
36 0	3 085	80 0	5 212
36 8	3 295		

(Rosenheim and Davidsohn, Z anorg 1903, 37 318)

(*β* modification), MoO₃, H₂O From MoO₃, 2H₂O at 60°–70° (Rosenheim and Davidsohn)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 828)

Easily sol in H₂SO₄ (Ruegenberg and Smith, J Am Chem Soc 1900, 22 772)

H₂MoO₄ Sol in H₂O and acids (Milngk)

Very sol in H₂O (Mylius, B 1903, 36, 638)

Solubility of MoO₃, 2H₂O in H₂O
1000 g H₂O dissolve g MoO₃ at t°

t°	G MoO ₃	t°	G MoO ₃
18	1 066	59	11 258
23	1 856	60	12 057
30	2 638	66	17 274
40	4 761	70	20 550
48	6 360	74 4	20 904
50 2	6 873	75	20 920
54	7 855	79	21 064

(Rosenheim and Berthelm, Z anorg 1903, 34 430)

Solubility of MoO₃, 2H₂O in ammonium salts +Aq at t°

1000 g of the solvent dissolve g MoO₃

Solvent	t°	G MoO ₃
10% (NH ₄) ₂ SO ₄	29 6	19 27
10% NH ₄ HSO ₄	31 5	27 53
"	41 8	34 36
"	49 7	37 69

(Rosenheim and Davidsohn, Z anorg 1903, 37 315)

H₂MoO₆ (?) Known only in solution

H₂Mo₂O₇ Easily sol in H₂O (Ullik)

H₂Mo₄O₁₃ Easily sol in H₂O (U)

H₂Mo₈O₂₅ Easily sol in H₂O (U)

Molybdic acid also exists in a colloidal modification, sol in H₂O (Graham, C R 59 174)

Molybdates

The normal molybdates of the alkali metals are easily sol in H₂O, while the others are sl sol or insol therein

The trimolybdates are sl sol in cold, but very easily sol in hot H₂O

The tetramolybdates are easily sol in H₂O

Aluminum molybdate, Al₁₀Mo O₄

Precipitate (Gentek, J pr 81 414)

Contains aluminum hydroxide and sulphate (Struve, J pr 61 441)

Aluminum ammonium molybdate

See Aluminicomolybdate, ammonium

Aluminum barium molybdate

See Aluminicomolybdate, barium

Ammonium molybdate, (NH₄)₂MoO₄

Efflorescent through loss of NH₃, decomp by H₂O into acid salt (Svanberg and Struve) Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 826)

$(\text{NH}_4)_2\text{Mo}_2\text{O}_7$ Sol in H_2O
 $+ \text{H}_2\text{O} = \text{NH}_4\text{HMoO}_4$ Sol in H_2O Sol
 in 2-3 pts H_2O (Brandes, Mauro, Gazz
 ch it 18 120)

$(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} + 4\text{H}_2\text{O}$ (Commercial am-
 monium molybdate)

Not efflorescent Sol in H_2O (Delafon-
 taine, N Arch Sc ph nat 23 17)

According to Struve and Berlin =

$(\text{NH}_4)_4\text{Mo}_5\text{O}_{17} + 3\text{H}_2\text{O}$
 According to Marignac and Delffs =
 $(\text{NH}_4)\text{HMoO}_4$ The true composition of
 commercial ammonium molybdate is
 $(\text{NH}_4)_{10}\text{Mo}_{12}\text{O}_{41}$ (Junius, Z anorg 1905, 46 428)

$+ 12\text{H}_2\text{O}$ More sol than the above
 (Rammelsberg, Pogg 127 298)

Insol in acetone (Krug and M'Elroy, J
 Anal Appl Ch 6 184)

$(\text{NH}_4)_{10}\text{Mo}_{12}\text{O}_{41}$ True formula for com-
 mercial ammonium molybdate (Sand and
 Eisenlohr, Z anorg 1907, 52 68)

$+ 7\text{H}_2\text{O}$ (Junius, Z anorg 1905, 46 428)

$(\text{NH}_4)_4\text{Mo}_5\text{O}_{17} + \text{H}_2\text{O}$ (Jean, C R 78
 436)

$(\text{NH}_4)_2\text{Mo}_2\text{O}_7 + \text{H}_2\text{O}$ Very difficultly sol
 in cold, easily sol in hot H_2O (Berlin, J pr
 49 445)

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Kammerer,
 J pr (2) 6 358)

$(\text{NH}_4)_2\text{O}$, 4MoO_3 Practically insol in
 cold, sl sol in hot H_2O (Westphal, Dissert
 1995)

$+ 2\text{H}_2\text{O}$ Very difficultly sol in cold,
 rather easily sol in hot H_2O (Berlin)

100 cc H_2O dissolve 3 5200 g at 15° , sp
 gr = 1 03, 3 6711 g at 18° , sp gr = 1 04,
 4 5961 g at 32° , sp gr = 1 05 (Wempe, Z
 anorg 1912, 78 255)

$+ 2\frac{1}{2}\text{H}_2\text{O}$ (Junius, Z anorg 1905, 46
 440)

$(\text{NH}_4)_2\text{O}$, $8\text{MoO}_3 + 13\text{H}_2\text{O}$ (Rosenheim,
 Z anorg 1897, 15 188)

$(\text{NH}_4)_4\text{O}$, $9\text{MoO}_3 + 17\text{H}_2\text{O}$ (Westphal,
 Dissert 1895)

See also Molybdenum trioxide ammonia

Ammonium barium molybdate,
 $3(\text{NH}_4)_2\text{O}$, 3BaO , $14\text{MoO}_3 + 12\text{H}_2\text{O}$
 (Westphal, Dissert 1895)

Ammonium bismuth molybdate,
 $\text{NH}_4\text{Bi}(\text{MoO}_4)_2$
 (Rüdert, J Am Chem Soc 1903, 25
 914)

Ammonium cadmium molybdate ammonia,
 $(\text{NH}_4)\text{Cd}(\text{MoO}_4)_2$, 2NH_3

Decomp by H_2O
 Sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Briggs, Chem
 Soc 1904, 85 674)

Ammonium cerium molybdate,
 $(\text{NH}_4)_6\text{CeMo}_{14}\text{O}_{48} + 24\text{H}_2\text{O}$
 Sol in H_2O (Barbieri, C A 1909 293)

Ammonium chromic molybdate

See Chromicomolybdate, ammonium

Ammonium cobaltous molybdate,
 $3(\text{NH}_4)_2\text{O}$, 7MoO_3 , 3CoO , $7\text{MoO}_3 + x\text{H}_2\text{O}$
 $5[3(\text{NH}_4)_2\text{O}$, $7\text{MoO}_3]$, $7[3\text{CoO}$, $7\text{MoO}_3] +$
 $x\text{H}_2\text{O}$
 $2[3(\text{NH}_4)_2\text{O}$, $7\text{MoO}_3]$, $3[3\text{CoO}$, $7\text{MoO}_3]$
 $+ x\text{H}_2\text{O}$
 $3[3(\text{NH}_4)_2\text{O}$, $7\text{MoO}_3]$, $5[3\text{CoO}$, $7\text{MoO}_3]$
 $+ x\text{H}_2\text{O}$
 $3(\text{NH}_4)_2\text{O}$, 7MoO_3 , $5[3\text{CoO}$, $7\text{MoO}_3] +$
 $x\text{H}_2\text{O}$
 $9[2(\text{NH}_4)_2\text{O}$, $5\text{MoO}_3]$, $5[2\text{CoO}$, $5\text{MoO}_3] +$
 $118\text{H}_2\text{O}$
 $4(\text{NH}_4)_2\text{O}$, 2CoO , $15\text{MoO}_3 + 20\text{H}_2\text{O}$
 (Marckwald, Dissert 1895)

Ammonium cobaltous molybdate ammonia,
 $(\text{NH}_4)_2\text{Co}(\text{MoO}_4)_2$, 2NH_3

Decomp by H_2O

Sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Briggs, Chem
 Soc 1904, 85 674)

Ammonium cobaltic molybdate

See Cobaltmolybdate, ammonium

Ammonium cupric molybdate, $(\text{NH}_4)_2\text{O}$, CuO ,
 $5\text{MoO}_3 + 9\text{H}_2\text{O}$

Sl sol in cold, sol in boiling H_2O without
 decomp (Struve)

Ammonium cupric molybdate ammonia,
 $(\text{NH}_4)_2\text{Cu}(\text{MoO}_4)_2$, 2NH_3

Sol in dil $\text{NH}_4\text{OH} + \text{Aq}$

Decomp by H_2O (Briggs, Chem Soc
 1904, 85 673)

Ammonium ferric molybdate, $3(\text{NH}_4)_2\text{Mo}_2\text{O}_7$,
 $\text{Fe}_2(\text{MoO}_4)_3 + 20\text{H}_2\text{O}$

Sol in H_2O (Struve)

See also Ferricomolybdate, ammonium

Ammonium lanthanum molybdate,
 $(\text{NH}_4)_6\text{La}_2\text{Mo}_{14}\text{O}_{48} + 24\text{H}_2\text{O}$

Sol in H_2O (Barbieri, C A 1909 293)

Ammonium lithium molybdate, $\text{NH}_4\text{LiMoO}_4$
 $+ \text{H}_2\text{O}$

(Traube, N Jahrb Miner 1894, I 194)

Ammonium magnesium molybdate, $(\text{NH}_4)_2\text{O}$,
 MgO , $2\text{MoO}_3 + 2\text{H}_2\text{O} = (\text{NH}_4)_2\text{MoO}_4$,
 $\text{MgMoO}_4 + 2\text{H}_2\text{O}$

Easily sol in H_2O (Ullik, A 144 344)

Ammonium manganous molybdate,
 $2(\text{NH}_4)_2\text{O}$, MnO , $3\text{MoO}_3 + 5\text{H}_2\text{O}$

Decomp by boiling H_2O (Marckwald,
 Dissert 1895)

$(\text{NH}_4)_2\text{O}$, 2MnO , $6\text{MoO}_3 + 16\text{H}_2\text{O}$ De-
 comp by boiling H_2O (Marckwald, Dissert
 1895)

$(\text{NH}_4)_2\text{O}$, 3MnO , $6\text{MoO}_3 + 16\text{H}_2\text{O}$ Decomp by boiling H_2O (Marckwald, Dissert 1895)
 $3(\text{NH}_4)_2\text{O}$, 2MnO , $12\text{MoO}_3 + 22\text{H}_2\text{O}$ (Marckwald, Dissert 1895)

Ammonium manganic molybdate

See Permanganomolybdate ammonium.

Ammonium mercuric molybdate

Sol in $\text{HCl} + \text{Aq}$ Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$, separating out on cooling Sol in hot $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Hirzel)

Ammonium molybdenum molybdate,

$(\text{NH}_4)_2\text{O}$, 2MoO_3 , $4\text{MoO}_3 + 9\text{H}_2\text{O}$

Easily sol in H_2O , but the solution soon becomes cloudy (Rammelsberg, Pogg 127 291)

Ammonium neodymium molybdate,

$(\text{NH}_4)_3\text{NdMoO}_{24} + 12\text{H}_2\text{O}$

Ppt (Barbieri, C C 1911, I 1043)

Ammonium nickel molybdate,

$(\text{NH}_4)_2\text{O}$, 3NiO , $9\text{MoO}_3 + 25\text{H}_2\text{O}$

Very sl sol in cold, sol in hot H_2O without decomp (Marckwald, Dissert 1895)

$3(\text{NH}_4)_2\text{O}$, 2NiO , $10\text{MoO}_3 + 14\text{H}_2\text{O}$ Very sl sol in cold, sol in hot H_2O without decomp (Marckwald, Dissert 1895)

$5(\text{NH}_4)_2\text{O}$, 3NiO , $16\text{MoO}_3 + 16\text{H}_2\text{O}$ (Hall, J Am Chem Soc 1907, 29, 702)

$6(\text{NH}_4)_2\text{O}$, 3NiO , $16\text{MoO}_3 + 29\text{H}_2\text{O}$ Very sl sol in cold, sol in hot H_2O without decomp (Marckwald, Dissert 1895)

$8(\text{NH}_4)_2\text{O}$, 6NiO , $31\text{MoO}_3 + 63\text{H}_2\text{O}$ Very sl sol in cold, sol in hot H_2O without decomp (Marckwald, Dissert 1895)

$3(\text{NH}_4)_2\text{O}$, 9NiO , $34\text{MoO}_3 + 120\text{H}_2\text{O}$ Very sl sol in cold, easily sol in hot H_2O without decomp (Marckwald, Dissert 1895)

Ammonium nickelic molybdate

See Nickelomolybdate, ammonium

Ammonium nickel hydrogen molybdate,

$(\text{NH}_4)_4\text{H}_6[\text{Ni}(\text{MoO}_4)_6] + 5\text{H}_2\text{O}$

See Nickelomolybdate, ammonium hydrogen

Ammonium praseodymium molybdate,

$(\text{NH}_4)_3\text{PrMoO}_{24} + 12\text{H}_2\text{O}$

Ppt (Barbieri, C A 1911 1884)

Ammonium samarium molybdate,

$(\text{NH}_4)_3\text{SmMoO}_{24} + 12\text{H}_2\text{O}$

Ppt (Barbieri, C A 1911 1884)

Ammonium sodium molybdate, $7(\text{NH}_4)_2\text{O}$, $2\text{Na}_2\text{O}$, $21\text{MoO}_3 + 15\text{H}_2\text{O}$ (?)

Easily sol in H_2O (Delafontaine, J pr 95 136)

$7(\text{NH}_4)_2\text{O}$, $3\text{Na}_2\text{O}$, $25\text{MoO}_3 + 30\text{H}_2\text{O}$ (?) (Delafontaine)

$(\text{NH}_4, \text{Na})_2\text{O}$, $3\text{MoO}_3 + \text{H}_2\text{O}$ Sol in H_2O (Mauro, Gazz ch it 11 214)

Ammonium thorium molybdate

See Thoromolybdate, ammonium

Ammonium titanium molybdate

See Titanomolybdate, ammonium

Ammonium vanadium molybdate

See Vanadiomolybdate, ammonium

Ammonium zinc molybdate

Sol in H_2O (Berzelius)

Ammonium zirconium molybdate

See Zirconomolybdate, ammonium

Ammonium molybdate hydrogen dioxide,

18MoO_3 , $7(\text{NH}_4)_2\text{O}$, $3\text{H}_2\text{O}_2 + 11\text{H}_2\text{O}$

Sol in H_2O (Barwald, B 17 1206)

Barium molybdate, basic, 2BaO , $\text{MoO}_3 + \text{H}_2\text{O}$ (?)

Insol in H_2O Sol in dil $\text{HCl} + \text{Aq}$ or $\text{HNO}_3 + \text{Aq}$ (Heine, J pr 9 204)

Barium molybdate, BaMoO_4

Difficultly sol in H_2O , sol in dil HCl , and $\text{HNO}_3 + \text{Aq}$ (Svanberg and Struve)

Sol in 17,200 pts H_2O at 23° More sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$ than in H_2O (Smith and Bradbury, B 24 2930)

$+ 3\text{H}_2\text{O}$ (Westphal, Dissert 1895)

$\text{BaMoO}_3 \cdot 19 + 3\text{H}_2\text{O}$ Sl sol in H_2O

$\text{Ba}_3\text{MoO}_{24} + 9\text{H}_2\text{O}$ Appreciably sol in H_2O (Jorgensen)

According to Svanberg and Struve = $\text{Ba}_2\text{Mo}_3\text{O}_{21} + 6\text{H}_2\text{O}$

$+ 12\text{H}_2\text{O}$ or 5BaO , $12\text{MoO}_3 + 20\text{H}_2\text{O}$ (Junius, Z anorg 1905, 46 433)

$+ 22\text{H}_2\text{O}$ Ppt (Westphal, Dissert 1895)

BaO , $4\text{MoO}_3 + 3\frac{1}{2}\text{H}_2\text{O}$ Ppt (Wempe, Z anorg 1912, 78 320)

$+ 12\text{H}_2\text{O}$ Ppt (Rosenham, Z anorg 1913, 79 299)

$\text{BaMo}_3\text{O}_{23} + 4\text{H}_2\text{O}$ Insol in cold or hot H_2O or $\text{HNO}_3 + \text{Aq}$ Extremely slightly decomp by H_2SO_4 , or $\text{H}_2\text{SO}_4 + \text{HNO}_3$, or $\text{HCl} + \text{Aq}$ (Svanberg and Struve)

Barium paramolybdate, 5BaO , $12\text{MoO}_3 + 10\text{H}_2\text{O}$

Ppt Sol in excess of $\text{BaCl} + \text{Aq}$ (Junius Z anorg 1905, 46 433)

Barium tetramolybdate, $\text{Ba}_4\text{H}_2(\text{Mo}_4\text{O}_{13})_2 + 17\text{H}_2\text{O}$

Insol in cold, apparently decomp by hot H_2O , a small part dissolving, and the rest forming an insol residue (Ulrich, A 144 336)

+14H₂O Insol in cold and hot H₂O
(Wempe, Z anorg 1912, 78 320)
BaO, 8MoO₃+17H₂O (Felix, Dissert 1912)

Barium chromic molybdate

See Chromicomolybdate, barium

Barium cobaltic molybdate

See Cobaltmolybdate, barium

Barium manganic molybdate

See Permanganomolybdate, barium

Barium nickelic molybdate

See Nickelomolybdate, barium

Barium nickel hydrogen molybdate,

Ba₂H₆Ni(MoO₄)₆+10H₂O

See Nickelomolybdate, barium hydrogen

Barium vanadium molybdate

See Vanadiomolybdate, barium

Barium molybdate hydrogen dioxide, 8BaO, 19MoO₃, 2H₂O₂+13H₂O

Precipitate (Barwald)

Bismuth molybdate, Bi₂O₃, 3MoO₃

Somewhat sol in H₂O Sol in 500 pts H₂O and in the stronger acids (Richter)

Bromomolybdenum molybdate

See under Bromomolybdenum comps

Cadmium molybdate, CdMoO₄

Insol in H₂O, sol in NH₄OH+Aq, KCN+Aq, or acids (Smith and Bradbury, B 24 2390)

CdO, H₂O, 8MoO₃+6H₂O Decomp by boiling with H₂O (Wempe, Z anorg 1912, 78 323)

Cæsium molybdate, Cs O, 3MoO₃+H₂O

(Ephraim and Herschfinkel, Z anorg 1909, 64 270)

Cs₂O, 5MoO₃+3H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 270)

+3½H₂O Very sl sol in cold, easily sol in hot H₂O (Wempe, Dissert 1911)

2Cs₂O, 5MoO₃+5H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 271)

3Cs₂O, 10MoO₃+3H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 271)

Cs₂O, 16MoO₃+8H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 271)

3Cs₂O, 10MoO₃+3H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 271)

Cæsium tetramolybdate, Cs₂O, 4MoO₃

Only sl sol in H₂O (Muthmann, B 1898, 31 1841)

+2H₂O Sl sol in H₂O (Muthmann, B 1898, 31 1841)

+3H₂O Easily sol in cold or hot H₂O (Wempe, Z anorg 1912, 78 317)

+5H₂O Very sol in cold and hot H₂O (Wempe, Dissert 1911)

Cs₂O, MoO₃, Cs₂O, 3MoO₃+4 5H₂O Sol in H₂O (Wempe, Z anorg 1912, 78 317)

Cæsium paramolybdate, 5Cs₂O, 12MoO₃+11H₂O

Efflorescent Easily sol in H₂O (Wempe, Z anorg 1912, 78 317)

Calcium molybdate, CaMoO₄

Insol precipitate (Ullik)

Sl sol in H₂O, insol in alcohol (Smith and Bradbury, B 24 2930)

+H₂O (Westphal, Dissert 1895)

+2H₂O (Westphal, Dissert 1895)

+6H₂O Difficultly sol in cold, easily in hot H₂O (Ullik, A 144 231)

CaMo₄O₁₃+9H₂O Easily sol in cold H₂O

CaO, 2H₂O, 12MoO₃+21H₂O Efflorescent Sl sol in cold, easily sol in hot H₂O (Wempe)

Calcium hydrogen tetramolybdate,

CaH₂(Mo₄O₁₃)₂+17H₂O

Sl sol in cold, easily sol in hot H₂O with decomp (Ullik)

+16H₂O Insol in cold, difficultly sol in hot H₂O (Wempe, Z anorg 1912, 78 318)

Cerium molybdate, Ce₂(MoO₄)₃

Precipitate Insol in H₂O, sol in acids (Cossa, B 19 536 R)

Chromic molybdate

Insol in H₂O, but sol in acids Sol in NH₄ molybdate+Aq (Berzelius)

See also Chromicomolybdic acid

Chromic molybdate, with M molybdate

See Chromicomolybdate M

Cobaltous molybdate, CoMoO₄

Decomp by alkalis and strong acids (Berzelius)

+H₂O Sl sol in pure, easily sol in acidified H₂O (Coloriano, Bull Soc (2) 50 451)

CoO, 2MoO₃+2H₂O (Marckwald, Dissert 1895)

½H₂O Sl sol in H₂O (Marckwald)

CoMo₄O₁₀+10H₂O Very sl sol in cold, but very easily sol in hot H₂O (Ullik, W A B 55, 2 767)

Cobaltic potassium molybdate

See Cobaltmolybdate, potassium

Cobaltous sodium molybdate,

Na₂O, 2CoO, 6MoO₃+18H₂O

(Marckwald, Dissert 1895)

2Na₂O, CoO, 7MoO₃+20H₂O Sol in cold H₂O without decomp Decomp on heating (Marckwald)

$3\text{Na}_2\text{O}$, 2CoO , $12\text{MoO}_3 + 27\text{H}_2\text{O}$ (Marckwald)

$3\text{Na}_2\text{O}$, 3CoO , $14\text{MoO}_3 + 50\text{H}_2\text{O}$ Sol in much cold H_2O (Marckwald)

$4\text{Na}_2\text{O}$, 6CoO , $25\text{MoO}_3 + 68\text{H}_2\text{O}$ (Marckwald)

Cobaltous molybdate ammonia, $\text{CoMoO}_4 \cdot 2\text{NH}_3 + \text{H}_2\text{O}$

Sol in H_2O (Sonnenschein, J pr 53 340)

Cupric molybdate, basic, 4CuO , $3\text{MoO}_3 + 5\text{H}_2\text{O}$

Insol in H_2O (Struve, J B 1854 350)

Cupric molybdate, CuMoO_4

Sl sol in H_2O , decomp by acids and alkaline solutions

$\text{CuMoO}_3 \cdot 6\frac{1}{2}\text{H}_2\text{O}$ Easily sol in cold H_2O (Ullik, A 144 233)

$+ 9\text{H}_2\text{O}$ Very sl sol in cold, and extraordinarily easily sol in hot H_2O (Ullik)

Cupric molybdate ammonia,

$\text{CuMoO}_4 \cdot 2\text{NH}_3 + \text{H}_2\text{O}$

Gives off NH_3 at ord temp Decomp by H_2O

Sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ from which it can be cryst (Briggs, Chem Soc 1904, 85 674)

$\text{CuMoO}_4 \cdot 4\text{NH}_3$ Decomp by H_2O Sol in dil $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen, Ch Z Repert 1896, 20 225)

Didymium molybdate, $\text{Dy}_2(\text{MoO}_4)_3$

Ppt Insol in H_2O (Cossa, B 19 536R)

Dy_2O_3 , $6\text{MoO}_3 + 3\text{H}_2\text{O}$ (?) Precipitate (Smith)

Glucinum molybdate, basic, 2GfO , $\text{MoO}_3 + 3\text{H}_2\text{O}$

Nearly insol in H_2O (Atterberg, J B 1873 258)

Glucinum molybdate, GfO , $\text{MoO}_3 + 2\text{H}_2\text{O}$

Sol in H_2O with decomp (Rosenheim, Z anorg 1897, 15 307)

GfMoO_4 , $\text{MoO}_3 + x\text{H}_2\text{O}$ Easily sol in H_2O (Atterberg)

Gold (auric) molybdate (?)

Sl sol in H_2O Sol in HCl , and $\text{HNO}_3 + \text{Aq}$ (Richter)

Hydroxylamine potassium molybdate

$\text{MoO}_4\text{H}_2(\text{NH}_2\text{O})_3(\text{NH}_2\text{OK})$

Easily sol in H_2O , pptd by alcohol (Hofmann, A 1899, 309 324)

Indium molybdate, $\text{In}_2(\text{MoO}_4)_3 + 2\text{H}_2\text{O}$

Ppt Insol in H_2O

Easily sol in HCl (Renz, B 1901, 34 2765)

Iron (ferrous) molybdate, FeMoO_4

Insol in H_2O (Schultze, A 126 55)

Iron (ferric) molybdate, Fe_2O_3 , $4\text{MoO}_3 + 7\text{H}_2\text{O}$

Nearly insol in H_2O Slowly sol in cold easily in hot HCl , or $\text{HNO}_3 + \text{Aq}$ Dil acid gradually dissolve out Fe_2O_3 in the cold When ignited, difficultly sol in all solvents (Steinacker)

Fe_2O_3 , $5\text{MoO}_3 + 16\text{H}_2\text{O}$ Very sl sol in H_2O (Struve, J B 1854 346)

$2\text{Fe}_2\text{O}_3$, $7\text{MoO}_3 + 34\text{H}_2\text{O}$ Ppt (Hall, J Am Chem Soc 1907, 29 704)

Ferric potassium molybdate, Fe_2O_3 , $3\text{K}_2\text{O}$

$12\text{MoO}_3 + 20\text{H}_2\text{O} = 3\text{K}_2\text{Mo}_2\text{O}_7$,

$\text{Fe}_2(\text{Mo}_2\text{O}_7)_3 + 20\text{H}_2\text{O}$

Sol in H_2O (Struve)

Lanthanum molybdate, $\text{LaH}_3(\text{MoO}_4)_3 =$

La_2O_3 , $\text{MoO}_3 + 3\text{H}_2\text{O}$ (?)

Precipitate (Smith)

Lead molybdate, PbMoO_4

Insol in H_2O Sol in warm $\text{HNO}_3 + \text{Aq}$ decomp by H_2SO_4 , sol in conc $\text{HCl} + \text{Aq}$, or $\text{KOH} + \text{Aq}$

Min *Wulfenite* As above

Lithium molybdate, Li_2MoO_4

Moderately sol in cold, and only sl more sol in hot H_2O (Ephraim, Z anorg 1909, 64 259)

$+ \text{H}_2\text{O}$ Easily sol in H_2O

$5\text{Li}_2\text{O}$, $5\text{MoO}_3 + 2\text{H}_2\text{O}$ 46.13 g are present in 100 ccm of the aqueous solution at 20° , and sp gr of the solution = 1.41 (Wempe, Z anorg 1912, 78 309)

Li_2O , $2\text{MoO}_3 + 5\text{H}_2\text{O}$ Sol in cold, easily sol in hot H_2O (Ephraim, Z anorg 1909, 64 258)

Li_2O , $3\text{MoO}_3 + 11\text{H}_2\text{O}$ Easily sol in warm H_2O (Wempe, Dissert 1911)

$+ 4\text{H}_2\text{O}$ (Wempe)

$+ 4\frac{1}{2}\text{H}_2\text{O}$ (Wempe)

$+ 7\text{H}_2\text{O}$ Nearly insol in cold, sol in hot H_2O (Ephraim, Z anorg 1909, 64 258)

$2\text{Li}_2\text{O}$, 3MoO_3 Sl sol in H_2O (Ephraim, Z anorg 1909, 64 255)

Lithium paramolybdate, $3\text{Li}_2\text{O}$, $7\text{MoO}_3 + 12\text{H}_2\text{O}$

Sol in H_2O (Rosenheim, Z anorg 1897, 15 181)

$+ 28\text{H}_2\text{O}$ Easily sol in cold and hot H_2O (Ephraim, Z anorg 1909, 64 255)

Lithium tetramolybdate, Li_2O , $4\text{MoO}_3 + 7\text{H}_2\text{O}$

Sol in cold H_2O (Ephraim, Z anorg 1909, 64 258)

Li_2O , H_2O , $8\text{MoO}_3 + 10\text{H}_2\text{O}$ Easily sol

in hot H_2O (Wempe, Z anorg 1912, 78 308)

Li_2O , $3\text{H}_2\text{O}$, $16\text{MoO}_3 + 6\frac{1}{2}\text{H}_2\text{O}$ Easily sol in warm H_2O (Wempe, Z anorg 1912, 78 308)

Lithium potassium molybdate, $\text{KLiMoO}_4 + \text{H}_2\text{O}$

(Traube, N Jahrb Mmer, 1894, I 194)

Magnesium molybdate, MgMoO_4

Min *Belonesra*

Insol in $\text{HCl} + \text{Aq}$ (Scacchi, Zeit Kryst 1888, 14 523)

+ $5\text{H}_2\text{O}$ Easily sol in cold, but still more sol in hot H_2O (Delafontaine)

Sol in 12-15 pts cold H_2O (Brandes)

+ $7\text{H}_2\text{O}$ Easily sol in hot or cold H_2O (Ullik)

$\text{MgMo}_3\text{O}_{10} + 10\text{H}_2\text{O}$ Difficultly sol in cold, very easily in hot H_2O (Ullik)

Magnesium paramolybdate, $\text{Mg}_3\text{Mo}_7\text{O}_{24} + 20\text{H}_2\text{O}$

Quite sol in cold, more easily in hot H_2O (Ullik)

Magnesium tetramolybdate,

MgO , H_2O , $8\text{MoO}_3 + 19\text{H}_2\text{O}$

Magnesium hydrogen tetramolybdate,

$\text{MgH}_2(\text{Mo}_4\text{O}_{13})_2 + 19\text{H}_2\text{O}$

Easily sol in cold H_2O (Ullik, A 144 335)

Sl sol in cold, easily sol in hot H_2O (Wempe, Dissert 1911)

+ $20\text{H}_2\text{O}$ Ppt (Wempe, Z anorg 1912, 78 323)

Magnesium hydrogen octomolybdate,

$\text{MgH}_2(\text{Mo}_8\text{O}_{25})_2 + 29\text{H}_2\text{O}$

Very difficultly sol in cold, very easily sol in hot H_2O (Ullik, W A B 60, 2 314)

Magnesium potassium molybdate, MgMoO_4 , $\text{K}_2\text{MoO}_4 + 2\text{H}_2\text{O}$

Slowly sol in cold, easily in hot H_2O (Ullik, A 144 343)

Manganous molybdate, $\text{MnMoO}_4 + \text{H}_2\text{O}$

Insol in H_2O Sl sol in pure, easily sol in acidified H_2O Decomp by alkalis or alkali carbonates + Aq (Coloriano, Bull Soc (2) 50 451)

+ $\frac{1}{2}\text{H}_2\text{O}$ (Marckwald, Dissert 1895)

+ $10\text{H}_2\text{O}$ (Marckwald)

Manganic potassium molybdate

See Permanganomolybdate, potassium

Manganic silver molybdate

See Permanganomolybdate, silver

Mercurous molybdate, $\text{Hg}_2\text{Mo}_2\text{O}_7$

Decomp by H_2O (Struve, J B 1754 350,)

Sol in 500-600 pts H_2O , decomp by $\text{HNO}_3 + \text{Aq}$ (Hatchett)

Molybdenum molybdate

See Molybdenum oxides, Mo_2O_7 , Mo_4O_{11} , etc

Neodymium molybdate, $\text{Nd}_2(\text{MoO}_4)_3$

Very sl sol in H_2O

1 pt is sol in 53790 pts H_2O at 28°

1 " " " 32466 " H_2O " 75°

(Hitchcock, J Am Chem Soc 1895, 17 532)

Nickel molybdate, $\text{NiMoO}_4 + \frac{2}{3}\text{H}_2\text{O}$, $+\frac{3}{4}\text{H}_2\text{O}$ and $+5\text{H}_2\text{O}$

(Marckwald, Dissert 1895)

NiO , $3\text{MoO}_3 + 18\text{H}_2\text{O}$ Sl sol in cold, easily sol in hot H_2O (Marckwald)

5NiO , $14\text{MoO}_3 + 57\text{H}_2\text{O}$, and $+70\text{H}_2\text{O}$

Sl sol in cold, easily sol in hot H_2O (Marckwald)

Nickel potassium molybdate, 3NiO , $5\text{K}_2\text{O}$, $16\text{MoO}_3 + 21\text{H}_2\text{O}$

Can be cryst from H_2O (Hall, J Am Chem Soc 1907, 29 701)

Nickelic potassium molybdate

See Nickel molybdate, potassium

Nickel potassium hydrogen molybdate,

$\text{K}_4\text{H}_6[\text{Ni}(\text{MoO}_4)_6] + 5\text{H}_2\text{O}$

See Nickelomolybdate, potassium hydrogen

Nickel sodium molybdate, 2NiO , Na_2O , $6\text{MoO}_3 + 17\text{H}_2\text{O}$

Sol in cold H_2O without decomp but decomp on warming (Marckwald, Dissert 1895)

Nickel molybdate ammonia, NiMoO_4 , $2\text{NH}_3 + \text{H}_2\text{O}$

Decomp by H_2O (Sonnenschein, J pr 53 341)

Potassium molybdate, K_2MoO_4

Deliquescent in moist air Very sol in H_2O Insol in alcohol (Svanberg and Struve, J pr 44 265)

184.6 grams are sol in 100 grams H_2O at 25° (Amadori, C A 1912 2878)

Solubility of $\text{K}_2\text{MoO}_4 + \text{K}_2\text{SO}_4$ at 25°

G per 100 g H_2O		G per 100 g H_2O	
K_2SO_4	K_2MoO_4	K_2SO_4	K_2MoO_4
0	184.6	1.50	99.49
0.46	180.7	2.13	45.89
0.72	177	3.95	17.48
0.98	127.2	8.55	4.73
1.27	107.5	12.10	0

(Amadori, Att acc Linc 1912, 21, I 467, 667)

+ $\frac{3}{4}$ H₂O Easily sol in H₂O (Wempe, Dissert 1911)
 K₂O, 8MoO₃+13H₂O Easily sol in warm H₂O (Wempe, Dissert 1911)
 K₂O, 10MoO₃+9H₂O Nearly insol in hot and cold H₂O 100 g H₂O dissolve 0.682 g at 100° (Felix, Dissert 1912)
 +15H₂O Sol in H₂O (Felix)
 5K₂O, 12MoO₃+8H₂O Sl sol in cold H₂O (Junius, Z anorg 1905, 46 439)

Potassium trimolybdate, K₂Mo₃O₁₀

Difficultly sol in cold, but much more easily in hot H₂O When ignited is absolutely insol in H₂O (Svanberg and Struve)
 +2H₂O (Junius, Z anorg 1905, 46 439)
 Sl sol in cold, easily sol in hot H₂O (Wempe, Dissert 1911)
 +2 $\frac{1}{4}$ H₂O Easily sol in H₂O (Wempe, Dissert 1911)
 +3H₂O Very sl sol in cold, more easily sol in hot H₂O (Wempe, Dissert 1911)
 +11H₂O Practically insol in H₂O (Westphal, Dissert 1895)

Potassium hydrogen tetramolybdate,

K₆H₄[H₂(Mo₂O₇)₂]+18H₂O
 Sl sol in cold H₂O Decomp by boiling H₂O (Rosenheim, Z anorg 1913, 79 298)
 KHM₄O₁₃+6H₂O Decomp by H₂O

Potassium paramolybdate, K₂Mo₇O₂₄+4H₂O

Decomp even by cold H₂O (Delafontaine)
 Formula is K₈Mo₉O₃₁+6H₂O, according to Svanberg and Struve (?)

Potassium selenium molybdate

See Selenomolybdate, potassium

Potassium sodium molybdate, K₂MoO₄, 2Na₂MoO₄+14H₂O

Very easily sol in cold, still more easily in hot H₂O (Delafontaine)

Potassium vanadium molybdate

See Vanadiomolybdate, potassium

Potassium zinc molybdate

Sol in H₂O (Berzelius)

Potassium molybdate hydrogen rhoxide,

6K₂O, 16MoO₃, 4H₂O₂+13H₂O
 Sol in H₂O (Barwald, C C 1885 424)

Potassium molybdate sulphocyanide, KSCN, K₂Mo₃O₁₀+4H₂O

Decomp by H₂O Sol in dil HCl+Ag (Péchar, C R 1894, 118 806)

Praseodymium molybdate, Pr₂(MoO₄)₃

Very sl sol in H₂O
 1 pt is sol in 65820 pts H₂O at 23°
 1 " " " 69800 " " 75°

(Hitchcock, J Am Chem Soc 1895, 17 530)

Rubidium molybdate, Rb₂O, MoO₃

Hygroscopic (Ephraim, Z anorg 1909 64 263)

Rb₂O, 2MoO₃+2H₂O Easily sol in H₂O (Ephraim, Z anorg 1909, 64 263)

Rb₂Mo₂O₂₄+4H₂O Very sl sol in cold much more easily sol in hot H₂O (Delafontaine, N Arch Sc phys nat 30 233)

(Ephraim, Z anorg 1909, 64 263)

+4 $\frac{1}{2}$ H₂O (Wempe, Dissert 1911)

2Rb₂O, 7MoO₃+5H₂O Very sl sol in cold, very easily sol in hot H₂O (Wempe, 5Rb₂O, 7MoO₃+14H₂O (Ephraim anc

Herschfinkel, Z anorg 1909, 64 268)

3Rb₂O, 8MoO₃+6H₂O (Ephraim anc Herschfinkel, Z anorg 1909, 64 269)

5Rb₂O, 12MoO₃+H₂O 100 cc H₂O dissolve 1.941 g at 24° (Wempe, Z anorg 1912, 78 258)

Rb₂O, 3MoO₃ Insol in H₂O (Muthmann, B 1898, 31 1839)

+H₂O (Muthmann, B 1898, 31 1839)

+3H₂O Sl sol in cold, easily sol in hot H₂O (Wempe, Dissert 1911)

6 $\frac{1}{2}$ H₂O (Ephraim and Herschfinkel, Z anorg 1909, 64 269)

2Rb₂O, 3MoO₃+4H₂O Sl sol in cold easily in hot H₂O (Wempe, Dissert 1911)

Rb₂O, 4MoO₃ Difficultly sol in cold easily in hot H₂O (Wempe, Z anorg 1912 78 312)

+ $\frac{1}{2}$ H₂O Practically insol in H₂O Very sol by addition of NH₃ (Ephraim anc Herschfinkel, Z anorg 1909, 64 266)

+2.5H₂O Insol in H₂O (Ephraim, Z anorg 1909, 64 263)

+4H₂O Sol in cold, more easily sol in hot H₂O (Wempe, Z anorg 1912 78 312)

Rb₂O, MoO₃, Rb₂O 3MoO₃+5H₂O Sol in cold or hot H₂O (Wempe, Z anorg 1912 78 312)

Rb₂O, H₂O, 8MoO₃+3H₂O Difficultly sol in cold, easily in hot H₂O (Wempe, Z anorg 1912, 78 312)

Rb₂O, 11MoO₃+5.5H₂O Ppt (Ephraim Z anorg 1909, 64 263)

Rb₂O, 13MoO₃+4H₂O Ppt (Ephraim

Rb₂O, 18MoO₃ Ppt (Ephraim)

Samarium molybdate, Sm₂(MoO₄)₃

Insol in H₂O (Cleve)

Samarium sodium molybdate,

Na₂Sm₂(MoO₄)₄

Insol in H₂O Easily sol in warm dil HNO₃+Aq (Cleve)

ver (argentous) molybdate, Ag_4O , 2MoO_3
Sol in $\text{HNO}_3 + 4\text{q}$ $\text{KOH} + \text{Aq}$ dissolves
 O_2 and Ag_2O separates out Not decomp
dil $\text{NH}_4\text{OH} + \text{Aq}$ (Wohler and Rauten-
rg, A 114 119)
Does not exist (Muthmann, B 20 983)

ver (argentic) molybdate, Ag_2MoO_4
Somewhat sol in H_2O , less when HNO_3 is
esent (Richter)
Very sl sol in pure H_2O , easily sol in
 O acidulated with HNO_3 (Struve and
anberg)
Sol in KCN or $\text{NaOH} + \text{Aq}$ (Smith and
adbury)

Ag_2O , 2MoO_3 Sl sol in H_2O Sol in
 $\text{CN} + \text{Aq}$ (Junius, Dissert 1905)
 $2\text{Ag}_2\text{O}$, 5MoO_3 Somewhat sol in H_2O
vanberg and Struve, J B 1847-48 412)
 Ag_2O , $4\text{MoO}_3 + 6\text{H}_2\text{O}$ Sl sol in H_2O with
comp (Wempe, Z anorg 1912, 78 322)

ver thorium molybdate

See Thoromolybdate, silver

ver molybdate ammonia, Ag_2MoO_4 , 4NH_3
Sol in H_2O with rapid decomposition
idmann, Bull Soc (2) 20 64)

ver molybdate hydrogen dioxide, $13\text{Ag}_2\text{O}$,
 $2\text{H}_2\text{O}_2$, 32MoO_3

Ppt (Barwald, B 17 1206)

dum molybdate, Na_2MoO_4

Anhydrous Easily and completely sol in
 O

$+2\text{H}_2\text{O}$ Sol in H_2O

$+10\text{H}_2\text{O}$ Efflorescent

Solubility in H_2O at t°

Solid phase	t°	Per cent of anhydrous salt	Mols H_2O to 1 mol of anhydrous salt	Mols of anhydrous salt to 100 mols H_2O
Na_2MoO_4 , $10\text{H}_2\text{O}$	6	30 63	25 92	3 86
"	4	33 83	22 38	4 47
"	6	35 58	20 72	4 83
"	90	38 16	18 54	5 39
Na_2MoO_4 , $2\text{H}_2\text{O}$	10	39 28	17 70	5 65
"	15 5	39 27	17 70	5 65
"	32	39 82	17 30	5 78
"	51 5	41 27	16 28	6 14
"	100	45 57	13 67	7 32

(Funk, B 1900, 33 3699)

Insol in methyl acetate (Naumann, B
09, 42 3790)

$\text{Na}_2\text{MoO}_4\text{O}_7$ After ignition, very difficultly
l in cold, and very slowly sol in hot H_2O
vanberg and Struve)

$+ \text{H}_2\text{O}$ Easily sol in H_2O

$+3\frac{1}{2}\text{H}_2\text{O}$ Easily sol in cold or hot H_2O
(Wempe, Dissert 1911)

$+4\text{H}_2\text{O}$ Easily and completely sol in
cold H_2O (Ullik)

$+6\frac{1}{2}\text{H}_2\text{O}$ Sl sol in cold, very easily sol
in hot H_2O (Wempe, Dissert 1911)

$+7\text{H}_2\text{O}$ Difficultly sol in cold H_2O , but
more easily than the corresponding K salt
100 pts H_2O dissolve 3 878 pts at 20° and
13 7 pts at 100° (Ullik, A 144 244)

$+9\text{H}_2\text{O}$ Easily sol in cold, very easily
sol in hot H_2O (Wempe)

$+11\text{H}_2\text{O}$ (Junius, Z anorg 1905, 46
437)

$3\text{Na}_2\text{O}$, 7MoO_3 Easily sol in cold, very
easily sol in hot H_2O (Ott, Dissert 1911)

$+20\text{H}_2\text{O}$ (Westphal, Dissert 1895)

$+22\text{H}_2\text{O}$ Efflorescent Easily sol in
 H_2O (Ullik, A 144 219)

Na_2O , $8\text{MoO}_3 + \frac{1}{2}\text{H}_2\text{O}$ Very sol in cold
or hot H_2O (Wempe, Dissert 1911)

$+4\text{H}_2\text{O}$ Insol in H_2O (Ullik, W A B
60, 2 312)

$+15\text{H}_2\text{O}$ (Rosenheim, Z anorg 1897, 15
188)

Na_2O , $10\text{MoO}_3 + 6\text{H}_2\text{O}$ Very sl sol in
 H_2O 100 g H_2O dissolve 0 842 g at 100°
(Felix, Dissert 1912)

$+7\text{H}_2\text{O}$ (Felix) Nearly insol in hot and
cold H_2O (Rosenheim, Z anorg 1903, 37
323)

$+12\text{H}_2\text{O}$ Difficultly sol in H_2O

$+21\text{H}_2\text{O}$ Abundantly but slowly sol in
cold H_2O $= \text{NaHNa}_5\text{O}_{16} + 10\text{H}_2\text{O}$ (Ullik)

$5\text{Na}_2\text{O}$, $12\text{MoO}_3 + 8\text{H}_2\text{O}$ Sl sol in cold,
easily sol in hot H_2O (Wempe, Dissert
1911)

$+20\text{H}_2\text{O}$ Sl sol in cold, easily sol in
hot H_2O (Wempe, Dissert 1911)

$+36\text{H}_2\text{O}$ (Junius, Z anorg 1905, 46 436)

$+44\text{H}_2\text{O}$ Sl sol in cold, easily sol in hot
 H_2O (Wempe, Dissert 1911)

Sodium tetramolybdate, $\text{Na}_2\text{Mo}_4\text{O}_{13} + 6\text{H}_2\text{O}$

Difficultly sol in cold, easily in hot H_2O
(Ullik)

100 cc H_2O dissolve at 21° , 28 39 g
of the salt Sp gr of the solution = 1 47

(Wempe Z anorg 1912, 78 306)

$+17\text{H}_2\text{O}$ (Felix, Dissert 1912)

$\text{Na}_2\text{H}_4[\text{H}_2(\text{Mo}_2\text{O}_7)_6] + 21\text{H}_2\text{O}$ Slowly sol
in cold, easily sol in hot H_2O (Rosenheim,
Z anorg 1913, 79 298)

$\text{NaHMo}_4\text{O}_{13} + 8\text{H}_2\text{O}$ Very sol in hot or
cold H_2O (Ullik, A 144 333)

$\text{NaHMo}_3\text{O}_{25} + 4\text{H}_2\text{O}$ Insol in H_2O
(Ullik)

Sodium manganous molybdate, $2\text{Na}_2\text{O}$, MnO ,
 $6\text{MoO}_3 + 19\text{H}_2\text{O}$

(Marckwald, Dissert 1895)

Sodium molybdate molybdenum oxide,
 $\text{Na}_2\text{Mo}_5\text{O}_{15}$

Insol in H_2O Sol in HNO_3 and aqua
regia Insol in HCl and in H_2SO_4 Sol in

alkalies (Stavenhagen and Engels, B 1895, 28 2280)

Strontium molybdate, SrMoO_4

Sl sol in H_2O (Schultze)
Sol in 9600 pts H_2O at 17° (Smith and Bradbury, B 24 2930)
 SrO , $3\text{MoO}_3 + \frac{1}{2}\text{H}_2\text{O}$ Scarcely sol in cold, easily in hot H_2O (Wempe, Dissert 1911)
 SrO , H_2O , $8\text{MoO}_3 + 6\text{H}_2\text{O}$ Scarcely sol in cold, easily in hot H_2O (Wempe, Dissert 1911)
 2SrO , $3\text{H}_2\text{O}$, $20\text{MoO}_3 + 21\text{H}_2\text{O}$ Ppt (Wempe, Z anorg 1912, 78 321)

Thalious molybdate, Ti_2MoO_4

Insol in H_2O Sol in alkalies Insol in alcohol (Oettinger, J B 1864, 254)
Sl sol in hot or cold H_2O (Ullik, J B 1867, 234)
 $8\text{Ti}_2\text{O}_3$, 11MoO_3 Sol in hot H_2O (Fleming, J B 1868, 250)
 $3\text{Ti}_2\text{O}_3$, 8MoO_3 (Fleming)

Thalious tetramolybdate, Ti_2O , $4\text{MoO}_3 + \text{H}_2\text{O}$

Sl sol in H_2O with decomp (Wempe, Z anorg 1912, 78 322)

Thalious paramolybdate, $5\text{Ti}_2\text{O}$, 12MoO_3

Insol in H_2O Easily sol in mineral acids and in alkali hydroxides and carbonates (Junnus, Z anorg 1905, 46 432)

Tin (stannic) molybdate

Insol in H_2O Sol in dil or conc $\text{HCl} + \text{Aq}$, or in $\text{KOH} + \text{Aq}$ Not decomp by $\text{HNO}_3 + \text{Aq}$ (Berzelius)

Uranous molybdate

Precipitate Sol in $\text{HCl} + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$
 $\text{U}(\text{MoO}_4)_3$ (Lancien, C C 1908, I 1763)

Uranyl molybdate, $(\text{UO}_2)_2\text{MoO}_4$

Insol in H_2O , methyl and ethyl alcohol, ether, acetic acid, CHCl_3 , C_6H_6 and C_7H_8 Sol in mineral acids (Lancien, C C 1907, I 784)
 2UO_3 , 3MoO_3 (?) Insol in H_2O Sol in strong acids and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Berzelius)
 3UO_3 , 7MoO_3 Insol in hot and cold H_2O Insol in NaOH , KOH , and $\text{NH}_4\text{OH} + \text{Aq}$ Sol in all min acids and decomp by an excess of H_2O Insol in acetic acid (Lancien, C C 1908, I 1763)
 UO_3 , 8MoO_3 (Lancien)
 $+13\text{H}_2\text{O}$ Insol in HNO_3 (Lancien)

Ytterbium molybdate, Yb_2O_3 , $7\text{MoO}_3 + 6\text{H}_2\text{O}$

Insol in hot H_2O (Cleve, Z anorg 1902, 32 152)
 $2\text{Yb}_2\text{O}_3$, MoO_3 Ppt (Cleve)

Yttrium molybdate

Insol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$ (Berlin)

Zinc molybdate, ZnMoO_4

Difficultly sol in H_2O , easily in acids (Schultze, A 126 49)
 $+ \text{H}_2\text{O}$ Sl sol in H_2O Easily sol in dil acids (Coloriano, Bull Soc (2) 50 451)
 $\text{ZnMo}_3\text{O}_{19} + 10\text{H}_2\text{O}$ Very difficultly sol in cold, but extraordinarily easily sol in hot H_2O (Ullik, W A B 55, 2 767)

Zinc tetramolybdate, $\text{ZnMo}_4\text{O}_{13} + 8\text{H}_2\text{O}$

Easily sol in cold H_2O (Ullik)
 ZnO , H_2O , $8\text{MoO}_3 + 14\text{H}_2\text{O}$ Ppt (Wempe, Z anorg 1912, 78 324)

Zinc molybdate ammonia, ZnMoO_4 , $2\text{NH}_3 + \text{H}_2\text{O}$

(Sonnenschein, J pr 53 339)

Permolybdic acid

See Permolybdic acid

Molybdic sulphuric acid, MoO_3 , SO_3

Deliquescent (Schultz-Sellack, B 4 14)
Very deliquescent Very sol in H_2O (Muthmann, A 1886, 238 126)
 MoO_3 , $3\text{SO}_3 + 2\text{H}_2\text{O}$ (?)

Molybdocyanhydric acid, $\text{H}_4\text{Mo}(\text{CN})_8 + 6\text{H}_2\text{O}$

Easily sol in H_2O and abs alcohol Solutions are stable at ord temp (Rosenheim and Garfunkel, Z anorg 1910, 65 168)

Cadmium molybdocyanide, $\text{Cd}_2\text{Mo}(\text{CN})_8 + 8\text{H}_2\text{O}$

Insol in H_2O (Rosenheim)

Cadmium molybdocyanide ammonia, $\text{Cd}_2\text{Mo}(\text{CN})_8$, $4\text{NH}_3 + 2\text{H}_2\text{O}$

(Rosenheim)

Cupric molybdocyanide ammonia, $\text{Cu}_2\text{Mo}(\text{CN})_8$, $4\text{NH}_3 + 7\text{H}_2\text{O}$

(Rosenheim)

Potassium molybdocyanide, $\text{K}_4\text{Mo}(\text{CN})_8 - 2\text{H}_2\text{O}$

Very sol in H_2O (Rosenheim)

Thalious molybdocyanide, $\text{Ti}_4\text{Mo}(\text{CN})_8$

Very sl sol in H_2O (Rosenheim)

Molybdoiodic acid, HIO_3 , $\text{H}_2\text{MoO}_4 + \text{H}_2\text{O}$

Easily sol in H_2O (Blomstrand, J pr (40 320)
 I_2O_5 , $2\text{MoO}_3 + 2\text{H}_2\text{O}$ Very sol in H_2O Insol in cold, sol in hot HNO_3 Sol in alcohol (Chrétien, A ch 1898, (7) 15 402)

Ammonium molybdoiodate, NH_4IO_3 , H_2MoO_4

Somewhat more sol than K salt (Blomstrand)

$(\text{NH}_4)_2\text{O}$, I_2O_5 , 2MoO_3 Very sl sol in cold H_2O More sol in hot H_2O (Rosenheim and Liebknecht, A 1899, 308 50)
 $+\text{H}_2\text{O}$ 1 l H_2O dissolves 5.39 g salt at 15° , 30.94 g at 100° More sol in dil HNO_3
 $+\text{Aq}$ (Chrétien, A ch 1898, (7) 15 409)
 $3(\text{NH}_4)_2\text{O}$, $(\text{I}_2\text{O}_5)_4$, 2MoO_3 , $+6\text{H}_2\text{O}$ (Chrétien)

Barium molybdoiodate, BaO , I_2O_5 , 2MoO_3 , $+2\text{H}_2\text{O}$

4.23 g are sol in 1 l H_2O at ord temp (Chrétien)

Cadmium molybdoiodate, acid, 3CdO , $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $+16\text{H}_2\text{O}$

Sl sol in H_2O (Chrétien)

Calcium molybdoiodate, CaO , I_2O_5 , 2MoO_3 , $+6\text{H}_2\text{O}$

1 l H_2O dissolves 7.8 g of the salt at 15° , 20.89 g at 90° (Chrétien)

Cobaltous molybdoiodate, CoO , I_2O_5 , 2MoO_3 , $+6\text{H}_2\text{O}$

5.11 g are sol in 1 l H_2O at 15° , 22.27 g at 100° (Chrétien)

Cobaltous molybdoiodate acid, CoO , $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $+18\text{H}_2\text{O}$

Very sol in H_2O (Chrétien)

Cupric molybdoiodate, CuO , I_2O_5 , 2MoO_3 , $+3\text{H}_2\text{O}$

1 l H_2O dissolves 10.63 g of the salt at 15° , 25.55 g at 100° (Chrétien)

Lithium molybdoiodate, Li_2O , I_2O_5 , 2MoO_3 , $+2\frac{1}{2}\text{H}_2\text{O}$

197.83 g are sol in 1 l H_2O at 15° Sol in dil HNO_3 + Aq (Chrétien)

Magnesium molybdoiodate, MgO , I_2O_5 , 2MoO_3 , $+6\text{H}_2\text{O}$

1 l H_2O dissolves 3.85 g of the salt at 15° , 16.2 g at 100° (Chrétien)

Manganous molybdoiodate, 3MnO , $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $+9\text{H}_2\text{O}$

1 l H_2O dissolves 17.05 g of the salt at 15° , 55.05 g at 100° (Chrétien)

Nickel molybdoiodate, NiO , I_2O_5 , 2MoO_3 , $+6\text{H}_2\text{O}$

5.43 g are sol in 1 l H_2O at 15° , 21.8 g at 100° (Chrétien)

2NiO , $2\text{I}_2\text{O}_5$, 3MoO_3 , $+23\text{H}_2\text{O}$ Easily sol in H_2O Not decomp by acids (Maass, Dissert 1901)

Nickel molybdoiodate, acid, 2NiO , $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $+15\text{H}_2\text{O}$

Very sol in H_2O (Chrétien)

Potassium molybdoiodate, KH_2IO_2 , MoO_3 , OH , or KIO_3 , MoO_3 , $+2\text{H}_2\text{O}$

Ppt Sl sol in H_2O (Blomstrand, J pr (2) 40 320)

K_2O , I_2O_5 , 2MoO_3 Only sl sol in cold H_2O , sol on long boiling 4.48 grs are sol in 1 l H_2O at 12° (Compare Blomstrand not identical) (Rosenheim, A 1899, 308 50)

$+\text{H}_2\text{O}$ Sl sol in H_2O 3.45 g are sol in 1 l H_2O at 15° , 28.38 g at 100° More sol in dil HNO_3 + Aq (Chrétien, A ch 1898, (7) 15 404)

Potassium molybdoiodate, acid

$(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $4\text{K}_2\text{O}$, $+7\text{H}_2\text{O}$
 $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $2\text{K}_2\text{O}$, $+13\text{H}_2\text{O}$
 $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $2\text{K}_2\text{O}$, $+4\text{H}_2\text{O}$
 $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $3\text{K}_2\text{O}$, $+7\text{H}_2\text{O}$
 $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $4\text{K}_2\text{O}$, $+5\text{H}_2\text{O}$ (Chrétien)

Silver molybdoiodate, Ag_2O , I_2O_5 , 2MoO_3 , $+1\frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O

$4\text{Ag}_2\text{O}$, $4\text{I}_2\text{O}_5$, 3MoO_3 Sol in H_2O containing HNO_3 (Chrétien)

Sodium molybdoiodate, Na_2O , I_2O_5 , 2MoO_3 , $+\text{H}_2\text{O}$

Sl sol in H_2O Sol in HNO_3 with decomp (Chrétien, C R 1896, 123 178)

1 l H_2O dissolves 6.97 g of the salt at 15° , 22.75 g at 90°
 $1\frac{1}{2}\text{H}_2\text{O}$ + Aq (1 10) dissolves 23.78 g of the salt at ord temp (Chrétien, A ch 1898, (7) 15 410)

$+\text{H}_2\text{O}$ Only sl sol in cold H_2O , sol on long boiling 3.35 grams are sol in 1 l H_2O at 12° (Rosenheim, A 1899, 308 50)

Strontium molybdoiodate, SrO , I_2O_5 , 2MoO_3 , $+3\text{H}_2\text{O}$

Very sol in H_2O (Chrétien, A ch 1898, (7) 15 415)

Strontium molybdoiodate, acid, 3SrO , $(\text{I}_2\text{O}_5)_2$, 2MoO_3 , $+15\text{H}_2\text{O}$

1 l H_2O dissolves 2.94 g of the salt at 15° , 13.64 g at 100° (Chrétien)

Uranyl molybdoiodate, 2UO_3 , $4\text{I}_2\text{O}_5$, 3MoO_3 , $+3\text{H}_2\text{O}$ (Chrétien)**Zinc molybdoiodate, ZnO , I_2O_5 , 2MoO_3 , $+5\text{H}_2\text{O}$**

1 l H_2O dissolves 4.08 g of the salt at 15° , 16.25 g at 100° (Chrétien)

Zinc molybdodiodate acid, ZnO , $(\text{I}_2\text{O}_5, 2\text{MoO}_3)_2$
 $+16\text{H}_2\text{O}$

Very sol in H_2O (Chrétien)

Molybdoperiodic acid

Ammonium molybdoperiodate, $5(\text{NH}_4)_2\text{O}$,
 I_2O_7 , $12\text{MoO}_3+12\text{H}_2\text{O}$

Sol in H_2O (Blomstrand, Sv V A H Bih 1892 No 6)

$4(\text{NH}_4)_2\text{O}$, I_2O_7 , $8\text{MoO}_3+7\text{H}_2\text{O}$ Very sl
 sol in cold H_2O (Blomstrand)

Ammonium sodium —, $2(\text{NH}_4)_2\text{O}$, Na_2O ,
 I_2O_7 , $2\text{MoO}_3+10\text{H}_2\text{O}$

Very sl sol in H_2O (B)

Barium sodium —, 9BaO , Na_2O , $2\text{I}_2\text{O}_7$,
 $24\text{MoO}_3+28\text{H}_2\text{O}$

Very sl sol in H_2O (B)

Calcium —, 5CaO , I_2O_7 , $12\text{MoO}_3+26\text{H}_2\text{O}$

Extremely sol in H_2O (Blomstrand)

4CaO , I_2O_7 , $12\text{MoO}_3+21\text{H}_2\text{O}$ Less sol in
 H_2O than above salt

Lithium —, $5\text{Li}_2\text{O}$, I_2O_7 , $12\text{MoO}_3+30\text{H}_2\text{O}$

Not so efflorescent as Na salt Sol in H_2O
 (B)

$+18\text{H}_2\text{O}$ (B)

Manganous sodium —, 2MnO , $3\text{Na}_2\text{O}$,
 I_2O_7 , $12\text{MoO}_3+32\text{H}_2\text{O}$

Sol in H_2O (B)

Potassium —, $5\text{K}_2\text{O}$, I_2O_7 , 12MoO_3+
 $12\text{H}_2\text{O}$

Not efflorescent (Blomstrand)

Sodium —, $5\text{Na}_2\text{O}$, I_2O_7 , $12\text{MoO}_3+34\text{H}_2\text{O}$

Efflorescent Very sol in H_2O (Blom-
 strand, Sv V A H Bih 1892 No 6 24)

$+26\text{H}_2\text{O}$ Not efflorescent Very sol in
 H_2O (Blomstrand)

Sodium strontium —, Na_2O , 4SrO , I_2O_7 ,
 $12\text{MoO}_3+20\text{H}_2\text{O}$

Sol in H_2O (B)

Molybdophosphoric acid

See Phosphomolybdic acid

Molybdosubphosphoric acid

Sodium molybdosubphosphate,
 $\text{Na}_2[\text{P}(\text{MoO}_7)_3]+8\text{H}_2\text{O}$

Ppt (Rosenheim, Z anorg 1913, 84 222)

Molybdophosphorous acid

Potassium molybdophosphate,
 $\text{K}_3[\text{HP}(\text{MoO}_7)_3]+11\text{H}_2\text{O}$

Difficultly sol in cold H_2O (Rosenheim,
 Z anorg 1913, 84 219)

Sodium molybdophosphate,
 $\text{Na}_2[\text{HP}(\text{MoO}_7)_3]+11\text{H}_2\text{O}$

Sl sol in H_2O (Rosenheim, Z anorg
 1913, 84 218)

Molybdophosphovanadic acid

See Phosphovanadiomolybdic acid

Molybdoselenious acid

Ammonium molybdoselenite, $4(\text{NH}_4)_2\text{O}$,
 3SeO_2 , $10\text{MoO}_3+4\text{H}_2\text{O}$

More sol in hot than cold H_2O , insol in
 alcohol (Péchar, A ch (6) 30 403)

Ammonium potassium molybdoselenite,
 $2(\text{NH}_4)_2\text{O}$, $2\text{K}_2\text{O}$, 3SeO_2 , 10MoO_3+
 $5\text{H}_2\text{O}$

Very sol in H_2O , insol in alcohol (Péch
 ard)

Barium molybdoselenite, 4BaO , 3SeO_2 ,
 $10\text{MoO}_3+3\text{H}_2\text{O}$

Sl sol in cold, easily in warm H_2O
 (Péchar)

Potassium molybdoselenite, 4K O , 3SeO_2 ,
 $10\text{MoO}_3+5\text{H}_2\text{O}$

Very sol in H_2O , insol in alcohol (Péch
 ard)

Sodium molybdoselenite, 4Na O , 3SeO_2 ,
 $10\text{MoO}_3+15\text{H}_2\text{O}$

Very efflorescent, and sol in H_2O , insol i
 alcohol (Péchar)

Molybdosilicic acid

See Silicomolybdic acid

Molybdosilicovanadic acid

See Silcovanadiomolybdic acid

Molybdosulphuric acid

Appreciably sol in H_2O (Hoffmann
 Dissert 1903)

Ammonium molybdosulphate, $(\text{NH}_4)_2\text{O}$,
 2MoO_3 , $\text{SO}_3+4\text{H}_2\text{O}$, ind $+9\text{H}_2\text{O}$

Decomp by H_2O (Wendland Z anorg
 1907, 54 261)

$(\text{NH}_4)_2\text{O}$, 2MoO_3 , $3\text{SO}_3+10\text{H}_2\text{O}$ (Wen
 land)

Ammonium molybdenyl molybdosulphat
 $(\text{NH}_4)_2\text{O}$, MoO , 7MoO_3 , $\text{SO}_3+11\text{H}_2\text{O}$

$1\frac{1}{2}(\text{NH}_4)_2\text{O}$, MoO_2 , 7MoO_3 , $\text{SO}_3+5\text{H}_2\text{O}$
 $2(\text{NH}_4)_2\text{O}$, MoO_2 , 7MoO_3 , $\text{SO}_3+14\text{H}_2\text{O}$

(Hoffmann, Dissert 1903)

3NH_3 , MoO_2 , 7MoO_3 , $\text{SO}_3+10\text{H}_2\text{O}$ Ver
 sol in H_2O Very sl sol in NH_4 salts + A
 Very stable toward alkali + Aq (Péchar
 C R 1893, 116 1441)

5NH_3 , MoO_2 , 7MoO_3 , $\text{SO}_3 + 8\text{H}_2\text{O}$ (Pé-
chard, C R 1893, 116 1441)

Potassium molybdosulphate, K_2O , 2MoO_3 ,
 $\text{SO}_3 + 2\text{H}_2\text{O}$

K_2O , 2MoO_3 , $\text{SO}_3 + 6\text{H}_2\text{O}$
 K_2O , 2MoO_3 , $3\text{SO}_3 + 6\text{H}_2\text{O}$ (Wenland, Z
anorg 1907, 54 260)

Potassium molybdenyl molybdosulphate,
 K_2O , MoO_2 , 7MoO_3 , $\text{SO}_3 + 8\text{H}_2\text{O}$
(Hoffmann, Dissert 1903)

Molybdosulphurous acid

Ammonium molybdosulphite, $4(\text{NH}_4)_2\text{O}$,
 3SO_2 , $10\text{MoO}_3 + 6\text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O
Insol in alcohol (Péchard, A ch (6) 30
396)

$3(\text{NH}_4)_2\text{O}$, 8MoO_3 , $2\text{SO}_2 + 5\text{H}_2\text{O}$ Sl sol
in cold, easily sol in warm H_2O Easily de-
comp by H_2O , and can be recryst only in
presence of an excess of sulphurous acid
(Rosenheim, Z anorg 1894, 7 177)

Ammonium potassium molybdosulphite,
 $2(\text{NH}_4)_2\text{O}$, $2\text{K}_2\text{O}$, 3SO_2 , $10\text{MoO}_3 + 9\text{H}_2\text{O}$

Sl sol in cold H_2O Decomp on warming
(Péchard)

Barium molybdosulphite, 2BaO , 5MoO_3 ,
 $2\text{SO}_2 + 10\text{H}_2\text{O}$

(Rosenheim, Z anorg 1897, 15 185)

Cæsium molybdosulphite, $2\text{Cs}_2\text{O}$, 5MoO_3 ,
 $2\text{SO}_2 + 6\text{H}_2\text{O}$

Unstable As K salt (Rosenheim)

Potassium molybdosulphite, $4\text{K}_2\text{O}$, 3SO_2 ,
 $10\text{MoO}_3 + 10\text{H}_2\text{O}$

Very sl sol in H_2O , but decomp on warm-
ing (Péchard)

$2\text{K}_2\text{O}$, 5MoO_3 , $2\text{SO}_2 + 10\text{H}_2\text{O}$ (Rosenheim)

Rubidium molybdosulphite, $2\text{Rb}_2\text{O}$, 5MoO_3 ,
 $2\text{SO}_2 + 12\text{H}_2\text{O}$

As K salt (Rosenheim)

Sodium molybdosulphite, $4\text{N}_2\text{O}$, 3SO_2 ,
 $10\text{MoO}_3 + 12\text{H}_2\text{O}$

Very sol in cold H_2O , insol in alcohol
(Péchard)

+ $16\text{H}_2\text{O}$ Very efflorescent (Péchard)
 $2\text{N}_2\text{O}$, 5MoO_3 , $2\text{SO}_2 + 12\text{H}_2\text{O}$ In dry state
it gradually gives off SO_2 and soon effloresces
(Rosenheim)

Strontium molybdosulphite, 2SrO , 5MoO_3 ,
 $2\text{SO}_2 + 12\text{H}_2\text{O}$

(Rosenheim)

Molybdotitanic acid

See Titanomolybdic acid

Molybdous acid

Magnesium molybdite, $\text{Mg}_2\text{Mo}_3\text{O}_8 = 2\text{MgO}$,
 3MoO_2

Not attacked by KOH , and $\text{HCl} + \text{Aq}$
(Muthmann, A 238 108)

Zinc molybdite, $\text{Zn}_2\text{Mo}_3\text{O}_8 = 2\text{ZnO}$, 3MoO_2

Easily sol in aqua regia (Muthmann, A
238 108)

Molybdovanadates

See Vanadiomolybdates

Neodymicotungstic acid

Ammonium neodymicotungstate, $3(\text{NH}_4)_2\text{O}$,
 Nd_2O_3 , $16\text{WO}_3 + 20\text{H}_2\text{O}$

Difficultly sol in H_2O (E F Smith, J
Am Chem Soc 1904, 26 1480)

Barium neodymicotungstate, 6BaO , Nd_2O_3 ,
 $16\text{WO}_3 + 17\text{H}_2\text{O}$

Insol in H_2O (E F Smith)

Neodymium

See also under Didymium

Neodymium bromide, NdBr_3

(Matignon, C R 1905, 140 1638)

Neodymium carbide, NdC

Decomp by H_2O , insol in conc HNO_3 ,
decomp by dil HNO_3 (Moissan, C R
1900, 131 597)

Neodymium chloride, NdCl_3

100 g H_2O dissolve 98.68 g NdCl_3 at 13° ,
140.4 g at 100°

Sp gr at $15^\circ/4^\circ$ of the solution sat at $13^\circ =$
1.74 (Matignon, A ch 1906, (8) 8 249)

44.5 g are sol in 100 g abs alcohol at 20°
1.8 g " " " " pyridine at 15°

Insol in ether, CHCl_3 , quinoline, toluidine,
etc Sl sol in aniline and in phenylhydraz-
ine (Matignon, A ch 1906, (8) 8 266)

+ $6\text{H}_2\text{O}$ Deliquescent

At 13° , 100 pts H_2O dissolve 246.2 pts of
the hydrated salt

At 100° , 100 pts H_2O dissolve 511 pts of
hydrated salt

Sat solution at 13° has a sp gr $15^\circ/4^\circ =$
1.741 (Matignon, C R 1901, 133 289)

Neodymium chloride ammonia, NdCl_3 ,
 12NH_3

Decomposes on heating into $\text{NdCl}_3 + \text{NH}_3$,
+ 2NH_3 , + 4NH_3 , + 5NH_3 , + 8NH_3 , and
+ 11NH_3 (Matignon, C R 1906, 142 1043)

Neodymium hydroxide

Sol in citric acid (Baskerville, J Am
Chem Soc 1904, 26 49)

Solubility in glycerine+Aq containing about 60% by vol of glycerine 100 cem of the solution contain 4.5 g neodymium oxide (Muller, Z anorg 1905, **43** 322)

Neodymium hydride, NdH₂ (?)

Slowly attacked by boiling H₂O Sol in acids with violent evolution of H₂ (Muthmann, A 1904, **331** 58)

Neodymium iodide, NdI₃

(Matignon, C R 1905, **140** 1638)

Neodymium nitride, NdN

Decomp in moist air with evolution of NH₃ (Muthmann, A 1904, **331** 59)

Neodymium oxide, Nd₂O₃

Easily sol in acids (v Welsbach, M 6 477)

Neodymium oxychloride, NdOCl

(Matignon, C R 1905, **140** 1638)

Neon, Ne

Less sol than argon in H₂O, sol in liquid oxygen (Ramsay, B 1898, **31** 3118)

Absorption by H₂O at t°

t°	Coefficient of absorption
0	0 0114
10	0 0118
20	0 0147
30	0 0158
40	0 0203
50	0 0317

(Antropoff, Roy Soc Proc 1910, **83** A, 480)

Nickel, Ni

Not attacked by H₂O Very slowly sol in dilute H₃PO₄, H₂SO₄, or HCl+Aq (Tupputi, A ch **78** 133)

Very easily attacked by HNO₃+Aq, and difficultly by hot H₂SO₄ When pure, is converted into passive condition by conc HNO₃ (Nickles, C R **38** 284)

Very sl attacked by cold acids, except HNO₃+Aq (Tissier, C R **50** 106)
Not attacked by NaOH+Aq (Venator, Dingl **261** 133)

Insol in liquid NH₃ (Gore, Am Ch J 1898, **20** 828)

Nickel amide, Ni(NH₂)₂

Decomp by H₂O, slowly sol in min acids Insol in liquid NH₃ (Bohart, J phys Chem 1915, **19** 560)

Nickel antimonide, NiSb

Insol in HCl+Aq, easily sol in HNO₃+Aq (Christofle, **1863**)

Min *Breithauptite* Insol in acids, easily sol in aqua regia

Ni₃Sb₂ (Christofle)

Nickel antimonide sulphide, NiSb₂, NiS₂=NiSbS

Min *Nickel glance*, *Ullmannite*

Decomp by HNO₃+Aq, completely sol in aqua regia with separation of S

Nickel arsenide, NiAs

Min *Niccolite* Sol in conc HNO₃+Ac with separation of As₂O₃, more easily sol in aqua regia

NiAs₂ Min *Chloanthite*, *Rammelsbergite* Sol in HNO₃+Aq

Ni₃As₂ Sol in HNO₃ and in aqua regia Readily attacked by fused alkali (Granger C R 1900, **130** 915)

Nickel arsenide sulphide, NiAs₂, NiS₂

Min *Gersdorffite* Partly sol in HNO₃+Aq with separation of S and As₂O₃, not attacked by KOH+Aq

Nickel azoimide, basic, Ni(OH)N₃

Insol in H₂O (Curtius, J pr 1898, (2) **58** 300)

Nickel azoimide, NiN₃+H₂O

Sol in H₂O, insol in alcohol and ether (Curtius, J pr 1900, (2) **61** 418)

Nickel potassium azoimide, Ni(N₃)₂, KN₃ (?)

Sol in H₂O (Curtius, J pr 1898, (2) **58** 302)

Nickel boride, Ni₂B

Attacked by HNO₃ Slowly sol in ho HCl (Jassoneix, C R 1907, **145** 240)

NiB Decomp by moist air and by alkali nitrates, chlorates, hydroxides and carborates, decomp by steam at red heat Not attacked by HCl Easily attacked by HNC and aqua regia, by H₂SO₄ only on heating (Moissan, C R 1896, **122** 425)

NiB₂ (Jassoneix, C R 1907, **145** 241)

Nickel bromide, NiBr₂

Deliquescent Slowly sol in H₂O

Sat NiBr₂+Aq contains at

—21° —6° +19° 38°
47.1 51.7 56.6 58.9% NiBr₂,

58° 77° 98° 100° 140°
60.5 60.3 61.0 61.0 60.7% NiBr

(Étard, A ch 1894, (7) **2** 542)

Somewhat hygroscopic Nearly insol in cold H₂O but begins to dissolve appreciably at 50°, and somewhat more rapidly at 90° but even at that temp 1 g requires 1–2 hou for solution HNO₃ does not appreciably hasten solution (Richards and Cushma Z anorg 1898, **16** 169)

Sl sol in benzonitrile (Naumann, B 1914, **47** 1369)
 Sol in quinoline (Beckmann and Gabel, Z anorg 1906, **51** 236)
 +3H₂O Deliquescent Very sol in H₂O, HCl+Aq, NH₄OH+Aq, alcohol, and ether (Berthelot, A ch **44** 389)
 +6H₂O (Bolschakoff, C C **1897**, II 331 and 726)
 +9H₂O (Bolschakoff, C C **1897**, II 726 and 331)

Nickel stannic bromide

See Bromostannate, nickel

Nickel bromide ammonia, NiBr₃, 6NH₃

Sol in little H₂O, but decomp by more (Rammelsberg, Pogg **55** 243)
 Sol in warm conc NH₄OH+Aq, insol in cold (Richards and Cushman, Z anorg **1898**, **16** 175)

Nickel bromide cupric oxide, NiBr₂, 3CuO + 4H₂O

Not decomp by H₂O (Mailhe, A ch **1902**, (7) **27** 377)

Nickel bromide hydrazine, NiBr, 2N H₄

Easily sol in dil acids and NH₄OH+Aq
 NiBr₂, 3N₂H₄ Sol in dil acids (Franzen, Z anorg **1903**, **60** 263-4)

Nickel carbonyl, Ni(CO)₄

Insol in H₂O, not attacked by dil acids or alkalies or conc HCl+Aq Easily sol in conc HNO₃+Aq and in aqua regia Sol in alcohol, benzene, and chloroform (Mond, Langer, and Quincke, Chem Soc **57** 749)

Sol in hydrocarbons, especially oil of turpentine (Berthelot, C R **1891**, **112** 1346)

Sol in acetone, toluene, methyl and ethyl alcohol, etc (I enher and Loos, J Am Chem Soc **1900**, **22** 114)

Nickel chloride, NiCl₂

Anhydrous Not immediately sol in H₂O, but gradually dissolves on boiling or by addition of HCl+Aq Deliquesces on air, and is then easily sol in H₂O Sol in NH₄OH+Aq Sol in alcohol Sol in hot HCl+Aq only slowly

Sp gr of NiCl₂+Aq containing
 5 10 15 20 25% NiCl₂
 1 0493 1 0995 1 1578 1 2245 1 3000
 (B Franz, J pr (2) **5** 285)

Sp gr of NiCl₂+Aq containing, in 1000
 grms H₂O, g NiCl₂+7H₂O at 23 1°
 128 g (= ½ mol) 256 384 512
 1 057 1 107 1 149 1 187
 640 768 896 1024
 1 220 1 249 1 276 1 301

Containing g NiCl₂ (anhydrous)
 65 g (= ½ mol) 130 195 260 325 390
 1 061 1 119 1 176 1 230 1 284 1 335
 (Gerlach, Z anal **28** 468)

Sp gr of NiCl₂+Aq at room temp containing

11 449 22 69 30 40% NiCl₂
 1 1093 1 2264 1 3371
 (Wagner, W Ann **1883**, **18** 269)

Sp gr of NiCl₂+Aq at 25°

Concentration of NiCl ₂ +Aq	Sp gr
1-normal	1 0591
1/2- "	1 0308
1/4- "	1 0144
1/8- "	1 0067

(Wagner, Z phys Ch **1890**, **5** 39)

Insol in liquid NH₃ (Franklin, Am Ch J **1898**, **20** 828)

100 pts absolute alcohol dissolve at room temperature 10 05 pts NiCl₂ (Bodtker, Z phys Ch **1897**, **22** 511)

Sol in quinoline (Beckmann and Gabel, Z anorg **1906**, **51** 236)

Difficultly sol in methyl acetate (Naumann, B **1909**, **42** 3790)

Insol in ethyl acetate (Naumann, B **1910**, **43** 314)

Solubility in glycol=16 1-16 3% (de Coninck, C C **1905**, II 1234)

Sl sol in benzonitrile (Naumann, B **1914**, **47** 1369)

Anhydrous NiCl₂ is insol in acetone (Krug and M'Elroy, J Anal Ch **6** 184)

Insol in acetone and in methylal (Eidmann, C C **1899**, II 1014)

+H₂O (Baubigny)
 1 l sat HCl+Aq at 12° contains 40 g NiCl₂

dissolved from NiCl₂, H₂O (Ditte)
 +2H₂O (Sabatier, Bull Soc (3) **1** 88)

+6H₂O Deliquescent in moist, efflorescent in dry air, sol in H₂O with evolution of heat Sol in 1 5 to 2 pts H₂O Easily sol in alcohol (Lupputi)

1 l H₂O dissolves 600 g NiCl₂+6H₂O (Ditte, A ch **1879**, (5) **22** 551)

Sat aq solution contains at

-17° -16° +10° 18°
 29 7 31 0 37 3 38 5% NiCl₂,

38° 59° 78° 96°
 41 9 45 0 46 6 46 7% NiCl₂

(Étard, A ch **1894**, (7) **2** 539)

Solubility of NiCl₂+6H₂O=37 53% NiCl₂ at 25° (Foote, J Am Chem Soc **1912**, **34** 882)

100 pts absolute alcohol dissolve at room temperature 53 71 pts NiCl₂+6H₂O (Bodtker, Z phys Ch **1897**, **22** 511)

+7H₂O 100 g absolute alcohol dissolve 2.16 g NiCl₂+7H₂O at 17° and 1.4 g at 3° (de Bruyn, R t c 1892, 11 156)

Nickel hydrogen chloride, 3NiCl₂, 2HCl+1½H₂O
(Reitzenstein, Z anorg 1898, 18 270)

Nickel rubidium chloride, NiCl₂, 2RbCl
Easily sol in H₂O and HCl+aq (Godefroy, B 8 9)

Nickel thallic chloride, NiCl₂, 2TlCl₃+8H₂O
Deliquescent Can be cryst from H₂O (Gewecke, A 1909, 366 221)

Nickel tin (stannous) chloride, NiCl₂, SnCl₂+6H₂O
Sol in H₂O (Jorgensen)

Nickel tin (stannic) chloride
See Chlorostannate, nickel

Nickel chloride ammonia, NiCl₂, 2NH₃
Sol in H₂O, decomp on boiling, insol in alcohol
(Andre, C R 1888,

Sol in cold H₂O without in alcohol Very sl sol in aq
in a sat solution of NH₄Cl
+aq (Sorensen, Z anorg 1894, 5 363)

Nickel chloride cupric oxide, NiCl₂, 3CuO+4H₂O
Not decomp by H₂O (Mailhe, A ch 1902, (7) 27 377)

Nickel chloride hydrazine, NiCl₂, 2N₂H₄
Sol in dil acids and NH₃+aq (Franzen, Z anorg 1908, 60 262)
NiCl₂, 3N₂H₄ Sol in dil acids (F)

Nickel fluoride, NiF₂
Sol in about 5000 pts H₂O, insol in alcohol and ether Not attacked by HCl, HNO₃, or H₂SO₄ even when hot (Poulenc, C R 114 1426)

Insol in liqnd NH₃ (Gore, Am Ch J 1898, 20 828)
+2H₂O Decomp by pure H₂O Sol in H₂O acidulated with HF (Berzelius)
+3H₂O (Clarke, Sill Am J (3) 13 291)

Nickel hydrogen fluoride, NiF₂, 5HF+6H₂O
Easily sol in H₂O and dil acids Sol in NH₄OH+aq with decomp (Bohm, Z anorg 1905, 43 330)

Nickel potassium fluoride, NiF₂, KF
+H₂O Sol in H₂O (Wagner, B 19 896)

NiF₂, 2KF Sl sol in H₂O Scarcely sol in methyl or ethyl alcohol or benzene (Poulenc, C R 114 747)

Nickel potassium zirconium fluoride
See Fluozirconate, nickel potassium

Nickel manganic fluoride
See Fluomanganate, nickel

Nickel sodium fluoride, NiF₂, NaF+H₂O
Sol in H₂O (Wagner, B 19 896)

Nickel stannic fluoride
See Fluostannate, nickel

Nickel titanium fluoride
See Fluotitanate, nickel

Nickel tungstyl fluoride
See Fluoxytungstate, nickel

Nickel vanadium fluoride
See Fluovanadate, nickel

Nickel zirconium fluoride
See Fluozirconate, nickel

Nickel fluoride ammonia, 5NiF₂, 6NH₃+8H₂O
Insol in cold H₂O Decomp by hot H₂O Easily sol in dil acids (Bohm, Z anorg 1905, 43 334)

Nickelous hydroxide, 4NiO₂H, H₂O
Very sl sol in H₂O Sol in acids Insol in KOH or NaOH+aq Somewhat diff cultly sol in (NH₄)₂CO₃ or NH₄OH+aq, but easily sol in presence of NH₄ salts Sol in NH₄ salts+aq Sol in KCN+aq (Rodgers, 1834)
Sol in boiling NH₄Cl+aq

NiO₂H₂
Solubility in NH₄OH+aq at 25°

NH ₄ norm	C Ni ppt l	C NiOH ppt l
1	0 054	0 00287
2	0 170	0 00579
3	0 257	0 00875
4	0 360	0 01227
4 911	2 580	0 0879
3 900	1 780	0 0607
2 101	0 835	0 0281
0 602	0 158	0 0054

The non-agreement of the results is due to the formation of different modifications of NiO₂H₂
(Bonsdorff, Z anorg 1904, 41 185)

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$
 Conc of $\text{Ni} = 0.014\text{N}$ in $1\text{N } \text{NH}_4\text{OH} + \text{Aq}$
 " " $= 0.036\text{N}$ " $2\text{N } \text{NH}_4\text{OH} + \text{Aq}$
 (Starck, B 1903, 36 3840)
 Sol in hot $\text{NH}_4\text{F} + \text{Aq}$ (von Helmholtz, Z anorg 1893, 3 133)
 Insol in methyl or amyl amine (Wurtz)
 Not pptd in presence of Na citrate (Spiller)
 Not pptd in presence of a large number of non-volatile organic substances, particularly $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ (Rose)

Nickelonickelic hydroxide, $\text{Ni}_3\text{O}_4 \cdot 2\text{H}_2\text{O}$

Sol in acids, insol in H_2O and alkalis (Dudley, J Am Chem Soc 1896, 18 901)

Nickelic hydroxide, $\text{Ni}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ (?)

(Wernicke, Pogg 141 122)
 $\text{Ni}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ (?) Sol in acids as nickelous salts Not attacked by boiling KOH or $\text{NaOH} + \text{Aq}$ Slowly sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in NH_4OH , and NH_4 salts + Aq (Odling)

Nickel iodide, NiI_2

Deliquescent and sol in H_2O (Erdmann, J pr 7 254)

Sat $\text{NiI}_2 + \text{Aq}$ contains at

-23°	-6°	$+11^\circ$	16°
51.8	54.3	57.8	59.0% NiI_2

43°	80°	85°	90°
64.1	65.0	65.2	65.7% NiI_2

(Étard, A ch 1894, (7) 2 546)

+ $6\text{H}_2\text{O}$ Deliquescent Easily sol in H_2O (Erdmann)

Nickel iodide ammonia, $\text{NiI}_2 \cdot 4\text{NH}_3$

(Rammelsberg, Pogg 48 119)
 $\text{NiI}_2 \cdot 6\text{NH}_3$ Decomp by H_2O Sol in warm dil $\text{NH}_4\text{OH} + \text{Aq}$ Very sl sol in conc $\text{NH}_4\text{OH} + \text{Aq}$ (Erdmann)

Nickel iodide hydrazine, $\text{NiI}_2 \cdot (\text{N}_2\text{H}_4)_2$

Insol in H_2O Sol in acids (Franzen, Z anorg 1911, 70 150)

Nickel suboxide, $\text{Ni}_3\text{O} + \text{H}_2\text{O}$

Insol in H_2O , sol in HCl and H_2SO_4 and HNO_3 , also in $\text{KCN} + \text{Aq}$ (Moore, C N 1895, 71 81)

Nickelous oxide, NiO

Insol in H_2O Sol in conc acids, except when crystalline, when it is scarcely attacked by acids (Fuchs, C R 33 256)

Very sl sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ (Demarcay)

Very slowly sol in $\text{NH}_4\text{OH} + \text{Aq}$ Insol in KOH , and $\text{NaOH} + \text{Aq}$

Sol in min acids, especially $\text{HCl} + \text{Aq}$, when warmed, insol in $\text{HC}_2\text{H}_3\text{O}_2$, NH_4Cl ,

and $\text{NH}_4\text{SCN} + \text{Aq}$ Insol in conc $\text{NaOH} + \text{Aq}$ (Zimmerman, A 232 324)

1 l solution containing 418.6 g sugar and 34.3 g CaO dissolves 0.29 g NiO (Bodenbender, J B 1865 600)

Mm *Bunsenite*

Nickelonickelic oxide, Ni_3O_4

Sol in acids (Baubigny, C R 87 1082)
 + $2\text{H}_2\text{O}$ Insol in H_2O , and in alkalis + Aq Sol in acids (Dudley, J Am Chem Soc 1896, 18 901)

$6\text{NiO} \cdot \text{Ni}_2\text{O}_3 + \text{H}_2\text{O}$ (Schonbein, J pr 93 35)

Nickelic oxide, Ni_2O_3

Sol in HNO_3 , H_2SO_4 , or $\text{HCl} + \text{Aq}$ with decomp, also in NH_4OH and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Winkelblech, A 13 259)

Nickel peroxide, Ni_3O_5 (?)

(Bayley, C N 39 81)
 Correct composition is Ni_2O_3 (Carnot, C R 108 610)

Ni_4O_7 (?) (Wicke, Zeit Ch 1865 303)

NiO_4 (Hollard, C R 1903, 136 230)

Nickel oxychloride

Sl sol in H_2O (Berzelius)

$\text{NiCl} \cdot 8\text{NiO} + 13\text{H}_2\text{O}$ (Raoult, C R 69 826)

Nickel oxyiodide, $\text{NiI}_2 \cdot 9\text{NiO} + 15\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$ or acetic acid Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Alcohol dissolves out NiI (Eidmann)

Nickel oxyselelide

Almost insol in boiling HCl , decomp by HNO_3 (Fonze-Diacon, C R 1900, 131 557)

Nickel phosphide, Ni_3P

Sol in $\text{HNO}_3 + \text{Aq}$ and aqua regia, insol in $\text{HCl} + \text{Aq}$ (Struve, J pr 79 321)

Sol in aqua regia and in HNO_3 , sol in fused alkali (Grieger, Bull Soc 1896, (3) 15 1089)

Easily sol in HNO_3 (Grieger, C N 1898, 77 229)

When prepared by heating phosphorus, copper and nickel in electric furnace, is insol in all acids except a mixture of HNO_3 and HF (Maronneau, C R 1900, 130 657)

Ni_3P Sol in HNO_3 , decomp by fused NaOH (Jolibois, C R 1910, 150 107)

Ni_3P Sol in HNO_3 , decomp by fused NaOH (J)

Ni_3P_2 Insol in HNO_3 , HCl and aqua regia stable in the air even when heated (Grieger, Bull Soc 1896, (3) 15 1086)

Ni_3P_2 Not attacked by HCl Easily attacked by HNO_3 (Rose, Pogg 1832, 24 232)

Ni_3P_2 Sol in HNO_3 , aqua regia and in fused alkali (Granger, C R 1896, **123** 177)

Nickel phosphosulphide, Ni_3PS_2

Decomp by hot H_2O or by aqua regia
Sl attacked by HNO_3 (Ferrand, A ch 1899, (7) **17** 417)

Nickel semiselenide, Ni_2Se

Almost insol in boiling HCl , decomp by HNO_3 (Fonzes-Diacon, C R 1900, **131** 557)

Nickel selenide, NiSe

Insol in H_2O , dil or conc $\text{HCl}+\text{Aq}$, slowly sol in HNO_3+Aq , easily in aqua regia (Little, A **112** 211)

Almost insol in boiling HCl , decomp by HNO_3 (Fonzes-Diacon, C R 1900, **131** 557)

NiSe_2 (Fonzes-Diacon)

Ni_2Se_3
 Ni_3Se_4 } Almost insol in boiling HCl ,
decomp by HNO_3 (Fonzes-Diacon)

Nickel silicide, Ni_2Si

Sol in HF and aqua regia, insol in cold H_2O , decomp by steam at red heat, sol in fused alkali carbonates (Vigouroux, C R 1895, **121** 687)

Nickel semisulphide, Ni_2S

Sol in HNO_3+Aq , with residue of S
Difficultly sol in conc $\text{HCl}+\text{Aq}$, insol in dil $\text{HCl}+\text{Aq}$ (Arfvedson, Pogg **1** 65, Gautier, C R **108** 1111)

Does not exist (Bornemann, C A **1908** 1686)

Nickel monosulphide, NiS

Anhydrous Insol in H_2O , HCl , or $\text{H}_2\text{SO}_4+\text{Aq}$ Sol in HNO_3+Aq or aqua regia
Min *Müllerite*

$+x\text{H}_2\text{O}$ Insol in H_2O , but decomp by H_2O in contact with the air (Clermont and Guot, C R **84** 714), or by boiling with H_2O (Geitner, A **139** 354)

When pptd with $(\text{NH}_4)_2\text{S}$, is somewhat sol in H_2O 1 l H_2O dissolves 39.87×10^{-6} moles NiS at 18° (Weigel, Z phys Ch 1907, **58** 294)

Very sl sol in dil $\text{HCl}+\text{Aq}$, and still less in $\text{HCl}_2\text{O}_2+\text{Aq}$ (Fresenius)

More sol in HNO_3+Aq , and easily in aqua regia

Somewhat sol in $\text{NH}_4\text{OH}+\text{Aq}$ or solutions of alkali sulphides Insol in $\text{NH}_4\text{SH}+\text{Aq}$ (Fresenius)

Sol at moment of formation in Na_2S but not in $(\text{NH}_4)_2\text{S}+\text{Aq}$ (Villiers, C R 1894, **119** 1264)

Sol while yet moist in $\text{H}_2\text{SO}_3+\text{Aq}$ (Berthier)

When recently pptd, sol in $\text{KCN}+\text{Aq}$ (Haidlen)

Pptd in presence of non-volatile organic substances as tartaric acid, etc (Rose)

Sol in potassium thiocarbonate + Aq (Rosenblatt, Z anal **26** 15)

Exists in a colloidal form in a very dil solution (Winnsinger, Bull Soc (2) **49** 452)

α modification

Very sol in $2\text{N}-\text{HCl}+\text{Aq}$ sat with H_2S

β modification

0.033 g is sol in 1 l $2\text{N}-\text{HCl}+\text{Aq}$ sat with H_2S , very sol in $2\text{N}-\text{HCl}+\text{Aq}$

γ modification

Insol in $2\text{N}-\text{HCl}+\text{Aq}$ sat with H_2S
0.013 g is sol in $2\text{N}-\text{HCl}+\text{Aq}$ (Thiel, C C **1914**, I 19)

Nickel sulphide, Ni_3S_2

(Bornemann, C A **1908** 1686)

Ni_2S_4 (Bornemann)

Ni_4S_5 (Bornemann)

Ni_4S_6 Min *Polydymite* Insol in $\text{HCl}+\text{Aq}$

Sol in HNO_3+Aq with separation of S
 Ni_4S_7 Min *Beyrichite* Sol in $\text{HCl}+\text{Aq}$

Nickel disulphide, NiS_2

(Fellenberg, Pogg **50** 75)

Does not exist (Bellucci, C A **1909** 293)

Nickel potassium sulphide, $3\text{NiS}, \text{K}_2\text{S}$

Insol in H_2O (Schneider, J pr (2) **9** 209)

$\text{K}_2\text{Ni}_{11}\text{S}_{10}$ Not attacked by hot $(\text{NH}_4)_2\text{S}$, slowly attacked by HCl or cold aqua regia, quickly by hot aqua regia HF and H_2SO_4 dissolve only on heating Insol in organic acids, alkalis and 12% HCl , also in KCN , AgNO_3 or CuSO_4+Aq (Milbauer, Z anorg **1904**, **42** 447)

Nickel telluride, Ni_2Te_3

Min *Melonite* Sol in HNO_3+Aq

NiTe (Fabre, C R **105** 277)

Nickelicotungstic acid

Ammonium nickelicotungstate, $2(\text{NH}_4)_2\text{O}, 2\text{Ni}_2\text{O}_3, 8\text{WO}_3+14\text{H}_2\text{O}$

(Rogers and Smith, J Am Chem Soc 1904, **26** 1476)

$3(\text{NH}_4)_2\text{O}, \text{Ni}_2\text{O}_3, 16\text{WO}_3+22\text{H}_2\text{O}$ Very sl sol in H_2O (Rogers and Smith)

Barium nickelicotungstate, $19\text{BaO}, \text{Ni}_2\text{O}_3, 16\text{WO}_3$

Ppt Very insol in H_2O (E F Smith)

Nickelmolybdic acid

Barium nickelmolybdate, $3\text{BaO}, \text{NiO}_2, 9\text{MoO}_3+12\text{H}_2\text{O}$

Ppt (Hall, J Am Chem Soc 1907, **29** 702)

Potassium nickelomolybdate, $3K_2O, NiO_2, 9MoO_3 + 6\frac{1}{2}H_2O$

Very insol even in hot H_2O (Hall)

Nickelomolybdic acid

Ammonium hydrogen nickelomolybdate,
 $(NH_4)_4H_6[Ni(MoO_4)_6] + 5H_2O$

Sl sol in H_2O , easily in dil acids (Barbieri, C A 1915 897)

Barium hydrogen nickelomolybdate,
 $Ba_2H_6[Ni(MoO_4)_6] + 10H_2O$

Ppt (Barbieri)

Potassium hydrogen nickelomolybdate,
 $K_4H_6[Ni(MoO_4)_6] + 5H_2O$

Sl sol in H_2O , easily in acids (Barbieri)

Silver hydrogen nickelomolybdate,
 $Ag_4H_6[Ni(MoO_4)_6] + 3H_2O$

Insol in H_2O , sol in NH_4OH , or $HNO_3 + Aq$ (Barbieri)

Nickelonickelous acid

Potassium nickelonickelite, $K_2Ni_3O_4$ or K_2O, NiO, NiO_2

(Hofmann and Hiendlmaier, B 1906, 39 3186)

Sodium nickelonickelite, $Na_2Ni_3O_6 = Na_2O, NiO, 2NiO_2$

(Bellucci and Rubegni, C C 1907, I 794)

Nickelous acid

Barium dnickelite, $BaO, 2NiO_2$

Unstable, decomp by cold H_2O , slowly and very rapidly by hot H_2O (Dufau, C R 1896, 123 496)

Niobium, Nb

For niobium and its compounds, see columbium, Cb, and the corresponding compounds

Nitramide, NH_2NO_2

Decomp by conc H_2SO_4 Easily sol in H_2O , alcohol, ether and acetone Less sol in benzol Almost insol in ligroin (Thiele and Lachman, A 1895, 288 297)

Sol in ether, insol in petroleum ether Very unstable, decomp by hot H_2O (Thiele and Lachman, B 1894, 27 1909)

Nitratochloroplatinamine comps

See Chloronitratoptatinamine comps

Nitratocobalt octamine comps

See Nitratooctamine cobaltic comps

Nitratooctamine cobaltic carbonate,

$(NO_3)_2Co_2(NH_3)_8(CO_3)_2 + H_2O$

Less sol than other octamine carbonates (Vortmann and Blasberg, B 22 2650)

— **chloride**, $(NO_3)_2Co_2(NH_3)_8Cl_4 + 4H_2O$
(Vortmann and Blasberg, B 22 2652)

— **iodide**, $(NO_3)_2Co_2(NH_3)_8I_4 + 2H_2O$
(Vortmann and Blasberg)

— **nitrate**

See Octamine cobaltic nitrate

— **sulphate**, $(NO_3)_2Co_2(NH_3)_8(SO_4)_2 + 2H_2O$
 $+ 4H_2O$ (Vortmann and Blasberg, B 22 2652)

Nitratoptatinamine nitrate,

$(NO_3)_2Pt(NH_3NO_2)_2$

Sl sol in cold, more easily in hot H_2O , easily sol in dil $HNO_3 + Aq$ (Cleve)

— **nitrite**, $(NO_3)_2Pt(NH_3NO_2)_2$

Easily sol in H_2O (Cleve)

Nitratoptatindiamine chloride,

$(NO_3)_2Pt(N_2H_6Cl)_2 + H_2O$

Moderately sol in cold, very easily in hot H_2O

— **chloroplatinate**, $(NO_3)_2Pt(N_2H_6Cl)_2, PtCl_4 + 2H_2O$

Ppt

— **chromate**, $(NO_3)_2Pt(N_2H_6)_2CrO_4$

Nearly insol in H_2O (Cleve)

— **dichromate**, $(NO_3)_2Pt(N_2H_6)_2Cr_2O_7$

Sl sol in H_2O

— **nitrate**, $(NO_3)_2Pt(N_2H_6NO_3)_2$

Sol in H_2O Insol in $HNO_3 + Aq$

— **phosphate**, $NO_3Pt(N_2H_6) + H_2O$

$\begin{array}{c} \diagup \quad \diagdown \\ PO_4 \end{array}$

Very sl sol in H_2O (Cleve)

Nitratoptatindiamine nitrate,

$(NO_3)_2Pt_2(N_2H_6)_4(NO_3)_4$

Sol in H_2O with decomp

Nitratopurpureocobaltic bromide,

$Co(NO_3)(NH_3)_5Br$

Resembles the chloride in its properties (Jorgensen, J pr (2) 23 227)

Nitratopurpureocobaltic carbonate,
 $\text{Co}(\text{NO}_3)(\text{NH}_3)_5(\text{CO}_3) + \text{H}_2\text{O}$

Less sol in H_2O than other purpureocarbonates (Vortmann and Blasberg, B 22 2648)

— **chloride**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{Cl}_2$

Sl sol in cold H_2O , but more than nitrate, more easily sol in hot H_2O , but is converted into roseo salt Insol in $\text{HCl} + \text{Aq}$ or alcohol (Jorgensen, J pr (2) 23 227)

— **mercuric chloride**,
 $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{Cl}_2, \text{HgCl}_2$

Not wholly insol in H_2O (Jorgensen)

— **chloroplatinate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{Cl}_2, \text{PtCl}_4$

Ppt Nearly insol in cold H_2O (Jorgensen)

— **chromate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{CrO}_4$

Nearly insol in H_2O (Jorgensen)

— **dichromate**

Sl sol in H_2O , but more easily than the neutral salt (Jorgensen)

— **dithionate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{S}_2\text{O}_6$

Very sl sol in cold, more easily in hot H_2O (Jorgensen)

— **nitrate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5(\text{NO}_3)_2$

Sol in 273 pts H_2O at 16° Much more sol in hot H_2O containing HNO_3 (Jorgensen, J pr (2) 23 227)

— **cobaltic nitrite**, $3\text{Co}(\text{NO}_3)(\text{NH}_3)_5, 2\text{Co}(\text{NO}_2)_6 + 2\text{H}_2\text{O}$

Very sl sol in H_2O (Jorgensen, Z anorg 5 176)

— **diamine cobaltic nitrite**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5(\text{NO}_2)_4\text{Co}(\text{NH}_3)_2$

Ppt (Jorgensen)

— **oxalate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{C}_2\text{O}_4$

Ppt

— **sulphate**, $\text{Co}(\text{NO}_3)(\text{NH}_3)_5\text{SO}_4 + \text{H}_2\text{O}$

Rather difficultly sol in cold H_2O (Jorgensen)

Nitratopurpureorhodium chloride,
 $(\text{NO}_3)_3\text{Rh}(\text{NH}_3)_5\text{Cl}_2$

Sl sol in cold H_2O , but more easily than the nitrate (Jorgensen, J pr (2) 34 394)

— **dithionate**, $(\text{NO}_3)_3\text{Rh}(\text{NH}_3)_5\text{S}_2\text{O}_6 + \text{H}_2\text{O}$

Nearly insol in cold H_2O (Jorgensen)

Nitratopurpureorhodium nitrate,
 $(\text{NO}_3)_3\text{Rh}(\text{NH}_3)_5(\text{NO}_3)_2$

Very sl sol in cold H_2O Insol in alcohol (Jorgensen)

Nitric acid, HNO_3

Miscible with H_2O When $\text{HNO}_3 + \text{Aq}$ is distilled at 760 mm pressure, an acid containing 68% HNO_3 is formed, which boils at 120.5° under 735 mm pressure By distilling at 150 mm pressure the acid contains 67.6% HNO_3 , at 70 mm (b-pt $65-70^\circ$) the acid contains 66.7% HNO_3 The percentage of HNO_3 in the liquid obtained by passing dry air into $\text{HNO}_3 + \text{Aq}$ containing 64-68% HNO_3 varies with the temp, the higher the temp the greater the percentage of HNO_3 (Roscoe, Chem Soc 13 150)

$\text{HNO}_3 + \text{Aq}$ of 1	51	sp gr contains 67% N_2O_5
	1 42	54
	1 35	44 4
	1 315	38 6

(Dalton)

$\text{HNO}_3 + \text{Aq}$ of 1	52	sp gr	88 22% N_2O_5
	1 522		
	1 4		41

(Mitscherlich)

$\text{HNO}_3 + \text{Aq}$ of 1 298 sp gr contains 36.75% N_2O_5 (Kirwan)

$\text{HNO}_3 + \text{Aq}$ of 1 298 sp gr contains 18% (Davy)

$\text{HNO}_3 + \text{Aq}$ of 1 298 sp gr contains 32-33% (Berthollet)

For Ure's table of sp gr of $\text{HNO}_3 + \text{Aq}$, see Watt's Dict 1st ed

Sp gr of $\text{HNO}_3 + \text{Aq}$ at 0° and 15°

% HNO_3	% N_2O_5	Sp gr at 0°	Sp gr at 15°
100 00	85 71	1 559	1 530
99 84	85 57	1 559	1 530
99 72	85 47	1 558	1 530
99 52	85 30	1 557	1 529
97 89	83 90	1 551	1 523
97 00	83 14	1 548	1 520
96 00	82 28	1 544	1 516
95 27	81 66	1 542	1 514
94 00	80 57	1 537	1 509
93 01	79 72	1 533	1 506
92 00	78 85	1 529	1 503
91 00	78 00	1 526	1 499
90 00	77 15	1 522	1 495
89 56	76 77	1 521	1 494
88 00	75 43	1 514	1 488
87 45	74 95	1 513	1 486
86 17	73 86	1 507	1 482
85 00	72 86	1 503	1 475
84 00	72 00	1 499	1 474
83 00	71 14	1 495	1 470
82 00	70 28	1 492	1 467
80 96	69 39	1 488	1 463
80 00	68 77	1 484	1 460
79 00	67 71	1 481	1 456
77 66	66 56	1 476	1 451
76 00	65 14	1 469	1 445
75 00	64 28	1 465	1 442
74 01	63 44	1 462	1 438

Sp gr of HNO_3 , etc—Continued

% HNO_3	% N_2O_5	Sp gr at 6°	Sp gr at 15°
73 00	62 57	1 457	1 435
72 39	62 05	1 455	1 432
71 24	61 06	1 450	1 429
69 96	60 00	1 444	1 423
69 20	59 31	1 441	1 419
68 00	58 29	1 435	1 414
67 00	57 43	1 430	1 410
66 00	56 57	1 425	1 405
65 07	55 77	1 420	1 400
64 00	54 84	1 415	1 395
63 59	54 50	1 413	1 393
62 00	53 14	1 404	1 386
61 21	52 46	1 400	1 381
60 00	51 43	1 393	1 374
59 59	51 08	1 391	1 372
58 88	50 47	1 387	1 368
58 00	49 71	1 382	1 363
57 00	48 86	1 376	1 358
56 10	48 08	1 371	1 353
55 00	47 14	1 365	1 346
54 00	46 29	1 359	1 341
53 81	46 12	1 358	1 339
53 00	45 40	1 353	1 335
52 33	44 85	1 349	1 331
50 99	43 70	1 341	1 323
49 97	42 83	1 334	1 317
49 00	42 00	1 328	1 312
48 00	41 14	1 321	1 307
47 18	40 44	1 315	1 308
46 64	39 97	1 312	1 295
45 00	38 57	1 300	1 284
43 53	37 31	1 291	1 274
42 00	36 00	1 280	1 264
41 00	35 14	1 274	1 257
40 00	34 28	1 267	1 251
39 00	33 43	1 260	1 244
37 95	32 53	1 253	1 237
36 00	30 86	1 240	1 225
35 00	29 99	1 234	1 218
33 86	29 02	1 226	1 211
32 00	27 43	1 214	1 198
31 00	26 57	1 207	1 192
30 00	25 71	1 200	1 185
29 00	24 85	1 194	1 179
28 00	24 00	1 187	1 172
27 00	23 14	1 180	1 166
25 71	22 04	1 171	1 157
23 00	19 71	1 153	1 138
20 00	17 14	1 132	1 120
17 47	14 97	1 115	1 105
15 00	12 85	1 099	1 089
13 00	11 14	1 085	1 077
11 41	9 77	1 075	1 067
7 72	6 62	1 050	1 045
4 00	3 42	1 026	1 022
2 00	1 71	1 013	1 010
0 00	0 00	1 000	0 999

(Kolb, A ch (4) 10 140)

Sp gr of HNO_3 +Aq at 15° a=%, b=sp gr if % is N_2O_5 , c=sp gr if % is HNO_3

a	b	c	a	b	c
1	1 007	1 006	51	1 372	1 323
2	1 014	1 012	52	1 378	1 329
3	1 021	1 018	53	1 385	1 335
4	1 027	1 024	54	1 390	1 341
5	1 034	1 029	55	1 396	1 346
6	1 040	1 035	56	1 401	1 356
7	1 047	1 040	57	1 407	1 358
8	1 053	1 045	58	1 413	1 363
9	1 061	1 051	59	1 418	1 369
10	1 069	1 057	60	1 423	1 374
11	1 076	1 064	61	1 427	1 380
12	1 083	1 070	62	1 432	1 386
13	1 091	1 077	63	1 436	1 390
14	1 098	1 083	64	1 440	1 395
15	1 104	1 089	65	1 445	1 400
16	1 112	1 095	66	1 449	1 405
17	1 120	1 100	67	1 452	1 410
18	1 126	1 106	68	1 457	1 414
19	1 134	1 112	69	1 461	1 419
20	1 141	1 120	70	1 466	1 422
21	1 149	1 126	71	1 470	1 427
22	1 156	1 132	72	1 474	1 430
23	1 165	1 138	73	1 478	1 435
24	1 172	1 145	74	1 482	1 439
25	1 180	1 151	75	1 486	1 442
26	1 187	1 159	76	1 490	1 445
27	1 195	1 166	77	1 494	1 449
28	1 202	1 172	78	1 499	1 452
29	1 211	1 179	79	1 503	1 456
30	1 218	1 185	80	1 507	1 460
31	1 225	1 192	81	1 511	1 463
32	1 232	1 198	82	1 515	1 467
33	1 240	1 204	83	1 519	1 470
34	1 248	1 210	84	1 523	1 474
35	1 255	1 218	85	1 527	1 478
36	1 264	1 225	86	1 530	1 481
37	1 271	1 230	87		1 484
38	1 280	1 236	88		1 488
39	1 286	1 244	89		1 491
40	1 295	1 251	90		1 495
41	1 304	1 257	91		1 499
42	1 312	1 264	92		1 503
43	1 318	1 270	93		1 506
44	1 325	1 276	94		1 509
45	1 332	1 284	95		1 512
46	1 340	1 290	96		1 516
47	1 346	1 298	97		1 520
48	1 352	1 304	98		1 523
49	1 360	1 312	99		1 526
50	1 366	1 316	100		1 530

(Kolb, calculated by Gerlich, Z anal 8 292)

Sp gr of HNO_3 +Aq at 17 5°

% N_2O_5	Sp gr	% N_2O_5	Sp gr	% N_2O_5	Sp gr
5	1 032	9	1 060	13	1 089
6	1 038	10	1 068	14	1 096
7	1 045	11	1 075	15	1 104
8	1 053	12	1 082	16	1 111

Sp gr of HNO₃, etc—Continued

% N ₂ O ₅	Sp gr	% N ₂ O ₅	Sp gr	% N ₂ O ₅	Sp gr
17	1 118	40	1 294	63	1 434
18	1 125	41	1 301	64	1 438
19	1 132	42	1 308	65	1 442
20	1 140	43	1 315	66	1 447
21	1 147	44	1 323	67	1 451
22	1 115	45	1 330	68	1 456
23	1 163	46	1 338	69	1 460
24	1 170	47	1 345	70	1 465
25	1 178	48	1 352	71	1 469
26	1 186	49	1 358	72	1 472
27	1 194	50	1 364	73	1 476
28	1 201	51	1 371	74	1 480
29	1 209	52	1 377	75	1 484
30	1 217	53	1 383	76	1 488
31	1 224	54	1 389	77	1 492
32	1 232	55	1 394	78	1 496
33	1 239	56	1 400	79	1 500
34	1 247	57	1 406	80	1 504
35	1 255	58	1 412	81	1 508
36	1 263	59	1 416	82	1 512
37	1 271	60	1 421	83	1 516
38	1 279	61	1 426	84	1 519
39	1 287	62	1 430	85	1 523

(Hager, Comm 1883)

Sp gr HNO₃+Aq at 17 5°

% N ₂ O ₅	Sp gr	% N ₂ O ₅	Sp gr	% N ₂ O ₅	Sp gr
10	1 068	40	1 293	70	1 465
15	1 104	50	1 361	80	1 500
20	1 140	60	1 417	85	1 514
30	1 217				

(Hager, Adjumenta varia, Leipzig, 1876)

Sp gr of HNO₃+Aq at 15°

% HNO ₃	Sp gr	% HNO ₃	Sp gr
1	1 00581	26	1 15869
2	1 01136	27	1 16660
3	1 01713	28	1 17371
4	1 02286	29	1 18073
5	1 02851	30	1 18830
6	1 03439	31	1 19552
7	1 04019	32	1 20276
8	1 04592	33	1 20635
9	1 05234	34	1 21300
10	1 05746	35	1 22013
11	1 06330	36	1 22675
12	1 06951	37	1 23347
13	1 07581	38	1 23980
14	1 08126	39	1 24510
15	1 08843	40	1 25235
16	1 09500	41	1 25850
17	1 10102	42	1 26475
18	1 10725	43	1 27125
19	1 11321	44	1 28895
20	1 12024	45	1 28450
21	1 12714	46	1 29110
22	1 13349	47	1 29780
23	1 13890	48	1 30443
24	1 14460	49	1 31101
25	1 15164	50	1 31722

(Squires, Pharm Era, Jan 1891)

Most accurate table

Sp gr of HNO₃+Aq at 15°, H₂O at 4°=1

Sp gr	% N ₂ O ₅	% HNO ₃	Kg HNO ₃ in 1 l
1 000	0 08	0 10	0 001
1 005	0 85	1 00	0 010
1 010	1 62	1 90	0 019
1 015	2 39	2 80	0 028
1 020	3 17	3 70	0 038
1 025	3 94	4 60	0 047
1 030	4 71	5 50	0 057
1 035	5 47	6 38	0 066
1 040	6 22	7 26	0 075
1 045	6 97	8 13	0 085
1 050	7 71	8 99	0 094
1 055	8 43	9 84	0 104
1 060	9 15	10 68	0 113
1 065	9 87	11 51	0 123
1 070	10 57	12 33	0 132
1 075	11 27	13 15	0 141
1 080	11 96	13 95	0 151
1 085	12 64	14 74	0 160
1 090	13 31	15 53	0 169
1 095	13 99	16 32	0 179
1 100	14 67	17 11	0 188
1 105	15 34	17 89	0 198
1 110	16 00	18 67	0 207
1 115	16 67	19 45	0 217
1 120	17 34	20 23	0 227
1 125	18 00	21 00	0 236
1 130	18 66	21 77	0 246
1 135	19 32	22 54	0 256
1 140	19 98	23 31	0 266
1 145	20 64	24 08	0 276
1 150	21 29	24 84	0 286
1 555	21 94	25 60	0 296
1 160	22 60	26 36	0 306
1 165	23 25	27 12	0 316
1 170	23 90	27 88	0 326
1 175	24 54	28 63	0 336
1 180	25 18	29 38	0 347
1 185	25 83	30 13	0 357
1 190	26 47	30 88	0 367
1 195	27 10	31 62	0 378
1 200	27 74	32 36	0 388
1 205	28 36	33 09	0 399
1 210	28 99	33 82	0 409
1 215	29 61	34 55	0 420
1 220	30 24	35 28	0 430
1 225	30 88	36 03	0 441
1 230	31 53	36 78	0 452
1 235	32 17	37 53	0 463
1 240	32 82	38 29	0 475
1 245	33 47	39 05	0 486
1 250	34 13	39 82	0 498
1 255	34 78	40 58	0 509
1 260	35 44	41 34	0 521
1 265	36 09	42 10	0 533
1 270	36 75	42 87	0 544
1 275	37 41	43 64	0 556
1 280	38 07	44 41	0 568
1 285	38 73	45 18	0 581
1 290	39 39	45 95	0 593
1 295	40 05	46 72	0 605

Sp gr of HNO_3 , etc—Continued

Sp gr	% N_2O_5	% HNO_3	Kg HNO_3 in 1 l
1 300	40 71	47 49	0 617
1 305	41 37	48 26	0 630
1 310	42 06	49 07	0 643
1 315	42 76	49 89	0 656
1 320	43 47	50 71	0 669
1 325	44 17	51 53	0 683
1 330	44 89	52 37	0 697
1 335	45 62	53 22	0 710
1 340	46 35	54 07	0 725
1 345	48 07	54 93	0 739
1 350	47 82	55 79	0 753
1 355	48 57	56 66	0 768
1 360	49 35	57 57	0 783
1 365	50 13	58 48	0 798
1 370	50 91	59 39	0 814
1 375	51 69	60 30	0 829
1 380	52 52	61 27	0 846
1 385	53 35	62 24	0 862
1 390	54 20	63 23	0 879
1 395	55 07	64 25	0 896
1 400	55 97	65 30	0 914
1 405	56 92	66 40	0 933
1 410	57 86	67 50	0 952
1 415	58 83	68 63	0 971
1 420	59 83	69 80	0 991
1 425	60 84	70 98	1 011
1 430	61 86	72 17	1 032
1 435	62 91	73 39	1 053
1 440	64 01	74 68	1 075
1 445	65 13	75 98	1 098
1 450	66 24	77 28	1 121
1 455	67 38	78 60	1 144
1 460	68 56	79 98	1 168
1 465	69 79	81 42	1 193
1 470	71 06	82 90	1 219
1 475	72 39	84 45	1 246
1 480	73 76	86 05	1 274
1 485	75 18	87 70	1 302
1 490	76 80	89 60	1 335
1 495	78 57	91 60	1 369
1 500	80 65	94 09	1 411
1 501	81 09	94 60	1 420
1 502	81 50	95 08	1 428
1 503	81 91	95 55	1 436
1 504	82 29	96 00	1 444
1 505	82 63	96 39	1 451
1 506	82 94	96 76	1 457
1 507	83 26	97 13	1 464
1 508	83 58	97 50	1 470
1 509	83 87	97 84	1 476
1 510	84 09	98 10	1 481
1 511	84 28	98 32	1 486
1 512	84 46	98 53	1 490
1 513	84 63	98 73	1 494
1 514	84 87	98 90	1 497
1 515	84 92	99 07	1 501
1 516	85 04	99 21	1 504
1 517	85 15	99 34	1 507
1 518	85 26	99 46	1 510
1 519	85 35	99 57	1 512
1 520	85 44	99 67	1 515

Sp gr of $\text{N-HNO}_3 + \text{Aq}$ at $18^\circ/4^\circ = 1.0324$
(Loomis, W Ann 1896, 60 550)

Sp gr (reduced to a vacuum) of HNO_3 from
78–100% concentration at $4^\circ/4^\circ$,
14 $2^\circ/4^\circ$ and 24 $2^\circ/4^\circ$

% HNO_3	Sp gr		
	$4^\circ/4^\circ$	14 $2^\circ/4^\circ$	24 $2^\circ/4^\circ$
78 22	1 47129	1 45504	1 43964
79 14		1 46011	1 44372
79 59	1 47496		
81 97	1 48391	1 46680	1 45092
84 90	1 49495		
85 21	1 49581		
85 80		1 47826	1 46224
87 55	1 50211		
87 90		1 48491	1 46891
89 73	1 50898	1 49125	
92 34	1 51804	1 49968	1 48264
94 04	1 51949	1 50149	1 48516
95 62	1 52192	1 50358	1 48677
96 64	1 52510	1 50632	1 48887
97 33		1 50911	1 49137
98 07	1 53212	1 51298	1 49543
99 97	1 54212	1 52236	1 50394

(Veley and Manley, Chem Soc 1903, 83
1016)

Sp gr at 20° of $\text{HNO}_3 + \text{Aq}$ containing M
g mols HNO_3 per liter

M 0 025 0 05 0 075 0 10
Sp gr 1 000926 1 001798 1 002653 1 003496

M 0 25 0 5 0 75 1 0

Sp gr 1 008481 1 01686 1 02503 1 0336

M 2 0

Sp gr 1 0670

(Jones and Pearce, Am Ch J 1907, 38 732)

For sp gr of $\text{HNO}_3 + \text{H}_2\text{SO}_4$, see under
 H_2SO_4

Partition coefficient for HNO_3 between
ether and H_2O is increased by the addition
of nitrates (Tanret, C R 1897, 124 464)

The hydrates described by Erdmann do
not exist. There are only two authentic hy-
drates, the mono- and the tri-hydrate
(Kuster, Ch Z 1904, 28 132)

The composition of the hydrates formed
by HNO_3 at different dilutions is calculated
from determinations of the lowering of the
fr-pt produced by HNO_3 and of the con-
ductivity and sp gr of $\text{HNO}_3 + \text{Aq}$ (Jones,
Am Ch J 1905, 34 328)

Dinitric acid, $\text{H}_2\text{N}_4\text{O}_{11} = 2\text{N}_2\text{O}_5, \text{H}_2\text{O}$

Fumes on air. Miscible with H_2O , with
evolution of much heat (Weber, J pr (2)
6 342)

Nitrates

All nitrates are sol in H_2O except a few
basic compounds. Most nitrates are insol in

conc $\text{HNO}_3 + \text{Aq}$, many are sol in alcohol, some are sol in glycerine

Aluminum nitrate, basic, $2\text{Al}_2\text{O}_3, 3\text{N}_2\text{O}_5 + 3\text{H}_2\text{O}$

Sol in H_2O (Ordway, Sill Am J (2) 26 203)

Basic aluminum nitrates containing 2 mols or less of Al_2O_3 to one of N_2O_5 may be obtained sol in H_2O , but the compounds containing more than 2 mols Al_2O_3 are insol in H_2O (Ordway, l c)

$2\text{Al}_2\text{O}_3, \text{N}_2\text{O}_5 + 10\text{H}_2\text{O}$ (Ditte, C R 110 782)

$\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}, \text{HNO}_3$ Sol in H_2O (Schlumberger, Bull Soc 1895, (3) 13 59)

Aluminum nitrate, $\text{Al}(\text{NO}_3)_3 + 9\text{H}_2\text{O}$

Deliquescent Very sol in H_2O , $\text{HNO}_3 + \text{Aq}$, or alcohol (Berzelius)

Melts in its crystal H_2O at 72° (Ordway Sol in 1 pt strong alcohol (Wenzel)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Ammonium nitrate, NH_4NO_3

Deliquescent

Sol in 0.502 pt H_2O at 18° (Karsten)

Sol in 0.54 pt H_2O at 10° (Harris C R 24 816)

Much more sol in hot than cold H_2O (Harris)

Sol in 2 pts H_2O at 15° and 0.5 pt boiling H_2O (Foureroy)

Sol in 1 pt cold and 0.5 pt boiling H_2O (Foureroy)

Sol in 0.5 pt H_2O at 18° (Berzelius)

Sol in 2 pts H_2O at 18° (Abi)

Decomp by boiling H_2O

Solubility in 100 pts H_2O at t°

t°	Pts NH_4NO_3	t°	Pts NH_4NO_3	t°	Pts NH_4NO_3
0	97	24	205	48	351
1	101	25	210	49	358
2	105	26	216	50	365
3	109	27	221	51	372
4	113	28	226	52	379
5	117	29	232	53	387
6	121	30	238	54	395
7	125	31	244	55	402
8	130	32	250	56	410
9	134	33	256	57	418
10	139	34	262	58	425
11	143	35	268	59	433
12	148	36	274	60	441
13	152	37	280	61	449
14	157	38	286	62	457
15	161	39	292	63	465
16	166	40	298	64	473
17	170	41	304	65	481
18	175	42	311	66	490
19	180	43	317	67	499
20	185	44	324	68	508
21	190	45	331	69	517
22	195	46	337	70	526
23	200	47	344		

(Mulder, Scheek Verhandel 1864 95)

100 pts H_2O dissolve 183 pts NH_4NO_3 at 19.5° (Mulder)

Solubility in H_2O at t°

t°	Specific gravity of the saturated solution	Mols of NH_4NO_3 soluble in 100 mols of water
12 2	1 2945	34 50
20 2	1 3116	43 30
23 0	1 3159	46 57
25 0	1 3197	48 19
27 7	1 3257	51 67
28 0	1 3260	51 86
30 0	1 3299	54 40
30 2	1 3308	54 61
31 9	1 3348	57 20
32 1	1 3344	57 60
32 7	1 3356	57 90
34 0	1 3375	58 89
35 0	1 3394	59 80
35 1	1 3397	60 00
35 6	1 3408	60 62
36 0	1 3412	61 00
36 6	1 3420	
37 5	1 3432	62 90
38 0	1 3438	63 60
38 5	1 3440	64 10
39 0	1 3448	65 09
39 5	1 3460	65 88
40 0	1 3464	66 80

(Muller and Kaufmann, Z phys Ch 19, 42 499)

Solubility in H_2O at t°

t°	G NH_4NO_3 per 100 g		Solid phase
	solution	water	
0	54 19	118 3	NH_4NO_3 rhomb β
12 2	60 53	153 4	
20 2	65 80	192 4	
25 0	68 17	214 2	
30 0	70 73	241 8	NH_4NO_3 rhomb β
32 1	71 97	256 9	
35	72 64	265 8	rhomb α
40	74 82	297 0	
50	77 49	344 0	NH_4NO_3 rhomb α
60	80 81	421 0	
70	83 32	499 0	NH_4NO_3 rhomb (
80	85 25	580 0	
90	88 08	740 0	
100	89 71	871 0	

(Saidell's Solubilities 1st ed 28 Cule f m
Muller & Kauffmann, see above, id
Schwarz, Ostwald's Lehrb, p 425)

100 g $\text{NH}_4\text{NO}_3 + \text{Aq}$ contain

54 19 g NH_4NO_3 at 0°

70 10 g " " 30°

84 03 g " " 70°

(de Waal, Dissert Leiden, 1910)

70.19 g NH_4NO_3 are contained in 100 g $\text{NH}_4\text{NO}_3 + \text{Aq}$ sat at 30° (Schreinemakers and de Baat, Arch near Sc 1911, (2) 15 415)

60 pts NH_4NO_3 mixed with 100 pts H_2O lower the temperature from 13.6° to -13.6° , that is 27.2° , but if the initial temperature is 0° it will fall only to -16.7° the freezing-point of the mixture (Rudorff, B 2 68)

Sp gr of $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 18°

Pts NH_4NO_3	Pts H_2O	Sp gr
80	1800	1.0180
80	900	1.0331
80	360	1.0743

(Thomsen and Gerlach, Z anal 23 520)

Sp gr of $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 15°

% NH_4NO_3	Sp gr	% NH_4NO_3	Sp gr
5	1.0201	30	1.1304
10	1.0419	40	1.1780
20	1.0860	50	1.2279

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 17.5°

% NH_4NO_3	Sp gr	% NH_4NO_3	Sp gr
1	1.0042	33	1.1454
2	1.0085	34	1.1502
3	1.0127	35	1.1550
4	1.0170	36	1.1598
5	1.0212	37	1.1646
6	1.0255	38	1.1694
7	1.0297	39	1.1742
8	1.0340	40	1.1790
9	1.0382	41	1.1841
10	1.0425	42	1.1892
11	1.0468	43	1.1942
12	1.0512	44	1.1994
13	1.0555	45	1.2045
14	1.0599	46	1.2096
15	1.0642	47	1.2147
16	1.0686	48	1.2198
17	1.0729	49	1.2249
18	1.0773	50	1.2300
19	1.0816	51	1.2353
20	1.0860	52	1.2407
21	1.0905	53	1.2460
22	1.0950	54	1.2514
23	1.0995	55	1.2567
24	1.1040	56	1.2621
25	1.1085	57	1.2674
26	1.1130	58	1.2728
27	1.1175	59	1.2781
28	1.1220	60	1.2835
29	1.1265	61	1.2888
30	1.1310	62	1.2942
31	1.1358	63	1.3005
32	1.1406	64	1.3059

(Gerlach, Z anal 27 310)

Sp gr of $\text{NH}_4\text{NO}_3 + \text{Aq}$

% NH_4NO_3	Sp gr $16^\circ/16^\circ$
0	1.000000
0.6419	1.000271
1.4101	1.000593
2.7501	1.001153
5.4890	1.002300
11.7981	1.004916
23.4480	1.009758
47.9500	1.019952

(Dyken Z phys Ch 1897, 24 107)

Sp gr $20^\circ/4^\circ$ of a normal solution of NH_4NO_3 = 1.030435, of a 0.5-normal solution = 1.014505 (Haugh, J Am Chem Soc 1912, 34 1151)

B-pt of $\text{NH}_4\text{NO}_3 + \text{Aq}$ containing pts NH_4NO_3 to 100 pts H_2O G = according to Gerlach (Z anal 26 445), L = according to Legrand (A ch (2) 59 426)

B-pt	G	L	B-pt	G	L
101°	10	10	140°	682	770 5
102	20	20 5	141	719	
103	30	31 3	142	737	840 6
104	41	42 4	143	765	
105	52	53 8	144	793	915 5
106	63	65 4	145	823	
107	74	77 3	146	853	995 5
108	85	89 4	147	883	
109	96	101 9	148	914	1081 5
110	108	114 9	149	945	
111	120	128 4	150	977	1173 5
112	132	142 4	151	1009	
113	145	156 9	152	1043	1273
114	158	172	153	1079	
115	172	188	154	1116	1383
116	187	204 4	155	1155	
117	202	221 4	156	1196	1504
118	217	238 4	157	1238	
119	232	256 8	158	1281	1637
120	248	275 3	159	1325	
121	265		160	1370	1775
122	283	314	161	1417	
123	301		162	1464	1923
124	319	354	163	1511	
125	337		164	1558	2084
126	356	396	165	1606	
127	376		166	1653	
128	396	440 2	167	1700	
129	417		168	1748	
130	439	487 4	169	1796	
131	461		170	1844	
132	484	537 3	180	2400	∞
133	507		190	3112	
134	530	590	200	4099	
135	554		210	5618	
136	578	645	220	8547	
137	603		230	16950	
138	629	705 5	240	∞	
139	655				

Very sol in $\text{HNO}_3 + \text{Aq}$ (Schulz, Zeit Ch 1869 531)

Solubility of NH_4NO_3 in HNO_3

Solution temp	% by wt NH_4NO_3	Solid phase
+8°	21 1	$\text{NH}_4\text{NO}_3, 2\text{HNO}_3$ (solution in HNO_3)
23 0	28 7	"
28 5	34 5	"
29 5 *	38 8	(solution in NH_4NO_3)
27 5	44 6	"
27 0	45 8	"
23 5	49 4	"
23 0	50 0	"
17 5	54 0	"
16 5	54 3	"
4 0	45 8	$\text{NH}_4\text{NO}_3, \text{HNO}_3$ labile (solution in HNO_3)
9 5	49 4	"
11 0	51 7	"
11 5	52 7	"
12 0	54 3	"
12 0	54 7	"
11 5	57 6	(solution in NH_4NO_3)
11 5	54 0	NH_4NO_3 (labile)
14 5	54 3	"
		stable
		"
		"
		"
		"
	68 1	"

* Mpt of $\text{NH}_4\text{NO}_3, 2\text{HNO}_3$

(Groschuff Z anorg 1904, 40 6)

Solubility of NH_4NO_3 in $\text{NH}_4\text{OH} + \text{Aq}$

Grams of NH_4NO_3	Grams of NH_3	Molecules of NH_4NO_3 in 100 molecules $\text{NH}_4\text{NO}_3 + \text{NH}_3$	Temperature at which the solutions are in equilibrium with the solid phase
		100	about 168°
0 7578	0 0588	74 2	109 8
0 6439	0 0665	67 3	94 0
4 2615	0 7747	53 8	68 8
0 7746	0 1857	47 0	35 9
0 9358	0 2352	45 9	33 3
0 7600	0 2607	38 3	0
0 9675	0 3515	36 9	-10 5
0 8308	0 3700	32 3	-30 0
0 9526	1 2457	13 9	-44 5
1 3918	4 4327	6 25	-60
0	100	0	about -80

(Kurloff, Z phys Ch 1898, 25 109)

$\text{NH}_4\text{NO}_3 + \text{NH}_4\text{Cl}$

100 pts H_2O dissolve 29 1 pts NH_4Cl and 173 8 pts NH_4NO_3 (Rudorff, B 6 484)

Sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ with pptn of NH_4Cl until a state of equilibrium is reached (Karsten)

Addition of KClO_3 to $\text{NH}_4\text{Cl} + \text{Aq}$ prevents pptn of NH_4Cl , and dissolves any NH_4Cl that may have been pptd (Margueritte, C R 38 306)

See also under Ammonium chloride
 $\text{NH}_4\text{NO}_3 + \text{KNO}_3$

100 pts H_2O dissolve

	At 9° (1)	At 11° (2)	At 11° (3)	At 11° (4)	At 15° (5)	At 15° (6)
KNO_3	20 2	40 6		26 0	46 2	
NH_4NO_3		88 8	143		130 4	161

2, Sat at 11° with NH_4NO_3 and then at 9° with KNO_3 , 5, sat at 11° with NH_4NO_3 and then at 15° with KNO_3 (Mulder)

Sol in sat $\text{HNO}_3 + \text{Aq}$ without causing ppt (Karsten), with separation of KNO_3 (Rudorff)

Composition of solution is dependent on the relative excess of the salts present (Rudorff)

100 pts H_2O dissolve 77 1 pts NaNO_3 and 162 9 pts NH_4NO_3 at 16° (Rudorff B 6 484)

If a sat solution of $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 11° is sat with $\text{Ba}(\text{NO}_3)_2$ at 9°, 100 pts H_2O dissolve

	At 11	At 9°
NH_4NO_3	143	101 3
$\text{Ba}(\text{NO}_3)_2$		6 2
		6 8

(Mulder)

Solubility of $\text{NH}_4\text{NO}_3 + \text{AgNO}_3$ in H_2O at t°

t°	% AgNO_3	% NH_4NO_3	Solid phase
-7 3°	47 1	0	$\text{Ice} + \text{AgNO}_3$ rhomb
-10 7	44 52	8 43	
-14 9	42 0	16 80	$\text{Ice} + \text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{AgNO}_3$ rh
-14 8	39 51	18 79	$\text{Ice} + \text{AgNO}_3, \text{NH}_4\text{NO}_3$
-18 7	15 99	37 30	$\text{Ice} + \text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3, \beta$ rh
-17 4	0	41 2	$\text{Ice} + \text{NH}_4\text{NO}_3, \beta$ rh
0	50 36	19 59	$\text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{AgNO}_3$ rh
18	55 36	22 06	
30	58 80	23 42	
55	63 32	26 12	
109 6	67 9	32 1	
0	22 13	44 87	$\text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3, \beta$ rh
18	27 07	49 22	
30	29 76	52 50	
40	32 68	52 22	$\text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3, \alpha$ rh
55	36 60	52 38	
101 5	47 5	52 5	$\text{AgNO}_3, \text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3$ rh

(Schreinemakers and de Baat, Arch ncer Sc 1911 (2) 15 414)

Solubility in NH_4NO_3 and AgNO_3 in H_2O at 30°

Composition of the solution		Solid phase
$\% \text{NH}_4\text{NO}_3$	$\% \text{AgNO}_3$	
0	73 0	AgNO_3
6 59	69 08	
15 62	63 27	
23 40	58 84	$\text{AgNO}_3 + \text{AgNO}_3, \text{NH}_4\text{NO}_3$
23 45	58 93	
24 33	57 93	
26 22	55 32	$\text{AgNO}_3, \text{NH}_4\text{NO}_3$
28 86	52 45	
34 47	45 85	
39 60	41 09	"
45 44	35 62	
52 49	29 77	
52 11	29 86	$\text{NH}_4\text{NO}_3 + \text{AgNO}_3, \text{NH}_4\text{NO}_3$
52 89	29 66	
54 12	27 75	
58 64	21 31	NH_4NO_3
63 59	12 51	
70 10	0	

(Schreinemakers and de Baat, Z phys Ch 1909, 65 572)

Solubility of $\text{NH}_4\text{NO}_3 + \text{NaNO}_3$ in H_2O at t°

t°	λ per 100 g H_2O		Sp gr
	NH_4NO_3	NaNO_3	
0	0	73 33	1 354
	105 5	66	1 407
	118 4	0	1 264
15	0	83 9	1 375
	24 03	81 21	1 386
	42 81	79 34	1 392
	64 6	78 06	1 401
	110 9	75 81	1 417
	152	75 35	1 428
	155 3	75 38	1 429
	156 1	60 76	1 405
	159	36 50	1 364
	160	27 79	1 350
	162 3	17 63	1 330
	167 4	0	1 298
30	0	96 12	1 401
	220 8	88 31	1 450
	232 6	0	1 329

(Fedotieff and Koltunoff, Z anorg 1914, 85 251)

Solubility of $\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$ in H_2O at 30°

$\% \text{NH}_4\text{NO}_3$	$\% (\text{NH}_4)_2\text{SO}_4$	Solid phase
70 1	0	NH_4NO_3
67 63	2 38	"
66 93	3 46	$\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$
63 84	4 96	$3\text{NH}_4\text{NO}_3$
58 06	8 22	$(\text{NH}_4)_2\text{SO}_4, 3\text{NH}_4\text{NO}_3$
52 75	11 42	$(\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3$
49 80	13 27	$(\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$
37 20	19 48	$(\text{NH}_4)_2\text{SO}_4$
19 91	28 83	"
12 05	34 7	"
0	44 1	"

(Schreinemakers and Haenen, Chem Weekbl 1909, 6 51)

Solubility of $\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$ in H_2O

Temp = 0°		
$\% \text{NH}_4\text{NO}_3$	$\% (\text{NH}_4)_2\text{SO}_4$	Solid phase
0	41 4	$(\text{NH}_4)_2\text{SO}_4$
5 61	37 89	$(\text{NH}_4)_2\text{SO}_4 + (\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3$
29 58	41 64	
29 81	21 33	
31 04	20 40	$(\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$
30 87	20 43	
31 61	19 50	
45 99	9 53	$3\text{NH}_4\text{NO}_3$
49 12	6 00	$(\text{NH}_4)_2\text{SO}_4, 3\text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3$
54 19	0	NH_4NO_3

Temp = 70°		
$\% \text{NH}_4\text{NO}_3$	$\% (\text{NH}_4)_2\text{SO}_4$	Solid phase
0	47 81	$(\text{NH}_4)_2\text{SO}_4$
11 10	40 81	$(\text{NH}_4)_2\text{SO}_4 + (\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3$
70 15	6 71	
71 58	5 82	
73 48	5 14	$(\text{NH}_4)_2\text{SO}_4, 2\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$
76 01	3 96	$3\text{NH}_4\text{NO}_3$
80 25	2 68	$(\text{NH}_4)_2\text{SO}_4, 3\text{NH}_4\text{NO}_3$
81 01	2 45	$(\text{NH}_4)_2\text{SO}_4, 3\text{NH}_4\text{NO}_3 + \text{NH}_4\text{NO}_3$
81 38	2 41	NH_4NO_3
84 03	0	"

(de Waal Dissert Leiden 1910)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

1 pt NH_4NO_3 dissolves in 2.29 pts alcohol of 66.8% at 25° (Pohl W A B 6 599)
1 pt NH_4NO_3 dissolves in 1.1 pt boiling alcohol (Wenzel)

100 pts absolute methyl alcohol dissolve 17.1 pts at 20.5° (de Bruyn, Z phys Ch 10 783)

100 g absolute methyl alcohol dissolve 14.6 g NH_4NO_3 at 14° and 16.3 g at 18.5° (Schiiff and Monsacchi, Z phys Ch 1896, 21 277)

100 pts absolute ethyl alcohol dissolve 3.8 pts at 20.5° (de Bruyn, Z phys Ch 10 783)

100 g absolute ethyl alcohol dissolve 4.6 g at 14° (Schiiff and Monsacchi, Z phys Ch 1896, 21 277)

Solubility of NH_4NO_3 in H_2O is decreased by presence of ethyl alcohol but increased by presence of methyl alcohol. NH_4NO_3 is only very sl sol in abs ethyl alcohol and the solubility increases slowly with rise in temp, it is more sol in abs methyl alcohol and the solubility increases rapidly with rise in temp (Fleckenstein, Phys Zeit 1905, 6 419)

Solubility of NH_4NO_3 in alcohol

t°	% NH_4NO_3	% Alcohol	% H_2O
0	54.19	0	45.81
"	42.69	12.70	44.61
"	1.96	97.93	0.11
30	70.10	0	29.90
"	59.83	10.60	29.57
"	8.06	85.30	6.64
"	3.60	96.51	0
70	84.03	0	15.97
"	72.37	11.12	16.51
"	61.11	22.87	16.02
"	41.25	44.64	14.11
"	24.71	67.23	8.06
"	7.51	92.49	0

(de Waal Dissert Leiden, 1910)

Sp gr of alcoholic solution of NH_4NO_3 at 15°

Pts NH_4NO_3	Pts alcohol	Sp gr
0	100	0.83904
2	98	0.84746
4	96	0.85604
6	94	0.86524

(Gerlach, Z anal 28 521)

Solubility in methyl alcohol + Aq at 30°

% by wt H_2O	% by wt alcohol	% by wt NH_4NO_3
29.9	0	70.1
21.6	24.5	53.9
20.6	31.3	48.1
16.5	46.0	37.5
11.5	59.4	29.1
0	83.3	16.7

(Schreinemakers, Z phys Ch 1909, 65 556)

Solubility of NH_4NO_3 in ethyl alcohol + Aq at 30° Composition of sat solution

% by wt H_2O	% by wt alcohol	% by wt NH_4NO_3
29.9	0	70.1
26.9	18.6	54.5
23.2	39.3	37.5
18.3	58.5	23.2
11.6	76.5	11.9
5.8	86.2	8.0
0	96.4	3.6

(Schreinemakers, Z phys Ch 1909 65 555)

Insol in benzonitrile (Naumann, B 1914 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Very sl sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

Sol in acetone (Eidmann, C C 1899 II 1014)

Ammonium hydrogen nitrate, $\text{NH}_4\text{H}(\text{NO}_3)_2$

Sol in H_2O (Ditte, C R 89 576, 641)

Decomp by H_2O (Groschuff, B 1904, 37 1487)

Ammonium dihydrogen nitrate,

$\text{NH}_4\text{H}_2(\text{NO}_3)_3$

Sol in H_2O (Ditte)

Solubility in H_2O

Solution temp	% by wt NH_4NO_3	% by wt HNO_3
-8.0	34.2	53.9
-2.5	34.8	54.8
+3.0	35.4	55.8
3.5	36.0	56.8
19.5	37.4	58.9
25.0	38.1	60.0
29.5 mpt	38.8	61.2

(Groschuff, Z anorg 1904, 40 7)

Ammonium cerous nitrate, $3\text{NH}_4\text{NO}_3$, $2\text{Ce}(\text{NO}_3)_3 + 12\text{H}_2\text{O}$

Very deliquescent Very sol in H_2O and alcohol (Holzmann, J pr 84 78)
 +10 H_2O Hygroscopic Sol in H_2O (Drossbach, B 1900, 33 3507)
 $2\text{NH}_4\text{NO}_3$, $\text{Ce}(\text{NO}_3)_3 + 4\text{H}_2\text{O}$ As above (Marignac, A ch (4) 30 64)

Solubility in H_2O

100 g H_2O dissolve at
 8 75° 25° 45°
 235 5 296 8 410 2 g anhydrous salt,

60° 65 06°
 681 2 817 4 g anhydrous salt
 (Wolff, Z anorg 1905, 45 98)

Ammonium ceric nitrate, $2\text{NH}_4\text{NO}_3$, $\text{Ce}(\text{NO}_3)_4$

Very sol in H_2O without decomp Sol in HNO_3 (Meyer, B 1900, 33 2137)
 Sol in alcohol (Meyer, Z anorg 1901, 27 369)

Solubility in H_2O

100 g H_2O dissolve at t°
 25° 35 2° 45 3°
 140 9 161 7 174 9 g anhydrous salt,

64 5° 85 60° 122°
 201 6 226 8 735 4 g anhydrous salt
 (Wolff, Z anorg 1905, 45 94)

+1½ H_2O Very deliquescent (Holzmann, J pr 84 78)

Ammonium cobalt nitrate

Permanent Sol in H_2O (Thenard)

Ammonium copper nitrate, $2\text{NH}_4\text{NO}_3$, $\text{Cu}(\text{NO}_3)_2$

Very sol in H_2O

Ammonium didymium nitrate, $2\text{NH}_4\text{NO}_3$, $\text{D}_1(\text{NO}_3)_3 + 4\text{H}_2\text{O}$

Somewhat deliquescent

Ammonium gadolinium nitrate, $2\text{NH}_4\text{NO}_3$, $\text{Gd}(\text{NO}_3)_3$

Deliquesces in the air (Benedicks, Z anorg 1900, 22 407)

Ammonium gold (auric) nitrate (Ammonium auronitrate), $\text{NH}_4\text{Au}(\text{NO}_3)_4$

Extremely deliquescent
 $\text{H}(\text{NH}_4)_2\text{Au}(\text{NO}_3)_6$ (Schottlander, A 217 312)

Ammonium lanthanum nitrate, $2\text{NH}_4\text{NO}_3$, $\text{La}(\text{NO}_3)_3 + 4\text{H}_2\text{O}$

Not deliquescent Sol in H_2O (Marignac)

Ammonium magnesium nitrate, $2\text{NH}_4\text{NO}_3$, $\text{Mg}(\text{NO}_3)_2$

Slowly deliquescent Sol in 10 pts H_2O at 12 5°, and much less hot H_2O (Fourcroy)

Ammonium mercurous nitrate, $4\text{NH}_4\text{NO}_3$, $\text{Hg}_2(\text{NO}_3)_2 + 5\text{H}_2\text{O}$

Sol in H_2O (Pagenstecher, Repert 14 188)

Ammonium nickel nitrate

Sol in 3 pts cold H_2O (Thénard, Scher J 10 428)

Ammonium praseodymium nitrate, $2\text{NH}_4\text{NO}_3$, $\text{Pr}(\text{NO}_3)_3 + 4\text{H}_2\text{O}$

Sol in H_2O (von Scheele, Z anorg 1898, 18 356)

Ammonium silver nitrate, NH_4NO_3 , AgNO_3

Very sol in H_2O (Russell and Maskelyne, Roy Soc Proc 26 357)

Sol in H_2O without decomp (Schreinemakers and de Baat, Chem Weekbl 1910, 7 6)

See also solubility of $\text{NH}_4\text{NO}_3 + \text{AgNO}_3$ under NH_4NO_3

Ammonium thorium nitrate, $(\text{NH}_4)_2\text{Th}(\text{NO}_3)_6$

Sol in strong HNO_3 (Meyer, Z anorg 1901, 27 383)

$\text{NH}_4\text{Th}(\text{NO}_3)_5 + 5\text{H}_2\text{O}$ Sol in HNO_3 of sp gr 1 25 (Meyer, Z anorg 1901, 27 382)

Ammonium uranyl nitrate, NH_4NO_3 , $\text{UO}_2(\text{NO}_3)_2$

Decomp by H_2O Sol in conc HNO_3 (Meyer, B 1903, 36 4057)

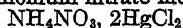
Solubility in H_2O at t°

t°	In 100 pts by wt of the solution			Solid phase
	Pts by wt UO_2	Pts by wt NH_4	Pts by wt total salt	
0 5	29 71	2 92		Double salt + $\text{UO}_2(\text{NO}_3)_2$
13 5	32 3	3 42		
24 9 a	36 40	3 54	68 72	
	36 53	3 54	68 97	
35 0 b	42 07	3 44		Double salt
50 0	44 37	2 90		
80 7 a	44 90	2 98	78 76	
	45 01	2 98	78 79	

Ammonium uranyl nitrate is decomp by H_2O at temp below 60° above 60° it is sol in H_2O without decomp (Rimbach, B 1904, 37 475)

Ammonium nitrate ammonia, $2\text{NH}_4\text{NO}_3$, 3NH_3

Known only as a solution of NH_3 in $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Troost, C R 94 789)
 NH_4NO_3 , 3NH_3 As above

Ammonium nitrate mercuric chloride,

Insol in H_2O Ether dissolves out HgCl_2
(Kosmann, A ch (3) 27 240)

$2\text{NH}_4\text{NO}_3, \text{HgCl}_2$ Sol in H_2O (Hofmann and Marburg, A 1899, 305 199)

Ammonium nitrate sulphate, $2(\text{NH}_4)_2\text{O}, \text{N}_2\text{O}_5, 2\text{SO}_3, \text{H}_2\text{O}$

Very hygroscopic and sol in H_2O (Friedheim, Z anorg 1894, 6 297)

$2\text{NH}_4\text{NO}_3, (\text{NH}_4)_2\text{SO}_4$ (de Waal, Dissert 1910)

$3\text{NH}_4\text{NO}_3, (\text{NH}_4)_2\text{SO}_4$ (de Waal)

See also solubility of $\text{NH}_4\text{NO}_3 + (\text{NH}_4)_2\text{SO}_4$ under NH_4NO_3

Ammonium nitrate metatungstate, $\text{NH}_4\text{NO}_3, 2(\text{NH}_4)_2\text{W}_4\text{O}_{13} + 4\text{H}_2\text{O}$

Decomposes by recrystallising out of H_2O
(Marignac, A ch (3) 69 61)

Antimony nitrate, $\text{Sb}_4\text{O}_6, \text{N}_2\text{O}_5$

Decomp by cold H_2O (Bucholz)

Aqueous solution sat at 10° contains 30.4% salt (Eller)

Sol in strong, less sol in dil $\text{HNO}_3 + \text{Aq}$
(Peligot, A ch (3) 20 288)

Insol in acetone (Naumann, B 1904, 37 4329)

Barium nitrate, $\text{Ba}(\text{NO}_3)_2$

Sol in H_2O with absorption of heat

100 pts H_2O at 0° dissolve 5.0 parts

$\text{Ba}(\text{NO}_3)_2$ (Gay-Lussac, A ch 11 313)

100 pts H_2O at 0° dissolve 5.2 parts

$\text{Ba}(\text{NO}_3)_2$ (Mulder)

$\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ sat at 20° contains 8.57 pts
 $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O , and has 1.0679 sp gr (Karsten), sat at 20° has 1.064 sp gr, and contains 7.94 pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O (Michel and Kiafft)

100 pts H_2O dissolve pts $\text{Ba}(\text{NO}_3)_2$ at t°

t°	Pts $\text{Ba}(\text{NO}_3)_2$	t°	Pts $\text{Ba}(\text{NO}_3)_2$
0	5.00	52 11	17.97
14 95	8.18	73 75	25.01
17 62	8.54	86 21	29.57
37 87	13.67	101 65	35.18
49 22	17.07		

(Gay-Lussac, A ch (2) 11 313)

Solubility in 100 pts H_2O at t°

t°	Pts $\text{Ba}(\text{NO}_3)_2$	t°	Pts $\text{Ba}(\text{NO}_3)_2$
0	5.0	52	17.7
1	5.1	53	18.1
2	5.3	54	18.4
3	5.5	55	18.7
4	5.7	56	19.0
5	6.0	57	19.3
6	6.2	58	19.6
7	6.4	59	20.0
8	6.6	60	20.3
9	6.8	61	20.6
10	7.0	62	20.9
11	7.3	63	21.0
12	7.5	64	21.6
13	7.7	65	21.0
14	7.9	66	22.3
15	8.1	67	22.6
16	8.3	68	22.9
17	8.5	69	23.3
18	8.8	70	23.6
19	9.0	71	23.9
20	9.2	72	24.3
21	9.5	73	24.9
22	9.7	74	25.0
23	9.9	75	25.4
24	10.1	76	25.7
25	10.4	77	26.0
26	10.6	78	26.4
27	10.8	79	26.7
28	11.1	80	27.0
29	11.3	81	27.4
30	11.6	82	27.7
31	11.8	83	28.1
32	12.1	84	28.4
33	12.3	85	28.8
34	12.6	86	29.1
35	12.8	87	29.5
36	13.1	88	29.8
37	13.4	89	30.2
38	13.7	90	30.6
39	14.0	91	30.9
40	14.2	92	31.3
41	14.5	93	31.7
42	14.8	94	32.0
43	15.1	95	32.4
44	15.4	96	32.7
45	15.6	97	33.1
46	15.9	98	33.5
47	16.2	99	33.8
48	16.5	100	34.2
49	16.8	101	34.5
50	17.1	101.9	34.8
51	17.4		

(Mulder, calculated from his own and other experiments, Scheik Verhandel 1864 50)

Sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ contains % $\text{Ba}(\text{NO}_3)_2$ at t°

t°	% $\text{Ba}(\text{NO}_3)_2$	t°	% $\text{Ba}(\text{NO}_3)_2$
0 4	4 3	60 0	16 1
2 1	4 9	73 0	19 4
6 0	5 6	92 0	23 4
6 5	5 6	110 0	27 4
11 0	6 4	132 0	31 8
15 3	7 1	134 0	32 5
18 0	7 7	150 0	34 9
28 5	9 7	152 0	35 4
45 5	12 8	171 0	38 3
52 0	14 9	215 0	45 8

(Étard, A ch 1894, (7) 2 528)

100 g H_2O dissolve 8 54 g $\text{Ba}(\text{NO}_3)_2$ at 17° (Gmelin-Kraut, Handbuch der anorg Chemie)

100 g H_2O dissolve 7 87 g $\text{Ba}(\text{NO}_3)_2$ at 15° , 8 32 g at 17° (Euler, Z phys Ch 1904, 49 315)

1000 g H_2O dissolve 0 72 gram-equivalents $\text{Ba}(\text{NO}_3)_2$ at $21 5^\circ$ (Euler, Z phys Ch 1904, 49 312)

10 30 g anhydrous $\text{Ba}(\text{NO}_3)_2$ are sol in 100 g H_2O at 25° (Parsons and Colson, J Am Chem Soc 1910, 32 1385)

4 74 g $\text{Ba}(\text{NO}_3)_2$ are contained in 100 g $\text{Ba}(\text{NO}_3)_2$ sat at 0° (Coppadoro, Gazz ch it 1911, 42, I 233)

Solubility of $\text{Ba}(\text{NO}_3)_2$ in $\text{H}_2\text{O} = 0 427$ mol l at 30° (Masson, Chem Soc 1911, 99 1136)

Solubility of $\text{Ba}(\text{NO}_3)_2$ in H_2O at $30^\circ = 10 33\%$ (Coppadoro, Gazz ch it 1913, 43 I 240)

Solubility in H_2O

100 g of the sat solution contain at

9 1° 21 1° 35°
6 25 8 46 11 39 g $\text{Ba}(\text{NO}_3)_2$

(Findlay, Chem Soc 1914, 105 780)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at $19 5^\circ$

$\text{Ba}(\text{NO}_3)_2$	Sp gr	$\text{Ba}(\text{NO}_3)_2$	Sp gr
1	1 009	6	1 050
2	1 017	7	1 060
3	1 025	8	1 069
4	1 034	9	1 078
5	1 042	10	1 087

(Calculated by Gerlach, Z anal 8 286, from Kremers, Pogg 95 110)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at 18°

% $\text{Ba}(\text{NO}_3)_2$	Sp gr
4 2	1 0340
8 4	1 0712

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at $17 5^\circ$

$\text{Ba}(\text{NO}_3)_2$	Sp gr	$\text{Ba}(\text{NO}_3)_2$	Sp gr
1	1 0085	6	1 0510
2	1 0170	7	1 0600
3	1 0255	8	1 0690
4	1 0340	Sat sol	1 0690
5	1 0425		

(Gerlach, Z anal 27 283)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at room temp

% $\text{Ba}(\text{NO}_3)_2$	Sp gr
5 25	1 0507
2 98	1 0274

(Wagner, W Ann 1883, 18 264)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
$1/2$ normal	1 0518
$1/4$ "	1 0259
$1/8$ "	1 0130

(Wagner, Z phys Ch 1890, 5 35)

$\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ containing 6 08% $\text{Ba}(\text{NO}_3)_2$ has sp gr $20^\circ/20^\circ = 1 0517$

$\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ containing 6 97% $\text{Ba}(\text{NO}_3)_2$ has sp gr $20^\circ/20^\circ = 1 0597$

(Le Blanc and Rohland, Z phys Ch 1896, 19 279)

Sp gr of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at 20° containing M g mols salt per liter

M	0 01	0 025	0 05
Sp gr	1 002031	1 005224	1 010591

M	0 075	0 10	0 15
Sp gr	1 015671	1 021143	1 031770

(Jones and Pearce, Am Ch J 1907, 38 708)

Sp gr of sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ at t°

t	g $\text{Ba}(\text{NO}_3)_2$ sol in 100 g H_2O	Sp gr
0	5 2	1 043
10	7 0	1 056
20	9 2	1 073
30	11 6	1 087
40	14 2	1 104
50	17 1	1 121
60	20 3	1 137
70	23 6	1 146

(Tschernaj, J Russ Phys Chem Soc 1912, 44 1565)

Saturated $\text{BaNO}_3 + \text{Aq}$ contains —
36 18 pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O , and boils at $101 1^\circ$ (Griffiths)

NITRATE, BARIUM

2 pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O , and at 101 65° (Gay-Lussac)
 8 pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O , and at 101 9° (Mulder)
 8 pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O , and at 102 5° (Kremers)
 $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ forms a crust at 101 1°, at temp observed was 101 5° (Gerlach, anal 26 427)

pt of $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ containing pts $\text{Ba}(\text{NO}_3)_2$ to 100 pts H_2O

B-pt	Pts $\text{Ba}(\text{NO}_3)_2$
100 5°	12 5
101 0	26 0
101 1	27 5

(Gerlach, Z anal 26 440)

sol in conc $\text{HNO}_3 + \text{Aq}$, and much less in dil $\text{HNO}_3 + \text{Aq}$ or $\text{HCl} + \text{Aq}$ than in

bility of $\text{Ba}(\text{NO}_3)_2$ in $\text{HNO}_3 + \text{Aq}$ at 30°

Solid phase $\text{Ba}(\text{NO}_3)_2$

gr of sat solution	G mol per l	
	HNO_3	$\text{Ba}(\text{NO}_3)_2$
0891	0 0000	0 4270
0811	0 1318	0 3282
	0 2496	0 3268
0663	0 4995	0 2410
0619	0 7494	0 1785
0609	1 000	0 1353
0633	1 247	0 1056
0668	1 493	0 0847
0783	1 998	0 0598
1050	2 993	0 0334
1341	3 986	0 0218
1341	3 994	0 0223
1645	5 012	0 0147

Masson, Chem Soc 1911, 99 1136)

ss sol in dil $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ than in dil + Aq

ubility in $\text{NH}_4\text{Cl} + \text{Aq}$ is the same as in

ss sol in $\text{NH}_4\text{OH} + \text{Aq}$, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{or } \text{NH}_4\text{NO}_3 + \text{Aq}$ than in H_2O (Pearson, Ch (2) 5 662)

$\text{Ba}(\text{NO}_3)_2$ is sol in about

33 pts H_2O at ord temp, and 4 67 pts 30°

67 pts $\text{NH}_4\text{OH} + \text{Aq}$ (conc) at ord

, and 5 67 pts at 100°

50 pts $\text{NH}_4\text{OH} + \text{Aq}$ (1 vol conc + 3 H_2O) at ord temp

00 pts $\text{HCl} + \text{Aq}$ (1 vol conc $\text{HCl} + 4 \text{H}_2\text{O}$) at ord temp

00 pts $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (1 vol commer-

$\text{HC}_2\text{H}_3\text{O}_2 + 1 \text{ vol } \text{H}_2\text{O}$) at ord temp

13 67 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1 pt $\text{NH}_4\text{Cl} + 10 \text{pts } \text{H}_2\text{O}$) at ord temp, and 4 67 pts at 100°

24 00 pts $\text{NH}_4\text{NO}_3 + \text{Aq}$ (1 pt $\text{NH}_4\text{NO}_3 + 10 \text{pts } \text{H}_2\text{O}$) at ord temp

17 33 pts $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (dil NH_4OH neutralised by dil $\text{HC}_2\text{H}_3\text{O}_2$) at ord temp, and 4 33 pts at 100°

14 67 pts $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (dil $\text{HC}_2\text{H}_3\text{O}_2$ neutralised by Na_2CO_3 and dil with 4 vols H_2O) at ord temp, and 5 33 pts at 100°

17 33 pts $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (see Stolba, Z anal 2 390) at ord temp, and 6 00 pts at 100°

18 67 pts grape sugar (1 pt grape sugar + 10 pts H_2O) at ord temp (Pearson, Zeit Ch 1869 662)

Sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ without pptn at first, but finally NH_4Cl is pptd until a certain state of equilibrium is reached (Karsten)

Solubility in $\text{BaO}_2\text{H}_2, 8\text{H}_2\text{O} + \text{Aq}$ at 25°

Sp gr 25°/25°	G BaO as $\text{Ba}(\text{OH})_2$ in 100 g H_2O	G $\text{Ba}(\text{NO}_3)_2$ in 100 g H_2O
1 0797	0	10 30
1 1002	1 55	10 66
1 1210	3 22	11 04
*1 1448	5 02	11 48

* This solution is sat with respect to both $\text{Ba}(\text{OH})_2, 8\text{H}_2\text{O}$ and $\text{Ba}(\text{NO}_3)_2$

(Parsons J Am Chem Soc 1910, 32 1385)

See also under BaO_2H_2

Solubility in $\text{BaCl}_2 + \text{Aq}$ at t°

t°	Sat solution contains	
	% BaCl_2	% $\text{Ba}(\text{NO}_3)_2$
—7	21 4	4 0
—1	23 0	4 0
+1 5	22 6	4 4
2		5 0
10	24 7	6 1
21	24 5	5 6
32	26 6	7 7
35	26 4	7 7
38	26 7	7 8
48	28 1	8 0
53	28 5	9 0
53	28 3	9 2
66	28 0	10 0
73	30 0	10 5
79	30 3	11 2
90	32 1	12 5
155	32 5	23 1
162	33 1	23 4
210	32 5	31 9

(Étard, A ch 1894, (7) 3 287)

See also under BaCl_2

$\text{Ba}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2$
 Very sl sol in sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ (Karsten.)
 100 pts sat $\text{Ba}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2 + \text{Aq}$
 contain 33.95 pts of the two salts at 19–20°
 (v. Hauer, J pr 98 137)

Solubility of $\text{Ba}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2$ at 25°

G per l		Sp gr
$\text{Ba}(\text{NO}_3)_2$	$\text{Pb}(\text{NO}_3)_2$	
102.2	0	1.079
54.9	17.63	1.088
86.5	49.80	1.108
79.7	68.10	1.119
77.0	97.20	1.140
69.8	130.7	1.163
66.0	177.3	1.198
57.5	247.7	1.252
25.9	334.3	1.294
28.8	429.7	1.376
0	553.8	1.459

(Fock, Z Kryst Min 1897, 28 365, 397)

100 ccm $\text{Ba}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2 + \text{Aq}$ sat at 17° contain 3.22 g $\text{Ba}(\text{NO}_3)_2$ and 38.59 g $\text{Pb}(\text{NO}_3)_2$ and solution has sp gr = 1.350 (Euler, Z phys Ch 1904, 46 313)

100 pts sat $\text{Ba}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2 + \text{Sr}(\text{NO}_3)_2 + \text{Aq}$ contain 45.90 pts of the three salts at 19–20° (v Hauer, l c)

$\text{Ba}(\text{NO}_3)_2 + \text{Sr}(\text{NO}_3)_2$
 100 pts sat $\text{Ba}(\text{NO}_3)_2 + \text{Sr}(\text{NO}_3)_2 + \text{Aq}$ contain 45.96 pts of the two salts at 19–20° (v Hauer, l c)

$\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$

100 pts H_2O dissolve

	(Mulder)		
	(1)		
	29.7	28.8	8.9
		5.4	
		34.2	

	(Karstén)		(Kopp)	
	(2)	(3)	(4)	(5)
	13.31	29.03	5.7	3.5
KNO_3	6.91	1.00	33.1	36.3
$\text{Ba}(\text{NO}_3)_2$	20.22	30.03	38.8	39.8

1 Sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ sat with KNO_3 at 18.5°

2 To sat $\text{KNO}_3 + \text{Aq}$, $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ was added

3 To sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$, KNO_3 was added

4 Both salts in excess + Aq at 21.5°

5 Both salts in excess + Aq at 23°

11 of the solution contains 59.1 g $\text{Ba}(\text{NO}_3)_2 + 124.2$ g $\text{KNO}_3 = 183.35$ g mixed salts at 17° Sp gr $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3 + \text{Aq} = 1.120$

11 of the solution contains 88.7 g $\text{Ba}(\text{NO}_3)_2 + 213.6$ g $\text{KNO}_3 = 302.3$ g mixed salts at 30° Sp gr $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3 + \text{Aq} = 1.191$ (Euler, Z phys Ch 1904, 49 313)

Solubility in $\text{KNO}_3 + \text{Aq}$ at 25°

100 pts of solution contain		Solid phase
pts KNO_3	pts $\text{Ba}(\text{NO}_3)_2$	
15.24	6.64	$\text{Ba}(\text{NO}_3)_2 + 2\text{KNO}_3$, $\text{Ba}(\text{NO}_3)_2$
14.69	6.60	"
14.79	6.62	"
16.30	5.49	2KNO_3 , $\text{Ba}(\text{NO}_3)_2$
21.99	3.04	"
27.66	2.01	$\text{KNO}_3 + 2\text{KNO}_3$, $\text{Ba}(\text{NO}_3)_2$
27.81	2.09	"
27.94	1.92	"
27.64	2.05	"

These results show that a double salt of potassium and barium nitrates is formed at 25°

(Foote, Am Ch J 1904, 32 252)

Solubility of $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$ at t°

t°	% $\text{Ba}(\text{NO}_3)_2$	% KNO_3	Solid phase
9.1	6.25	0	$\text{Ba}(\text{NO}_3)_2$
	4.20	8.15	$\text{Ba}(\text{NO}_3)_2 + 2\text{KNO}_3$, $\text{Ba}(\text{NO}_3)_2$
	1.98	12.02	2KNO_3 , $\text{Ba}(\text{NO}_3)_2$
	0.98	16.80	2KNO_3 , $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$
	0	16.76	KNO_3
21.1	8.46	0	$\text{Ba}(\text{NO}_3)_2$
	7.47	2.12	"
	6.35	5.98	"
	6.06	8.47	"
	5.98	13.24	$\text{Ba}(\text{NO}_3)_2 + 2\text{KNO}_3$, $\text{Ba}(\text{NO}_3)_2$
	3.35	18.24	2KNO_3 , $\text{Ba}(\text{NO}_3)_2$
	2.30	21.47	"
	1.76	24.86	2KNO_3 , $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$
	0	24.77	KNO_3
35	11.39	0	$\text{Ba}(\text{NO}_3)_2$
	8.18	12.99	"
	8.08	17.48	"
	8.42	19.75	$\text{Ba}(\text{NO}_3)_2 + 2\text{KNO}_3$, $\text{Ba}(\text{NO}_3)_2$
	5.85	24	2KNO_3 , $\text{Ba}(\text{NO}_3)_2$
	5.02	26.05	"
	3.02	34.87	2KNO_3 , $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$
	1.77	34.98	KNO_3
	0	35.01	"

(Findlay, Chem Soc 1914, 105 779)

$\text{Ba}(\text{NO}_3)_2 + \text{NaNO}_3$
 $\text{Ba}(\text{NO}_3)_2$ is sol in sat $\text{NaNO}_3 + \text{Aq}$ with-
 out separation

100 pts H_2O dissolve

	(Karsten) At 18 75°		
	86 6	88 14 3 77	8 9
NaNO_3 $\text{Ba}(\text{NO}_3)_2$			
	(Kopp) At 20 2°		
	87 7	88 6 3 6	9 2
NaNO_3 $\text{Ba}(\text{NO}_3)_2$			

Solubility of $\text{Ba}(\text{NO}_3)_2 + \text{NaNO}_3$ in H_2O at 0°

% NaNO_3	% $\text{Ba}(\text{NO}_3)_2$	Solid phase
0	4 74	$\text{Ba}(\text{NO}_3)_2$
0 41	4 33	"
0 61	4 03	"
1 68	3 34	"
3 54	2 50	"
8 05	1 60	"
12 71	1 56	"
20 24	1 53	"
20 92	1 43	"
27 74	1 56	"
30 81	1 55	"
33 79	1 53	"
35 83	1 49	"
41 30	1 55	$\text{Ba}(\text{NO}_3)_2 + \text{NaNO}_3$
41 68	0 51	NaNO_3
42 47	0	"

(Coppadoro, Gazz ch it, 1912, **42** (1) 233)

Solubility of $\text{Ba}(\text{NO}_3)_2 + \text{NaNO}_3$ in H_2O
 at 30°

% NaNO_3	% $\text{Ba}(\text{NO}_3)_2$	Solid phase
0	10 33	$\text{Ba}(\text{NO}_3)_2$
2 33	8 58	"
7 09	5 28	"
12 07	3 89	"
14 41	3 54	"
17 87	3 20	"
19 06	3 07	"
23 55	2 81	"
41 22	2 27	"
48 22	2 11	$\text{Ba}(\text{NO}_3)_2 + \text{NaNO}_3$
48 50	1 00	NaNO_3
49 16	0	"

(Coppadoro, Gazz ch it 1913, **43**, I 240)

Moderately sol in liquid NH_3 (Franklin,
 Am Ch J 1898, **20** 827)

100 pts hydrazine dissolves 811 pts
 $\text{Ba}(\text{NO}_3)_2$ at 12 5-13° (de Bruyn, R t c
 1899, **18** 297)

100 pts anhydrous hydroxylamine dissolve
 114 pts $\text{Ba}(\text{NO}_3)_2$ (de Bruyn, R t c
 1892, **11** 18)

Insol in absolute alcohol

Solubility in dilute alcohol increases wit
 the temp (Gerardin, A ch (4) **5** 145)

Solubility in ethyl alcohol + Aq at 25°

% $\text{C}_2\text{H}_5\text{OH}$ in the solvent	% $\text{C}_2\text{H}_5\text{OH}$ in the solution	% $\text{Ba}(\text{NO}_3)_2$ in the solution
0	0	9 55
10 25	9 5	7 63
18 60	17 5	6 02
25 05	23 7	5 25
40 20	38 8	3 53
58 00	57 0	1 85
78 70	78 2	0 62
90 10	89 9	0 18
99 40	99 39	0 005

(D'Ans and Sregler, Z phys Ch 1913, **82** 37)

Completely insol in boiling amyl alcoho
 (Browning, Sill Am J **143** 314)

Solubility in organic solvents

Solvent	% $\text{Ba}(\text{NO}_3)_2$ in the solution at 25°
Methyl alcohol	0 50
Ethyl alcohol	0 005
Acetone	0 00
Ether	very small
Paracetaldehyde	" "

(D'Ans and Siegler, Z phys Ch 1913, **82** 44)

Solubility in phenol + Aq at 25°

Concentration of the phenol Mol / Liter	Solubility of $\text{Ba}(\text{NO}_3)_2$ Mol / Liter
0 000	0 3535
0 045	0 3785
0 082	0 3746
0 146	0 3664
0 310	0 3492
0 401	0 3400
0 501	0 3299
0 728 (sat)	0 3098

(Rothmund and Wilsmore, Z phys Ch 190
40 620)

Insol in benzonitrile (Naumann, B 1914
47 1370)

Insol in methyl acetate (Naumann, F
 1909, **42** 3790), ethyl acetate (Naumann
 B 1904, **37** 3602)

Insol in acetone (Krug and M'Elroy,
 Anal Ch **6** 184)

Difficultly sol in acetone (Naumann, F
 1904, **37** 4328)

Sol in acetone (Eidmann, C C 1899, I
 1014)

Barium mercurous nitrate, 2BaO , $2\text{Hg}_2\text{O}$, $3\text{N}_2\text{O}_5$

Decomp by H_2O Sol in hot dil HNO_3 + Aq and hot $\text{Hg}_2(\text{NO}_3)_2$ + Aq, from which it crystallises on cooling (Stadeler, A 87 129)

Barium potassium nitrate, $\text{Ba}(\text{NO}_3)_2$, 2KNO_3

Ppt (Wallbridge, Am Ch J 1903, 30 154)

Solubility determinations show that the only double salt formed by barium and potassium nitrates at 25° is $\text{Ba}(\text{NO}_3)_2 \cdot 2\text{KNO}_3$

See $\text{Ba}(\text{NO}_3)_2 + \text{KNO}_3$ under $\text{Ba}(\text{NO}_3)_2$ (Foote, Am Ch J 1904, 32 252)

Barium nitrate metatungstate, $2\text{Ba}(\text{NO}_3)_2$, $\text{BaW}_4\text{O}_{13} + 6\text{H}_2\text{O}$

Efflorescent Sol in warm H_2O (Péchar, A ch (6) 22 198)

Bismuth nitrate, basic, Bi_2O_3 , $\text{N}_2\text{O}_5 + 2\text{H}_2\text{O}$

Sol in a large amount of H_2O Sol in HNO_3 + Aq (Heintz)

Sol in 135 pts H_2O at 90 – 93° (Ruge, J B 1862 163)

$+ \frac{1}{2}\text{H}_2\text{O}$ Sol in much H_2O (Yvon, C R 84 1161)

$+ \text{H}_2\text{O}$ (Ruge)
 $2\text{Bi}_2\text{O}_3$, N_2O_5 Not acted upon by H_2O (Ditte, C R 84 1317)

$+ \text{H}_2\text{O}$ (Yvon)
 Bi_2O_3 , $2\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ (Ruge)

$11\text{Bi}_2\text{O}_3$, $5\text{N}_2\text{O}_5 + 16\text{H}_2\text{O}$ Not decomp by H_2O (Yvon)

$5\text{Bi}_2\text{O}_3$, $4\text{N}_2\text{O}_5 + 8\text{H}_2\text{O}$ Ppt Not attacked by H_2O (Schulten, Bull Soc 1903, (3) 29 722)

$5\text{Bi}_2\text{O}_3$, $5\text{N}_2\text{O}_5 + 9\text{H}_2\text{O}$ Sol in H_2O with decomp (Schulten)

$6\text{Bi}_2\text{O}_3$, $5\text{N}_2\text{O}_5 + 8\text{H}_2\text{O}$, and $+ 9\text{H}_2\text{O}$ (Rutten, Z anorg 1902, 30 368)

At 25° the salt $\text{Bi}_{12}\text{O}_{13}(\text{NO}_3)_{10}$, $9\text{H}_2\text{O}$ is in equilibrium with HNO_3 + Aq from 0 03–0 32–N, the salt $\text{BiO}(\text{NO}_3)$, H_2O is in equilibrium with HNO_3 + Aq from 0 425–0 72–N

At 50° the salt $\text{Bi}_4\text{O}_5(\text{NO}_3)_2$, H_2O is in equilibrium with HNO_3 + Aq from 0 057–0 285–N, the salt $\text{Bi}_{12}\text{O}_{13}(\text{NO}_3)_{10}$, $9\text{H}_2\text{O}$ is in equilibrium with HNO_3 + Aq from 0 285–0 446–N

At 75° the salt $\text{Bi}_4\text{O}_5(\text{NO}_3)_2$, H_2O is in equilibrium with HNO_3 + Aq from 0 109–0 314–N (Allan, Am Ch J 1901, 25 314)

Bismuth nitrate, $\text{Bi}(\text{NO}_3)_3$

Permanent Decomp by little H_2O with separation of a basic salt This decomposition is prevented by slight excess of HNO_3 , and then the salt is completely sol in a large amount of H_2O (Rose)

Sol in dil HNO_3 + Aq Not decomp by H_2O in presence of $\text{HC}_2\text{H}_3\text{O}_2$ or $-\frac{1}{10}$ pt NH_4NO_3 (Lowe, J pr 74 341)

Completely sol in HNO_3 + Aq containing 83 g HNO_3 per liter (Ditte)

Solubility of $\text{Bi}(\text{NO}_3)_3$ in 23N-HNO_3 + Aq = 2 04 g at Bi per l, in 0922N-HNO_3 + Aq = 2 23 g at Bi per l (Dubrisay, C R 1911, 153 1077)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone (Krug and M'Elroy)

Solubility of $\text{Bi}(\text{NO}_3)_3$ in 6 67% acetone + 23N-HNO_3 + Aq = 1 89 g at Bi per l, in 6 67% acetone + 0922N-HNO_3 + Aq = 2 17 g at Bi per l, in 13 33% acetone + 0922N-HNO_3 + Aq = 2 08 g at Bi per l (Dubrisay, C R 1911, 153 1077)

When $\text{Bi}(\text{NO}_3)_3$ is mixed with mannite (dulcitate, sorbite) in proportion to the mol wts and H_2O is added, a clear solution is obtained which is not pptd by addition of much H_2O These solutions are more stable the greater the proportion of mannitol (Vanno and Hunser, Z anorg 1901, 28 211)

$+ \frac{1}{2}\text{H}_2\text{O}$ (Ditte)
 $+ 5\text{H}_2\text{O}$ If treated with increasing amts of H_2O , the amt of Bi which dissolves decreases, and when 1 pt is treated with 50,000 pts H_2O , no Bi goes into solution (Antony and Gagli, Gazz ch it 1898, 28 245)

48 66 pts are sol in 100 pts acetone at 0°
41 70 " " " " 100 " " " 19°

(Laszczynski, B 1894, 27 2287)

$+ \frac{5}{2}\text{H}_2\text{O}$ (Yvon, C R 84 1161)

$+ 10\text{H}_2\text{O}$ Melts in crystal H_2O with decomp at 74° (Ordway)

Bismuth caesium nitrate, $\text{Bi}(\text{NO}_3)_3$, 2CsNO_3

Ppt (Wells, Am Ch J 1901, 26 277)

Bismuth cobalt nitrate, $2\text{Bi}(\text{NO}_3)_3$, $3\text{Co}(\text{NO}_3)_2$
 $+ 24\text{H}_2\text{O}$

100 cc sat solution in HNO_3 + Aq (sp gr 1 325) contain 54 67 g hydrated salt (Jantsch Z anorg 1912, 76 321)

Bismuth magnesium nitrate, $2\text{Bi}(\text{NO}_3)_3$, $3\text{Mg}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$

Deliquescent Effloresces in dry air Decomp by H_2O (Urban and Lacombe, C R 1903, 137 569)

100 cc sat solution in HNO_3 + Aq (sp gr 1 325) contain 41 69 g hydrated salt (Jantsch Z anorg 1912, 76 321)

Bismuth manganous nitrate, $2\text{Bi}(\text{NO}_3)_3$, $3\text{Mn}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$

Deliquescent Effloresces in dry air Decomp by H_2O (Urban and Lacombe, C R 1903, 137 569)

100 cc sat solution in HNO_3 + Aq (sp gr 1 325) contain 65 77 g hydrated salt (Jantsch Z anorg 1912, 76 321)

Bismuth nickel nitrate, $2\text{Bi}(\text{NO}_3)_3, 3\text{Ni}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$

Deliquescent Effloresces in dry air
Decomp by H_2O (Urban and Lacombe, C R 1903, 37 569)

100 cc sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contain 46 20 g hydrated salt at 16° (Jantsch)

Bismuth zinc nitrate, $2\text{Bi}(\text{NO}_3)_3, 3\text{Zn}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$

Deliquescent Decomp by H_2O (Urban and Lacombe, C R 1903, 137 569)

100 cc sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contain 57 51 g hydrated salt at 16° (Jantsch)

Cadmium nitrate, basic, $\text{Cd}(\text{OH})\text{NO}_3 + \text{H}_2\text{O}$

Decomp by H_2O , or ordinary alcohol (Klinger, B 16 997)

$12\text{CdO}, \text{N}_2\text{O}_5 + 11\text{H}_2\text{O}$ Sl sol in H_2O , more sol in H_2O than basic sulphate (Haber-mann, 5 432)

$5\text{CdO}, 2\text{N}_2\text{O}_5 + 8\text{H}_2\text{O}$ Decomp by cold H_2O (Rousseau and Tite, C R 114 1184)

Cadmium nitrate, $\text{Cd}(\text{NO}_3)_2$

Deliquescent, and very sol in H_2O

See +4, and $9\text{H}_2\text{O}$

Sp gr of aqueous solution containing

5 10 15 20 25% $\text{Cd}(\text{NO}_3)_2$,
1 0528 1 0978 1 1516 1 2134 1 2842

30 35 40 45 50% $\text{Cd}(\text{NO}_3)_2$
1 3566 1 4372 1 5372 1 6474 1 7608

(Franz, J pr (2) 5 274)

Sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ at 18°

% $\text{Cd}(\text{NO}_3)_2$ 1 5 10 15
Sp gr 1 0069 1 0415 1 0869 1 136

% $\text{Cd}(\text{NO}_3)_2$ 20 25 30 35
Sp gr 1 1903 1 25 1 3125 1 3802

% $\text{Cd}(\text{NO}_3)_2$ 40 45 48
Sp gr 1 459 1 543 1 5978

(Grotrian, W Ann 1883, 18 193)

Sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

7 81 15 71 22 36% $\text{Cd}(\text{NO}_3)_2$
1 0744 1 1593 1 2411

(Wagner, W Ann 1883, 18 265)

Sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$

% $\text{Cd}(\text{NO}_3)_2$	t	Sp gr at t°	Sp gr at 18
0 0492	17 57	0 99912	0 99904
	21 14	0 99839	
0 100	18 00		0 99945
0 249	17 34	1 0008	1 0007
	20 22	1 0002	
0 464	18 00		1 0025
0 952	18 00		1 0065

(Wershofen, Z phys Ch 1890, 5 493)

Sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0954
$\frac{1}{2}$ - "	1 0479
$\frac{1}{4}$ - "	1 0249
$\frac{1}{16}$ - "	1 0119

(Wagner, Z phys Ch 1890, 5 36)

Sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ at 18°/4°

% $\text{Cd}(\text{NO}_3)_2$ 54 027 43 716 30 8,
Sp gr 1 711 1 515 1 32

% $\text{Cd}(\text{NO}_3)_2$ 21 353 14 899 8 68
Sp gr 1 204 1 134 1 07

(de Muynck, W Ann 1894, 53 561)

$\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ containing 7 89% $\text{Cd}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1 0673$

$\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ containing 12 14%
 $\text{Cd}(\text{NO}_3)_2$ has sp gr $20^\circ/20^\circ = 1 1070$

(Le Blanc and Rohland, Z phys Ch 189 19 282)

Sat $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ boils at 132°

Almost entirely insol in conc $\text{HNO}_3 + \text{A}$ (Wurtz)

Moderately sol in liquid NH_3 (Frankh Am Ch J 1898, 20 827)

Sol in alcohol

Sol in ethyl acetate (Naumann, B 190 37 3601)

Sol in acetone and in methylal (Eh mann, C C 1899, II 1014)

$+4\text{H}_2\text{O}$ M-pt of $\text{Cd}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$
59 5° (Ordway, Tilden, Chem Soc 45 409)
Solubility in H_2O

Solubility in H_2O at t°

t	% $\text{Cd}(\text{NO}_3)_2$ in the solution	Mols H_2O to 1 mol $\text{Cd}(\text{NO}_3)_2$
0	52 31	11 96
18	55 90	10 34
30	58 40	9 34
40	61 42	8 24
59 5 mpt	76 54	4 00

(Funk, B 1899, 32 105)

Sat solution of $\text{Cd}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$ in H at 0° contains 52 3% $\text{Cd}(\text{NO}_3)_2$ at 18°
55 9% $\text{Cd}(\text{NO}_3)_2$ (Mvlius, Z anorg, 191 74 411)

Sol in liquid NH_3 (Johnson and Wil more, Elektroch Z 1908, 14 227)

Sol in acetone (Naumann, B 1904, 3 4328)

Sol in ethyl acetate (Naumann, B 191 43 314)

$+9\text{H}_2\text{O}$ Solubility in H_2O

Sat solution contains at

—13° —1° +1°
37 37 47 33 52 73% $\text{Cd}(\text{NO}_3)_2$

Cryohydrate is formed at -16° (Funk, Z anorg 1899, 20 416)

The composition of the hydrates formed by $\text{Cd}(\text{NO}_3)_2$ at different dilutions is calculated from determinations of the lowering of the fr-pt produced by $\text{Cd}(\text{NO}_3)_2$ and of the conductivity and sp gr of $\text{Cd}(\text{NO}_3)_2 + \text{Aq}$ (Jones, Am Ch J 1905, 34 308)

Cadmium uranyl nitrate, $\text{Cd}(\text{NO}_3)_2 \cdot (\text{UO}_2)(\text{NO}_3)_2 + 30\text{H}_2\text{O}$

Sol in H_2O and acids Insol in alcohol and alkalis + Aq (Lancien, C C 1912, I 208)

Cadmium nitrate ammonia, $\text{Cd}(\text{NO}_3)_2 \cdot 6\text{NH}_3 + \text{H}_2\text{O}$
(André, C R 104 987)

Cadmium nitrate cupric oxide, $\text{Cd}(\text{NO}_3)_2 \cdot \text{CuO} + 5\text{H}_2\text{O}$
Ppt (Mailhe, C R 1902, 134 235)

Cadmium nitrate cupric oxide, $\text{Cd}(\text{NO}_3)_2 \cdot 3\text{CuO} + 5\text{H}_2\text{O}$
(Mailhe, A ch 1902, (7) 27 383)

Cadmium nitrate hydrazine, $\text{Cd}(\text{NO}_3)_2 \cdot 3\text{N}_2\text{H}_4$
Decomp by hot H_2O Sol in warm NH_4OH (Franzen, Z anorg 1908, 60 282)

Cæsium nitrate, CsNO_3

100 pts H_2O dissolve 10.58 pts CsNO_3 at 32° Sl sol in absolute alcohol (Bunsen)

Solubility of CsNO_3 in H_2O at t°

t°	G CsNO_3 per 100 g		t°	G CsNO_3 per 100 g	
	Solu tion	Water		Solu tion	Water
0	8.54	9.33	60	45.6	83.8
10	12.97	14.9	70	51.7	107.0
20	18.7	23.0	80	57.3	134.0
30	25.3	33.9	90	62.0	163.0
40	32.1	47.2	100	66.3	197.0
50	39.2	64.4	106.2	68.8	220.3

(Berkeley, Trans Roy Soc 1904, 203 A, 213)

100 g H_2O dissolve 26.945 g CsNO_3 at 25° (Haigh, J Am Chem Soc 1912, 34 1148)

Sp gr $20^{\circ}/4^{\circ}$ of a normal solution of CsNO_3 = 1.140905, of a 0.5 normal solution = 1.07001 (Haigh)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

Solubility in glycol = 8% at ord temp (de Coninck, Belg Acad Bull 1905, 359)

Cæsium hydrogen nitrate

$\text{CsNO}_3 \cdot \text{HNO}_3$ Sol in H_2O (Wells, Am Ch J 1901, 26 273)
 $\text{CsNO}_3 \cdot 2\text{HNO}_3$ (W)

Cæsium cerium nitrate, $\text{Cs}_2\text{Ce}(\text{NO}_3)_6$

Sol in H_2O , very sl sol in HNO_3 (Meyer, Z anorg 1901, 27 371)
Sol in HNO_3 (Meyer, B 1900, 33 2137)

Cæsium ferric nitrate, $\text{CsNO}_3 \cdot \text{Fe}(\text{NO}_3)_3 + 7\text{H}_2\text{O}$

Deliquescent (Wells, Am Ch J 1901, 26 276)

Cæsium silver nitrate, $\text{CsNO}_3 \cdot \text{AgNO}_3$

Sol in H_2O (Russell and Maskelyne, Roy Soc Proc 26 357)

Cæsium thorium nitrate, $\text{Cs}_2\text{Th}(\text{NO}_3)_6$

Decomp by H_2O , sl sol in HNO_3 (Meyer, Z anorg 1901, 27 384)

Cæsium uranyl nitrate, $\text{Cs}(\text{UO})_2(\text{NO}_3)_6$

Decomp by H_2O Sol in conc HNO_3 (Meyer, B 1903, 36 4057)

Decomp by H_2O at low temp, so that the solid phase in contact with the solution consists of the double salt and CsNO_3 . At 16° 100 pts by wt of the solution in H_2O contain 31.39 pts UO_2 and 6.59 pts Cs (Rumbach, B 1904, 37 477)

Calcium nitrate, basic, $\text{Ca}(\text{NO}_3)_2 \cdot \text{CaO}_2\text{H}_2 + 2\frac{1}{2}\text{H}_2\text{O}$

Decomp by H_2O (Werner, A ch (6) 27 570)
+ H_2O As above (Rousseau and Tite, C R 114 1184)

Calcium nitrate, $\text{Ca}(\text{NO}_3)_2$

Deliquescent Very sol in H_2O with evolution of much heat

100 pts H_2O at 0° dissolve 84.2 pts $\text{Ca}(\text{NO}_3)_2$ (Poggiale)
100 pts H_2O at 0° dissolve 93.1 pts $\text{Ca}(\text{NO}_3)_2$ (Mulder)

Sol in 0.25 pt cold H_2O with reduction of temp Sol in all proportions in boiling H_2O (Berzelius)
Sol in 2 pts cold and 0.6667 pt boiling H_2O (Fourcroy)

Sat $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 12.5° contains 33.8% (Hasenfratz A ch 23 29)

Solubility in H_2O

100 g of the solution contain at

55° 80° 90° 100°
78.16 78.20 78.37 78.43 g $\text{Ca}(\text{NO}_3)_2$

125° 147.5° 151° (bpt of sat solution at 760 mm)
78.57 78.80 79.00 g $\text{Ca}(\text{NO}_3)_2$

The anhydrous salt is the stable solid phase above 51.3° (Bassett and Taylor, Chem Soc 1912, 101 580)

100 g sat $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ contain 77.3 g $\text{Ca}(\text{NO}_3)_2$ at 25° (Taylor and Henderson, J Am Chem Soc 1915, 37 1692)
 See also +2, 3, and $4\text{H}_2\text{O}$
 Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

17.55 30.10 40.13 % $\text{Ca}(\text{NO}_3)_2$
 1.1714 1.2739 1.3857

(Wagner, W Ann 1883, 18 270)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 17.5°

$\text{Ca}(\text{NO}_3)_2$	Sp gr	$\text{Ca}(\text{NO}_3)_2$	Sp gr
1	1.009	35	1.328
5	1.045	40	1.385
10	1.086	45	1.447
15	1.129	50	1.515
20	1.174	55	1.588
25	1.222	60	1.666
30	1.272		

(Franz, J pr (2) 5 274)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 17.5°

$\text{Ca}(\text{NO}_3)_2$	Sp gr	$\text{Ca}(\text{NO}_3)_2$	Sp gr
10	1.076	40	1.368
20	1.163	50	1.483
30	1.261	60	1.605

(Gerlach, Z anal 27 283)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 18°

$\text{Ca}(\text{NO}_3)_2$	Sp gr	$\text{Ca}(\text{NO}_3)_2$	Sp gr
6.25	1.0487	37.5	1.3546
12.5	1.1016	50.0	1.5102
25.0	1.2198		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 24.65° a=no of g $\times \frac{1}{2}$ mol wt dissolved in 1000 g H_2O , b=sp gr if a is $\text{Ca}(\text{NO}_3)_2, 4\text{H}_2\text{O}$, $\frac{1}{2}$ mol wt = 118, c=sp gr if a is $\text{Ca}(\text{NO}_3)_2, \frac{1}{2}$ mol wt = 82

a	b	c	a	b	c
1	1.056	1.059	6	1.243	1.286
2	1.104	1.112	7	1.270	1.323
3	1.145	1.160	8	1.294	
4	1.181	1.205	9	1.316	
5	1.213	1.246	10	1.336	

(Favre and Valson, C R 79 968)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1.0596
$\frac{1}{2}$ "	1.0300
$\frac{1}{4}$ "	1.0151
$\frac{1}{8}$ "	1.0076

(Wagner, Z phys Ch 1890, 5 36)

$\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ containing 7.15% $\text{Ca}(\text{NO}_3)_2$ has sp gr $20^\circ/20^\circ = 1.0554$

$\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ containing 7.91% $\text{Ca}(\text{NO}_3)_2$ has sp gr $20^\circ/20^\circ = 1.0613$

(Le Blanc and Rohland, Z phys Ch 1896, 19 284)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 20° containing M g mols of salt per liter

M 0.0125 0.025 0.05 0.125
 Sp gr 1.001846 1.003166 1.00604 1.01523

M 0.25 0.5 0.75
 Sp gr 1.03074 1.06011 1.08874

M 1.00 1.50
 Sp gr 1.11751 1.17375

(Jones and Pearce, Am Ch J 1907, 38 704)

Saturated $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ containing 351.2 pts $\text{Ca}(\text{NO}_3)_2$ to 100 pts H_2O boils at 151° (Legrand), 152° (Kremers)

Forms a crust at 141°, and contains 333.5 pts $\text{Ca}(\text{NO}_3)_2$ to 100 pts H_2O , highest temp observed, 151° (Gerlach, Z anal 26 427)

B-pt of $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ containing pts $\text{Ca}(\text{NO}_3)_2$ to 100 pts H_2O G=according to Gerlach (Z anal 26 447), L=according to Legrand (A ch (2) 59 436)

B-pt	G	L	B-pt	G	L
101°	10	15	127	215.5	
102	20	25.3	128	222.5	197.0
103	30	34.4	129	230	
104	40	42.6	130	237.5	209.5
105	50	50.4	131	245	
106	60	57.8	132	253	222.2
107	70	64.9	133	261.5	
108	80	71.8	134	270	235.1
109	89	78.6	135	278.5	
110	98	85.3	136	287	248.1
111	106.5	91.9	137	296	
112	114.5	98.4	138	305	261.3
113	122.5	104.8	139	314.5	
114	130	111.2	140	324	271.7
115	137.5	117.5	141	333.5	
116	144	123.8	142	343.5	288.4
117	150.5	130	143	354	
118	157	136.1	144	361.5	302.6
119	163.5	142.1	145	375	
120	170	148.1	146	386	317.4
121	176		147	397.5	
122	182.5	160.1	148	409	333.2
123	189		149	420.5	
124	195.5	172.2	150	432.5	351.2
125	202		151	444.5	362.2
126	208.5	184.5	151.97	455.68	

Sat $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ boils at 132° (Ordway, Sill Am J (2) 27 14)

Conc HNO_3 precipitates $\text{Ca}(\text{NO}_3)_2$ from its aqueous solution (Mitscherlich, Pogg 18 159)

Very sol in conc HNO_3 (Rawson, J Soc Chem Ind 1897, 16 113)

Solubility in $\text{HNO}_3 + \text{Aq}$ at 25°

100 g of the solution contain			Solid phase
G	$\text{Ca}(\text{NO}_3)_2$	G HNO_3	
57	98	0 00	$\text{Ca}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$
54	82	3 33	
52	96	5 87	
51	58	7 21	
47	82	11 27	
45	59	13 71	
40	70	19 65	
38	17	22 80	
34	46	28 81	
32	84	32 63	
32	50	33 52	$\text{Ca}(\text{NO}_3)_2 + 3\text{H}_2\text{O}$
33	44	35 63	
29	05	41 66	
27	79	45 70	
31	09	40 56	
26	07	45 70	
17	41	55 48	
12	25	62 05	
9	34	65 69	
8	52	67 20	
5	06	71 12	$\text{Ca}(\text{NO}_3)_2$
2	53	74 77	
1	05	78 56	
0	54	80 83	
0	36	85 83	
0	01 (about)	90 90	
0	00	96 86	

These results show that the hydrates of $\text{Ca}(\text{NO}_3)_2$, which are stable at 25° in contact with $\text{HNO}_3 + \text{Aq}$ are $\text{Ca}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$, $+3\text{H}_2\text{O}$ and $+2\text{H}_2\text{O}$

(Bassett and Taylor, Chem Soc 1912, 101 582)

Sol in glacial $\text{HC}_2\text{H}_3\text{O}_2$ (Persoz)

Sol in sat $\text{KNO}_3 + \text{Aq}$ with elevation of temp and pptn of a portion of KNO_3 (Fourcroy and Vauquelin, A ch 11 135)

Solubility of $\text{Ca}(\text{NO}_3)_2 + \text{NaNO}_3$ at t°

t°	$\text{Ca}(\text{NO}_3)_2$	NaNO_3	Solid phase
9	47 51	9 51	$\text{Ca}(\text{NO}_3)_2, 4\text{H}_2\text{O}$ " $+ \text{NaNO}_3$ NaNO_3 "
	46 08	12 56	
	26 67	23 32	
	11 76	34 26	
25	54 58	7 25	$\text{Ca}(\text{NO}_3)_2, 4\text{H}_2\text{O}$ " $+ \text{NaNO}_3$ NaNO_3 " " "
	53 22	10 70	
	52 73	12 08	
	52 40	11 58	
	37 31	19 48	
	26 91	24 98	
	14 61	36 12	

(Kremann and Rothmund, Z anorg 1914, 86 373)

Solubility of $\text{Ca}(\text{NO}_3)_2 + \text{CaS}_2\text{O}_8$ at t°

t°	$\text{Ca}(\text{NO}_3)_2$	CaS_2O_8	Solid phase
9	46 02	5 46	$\text{Ca}(\text{NO}_3)_2, 4\text{H}_2\text{O}$ " $\text{CaS}_2\text{O}_8, 6\text{H}_2\text{O}$ $\text{CaS}_2\text{O}_8, 6\text{H}_2\text{O}$ "
	45 68	6 81	
	27 92	10 46	
	10 49	22 81	
		29 33	$\text{Ca}(\text{NO}_3)_2, 4\text{H}_2\text{O}$ " $\text{CaS}_2\text{O}_8, 6\text{H}_2\text{O}$ $\text{CaS}_2\text{O}_8, 6\text{H}_2\text{O}$ " " "
25	54 03	4 27	
	50 25	9 10	
	45 92	13	
	42 93	13 83	
	32 01	17 09	
	19 51	23 78	
	8 15	29 85	

(Kremann and Rothmund, Z anorg 1914, 86 373)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Sol in 0.8 pt alcohol (Macquer), 1 pt boiling alcohol (Bergmann)

Dry $\text{Ca}(\text{NO}_3)_2$ is sol in 7 pts alcohol at 15° and 1 pt boiling alcohol (Bergmann)

Sp gr of $\text{Ca}(\text{NO}_3)_2 + \text{alcohol}$

% $\text{Ca}(\text{NO}_3)_2$	Sp gr $20^\circ/20^\circ$
0	0.7949
4.96	0.8278
6.47	0.8383

(Le Blanc and Rohland, Z phys Ch 1896, 19 284)

Solubility in ethyl alcohol + Aq at 25°

% $\text{C}_2\text{H}_5\text{OH}$ in the solvent	% $\text{C}_2\text{H}_5\text{OH}$ in the solution	% $\text{Ca}(\text{NO}_3)_2$ in the solution
*0	0	82.5
*25.1	5.8	77.0
*50.1	15.2	69.52
*60.1	20.4	66.08
*63.9	22.4	64.94
70.4	26.5	62.3
72.0	27.39	61.96
73.4	28.5	61.15
75.3	29.9	60.3
*84.9	35.9	57.7
*99.1	48.1	51.4

* Metastable solutions

(D'Ans and Siegler, Z phys Ch 1913, 82 43)

Solubility of $\text{Ca}(\text{NO}_3)_2 \cdot 2\text{C}_2\text{H}_5\text{OH}$ in $\text{C}_2\text{H}_5\text{OH}$
+Aq at 25°

% $\text{C}_2\text{H}_5\text{OH}$ in the solvent	% $\text{C}_2\text{H}_5\text{OH}$ in the solution	% $\text{Ca}(\text{NO}_3)_2$ in the solution
98 1	60 2	38 6
94 1	54 6	41 9
85 8	42 5	50 97
80 5	35 8	55 3
75 3	29 9	60 28

(D'Ans and Siegler, *l c*)

See also under $+4\text{H}_2\text{O}$

Solubility in organic solvents

Solvent	% $\text{Ca}(\text{NO}_3)_2$ in the solution at 25°
Methyl alcohol	65 5
Ethyl alcohol	52 0
Propyl alcohol	36 5
Isobutyl alcohol	25 0
Amyl alcohol	13 3
Acetone	58 5

(D'Ans and Siegler, *l c*)

Sol in 187 pts ether-alcohol (1 1)
(Fresenius, *Z anal* **32** 191)

Ether ppts $\text{Ca}(\text{NO}_3)_2$ from its alcoholic solution Easily sol in boiling amyl alcohol
(Browning, *Sill Am J* **143** 53)

Sol in acetone (Naumann, *B* 1904, **37** 4328)

Insol in benzonitrile (Naumann, *B* 1914, **47** 1370)

Insol in methylal (Eidmann, *C C* **1899**, II 1014)

1 g $\text{Ca}(\text{NO}_3)_2$ is sol in 1.44 g methyl acetate at 18° Sp gr $18^\circ/4^\circ$ of sat solution = 1.313 (Naumann, *B* 1909, **42** 3795)

Sol in ethyl acetate (Naumann, *B* 1910, **43** 314)

+ $2\text{H}_2\text{O}$ Solubility in H_2O

100 g of the solution contain at

49° 51°
77.49 78.05 g $\text{Ca}(\text{NO}_3)_2$

Solutions in stable equilibrium with the dihydrate can only exist between the limits of temp 48.4° and 51.3° (Bassett and Taylor, *Chem Soc* 1912, **101** 580)

+ $3\text{H}_2\text{O}$ Solubility in H_2O

100 g of the solution contain at

40° 45° 50° 51°
70.37 71.45 73.79 74.73 g $\text{Ca}(\text{NO}_3)_2$

Mpt of $\text{Ca}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O} = 51.1^\circ$

(Bassett and Taylor, *l c*)

+ $4\text{H}_2\text{O}$ $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ melts in its crystal H_2O at 44° (Tilden, *Chem Soc* **45** 409)

Solubility in H_2O at t°

100 g of the solution contain g $\text{Ca}(\text{NO}_3)_2$ at t°

t°	G $\text{Ca}(\text{NO}_3)_2$
-26.7	43.37
-10.0	47.31
0.0	50.50
$+5.0$	51.97
10.0	53.55
15.0	54.94
20.0	56.39
25.0	57.98
30.0	60.41
35.0	62.88
40.0	66.21
42.4	68.68
42.5	68.74
42.7	mpt of $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
42.45	71.70

(Bassett and Taylor, *l c*)

Solubility of α and β modifications in H_2O at t°

α modification is the stable form

t°	G $\text{Ca}(\text{NO}_3)_2$ in 100 g of solution	Solid phase
0	50.17	α $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$
22.2	56.88	α "
25.0	57.90	α "
30.0	60.16	α "
30.0	61.57	β "
34.0	63.66	β "
35.0	62.88	α "
38.0	64.34	α "
38.0	66.65	β "
39.0	67.93	β "
139.6	69.50	β "
239.0	75.34	β "
40.0	66.21	α "
142.7	69.50	α "
242.4	71.70	α "

¹ mpt of hydrate

² reflex pt

(Taylor and Henderson, *J Am Chem Soc* 1915, **37** 1692)

Sp gr of solution sat at $18^\circ = 1.548$, containing 54.8% $\text{Ca}(\text{NO}_3)_2$ (Mylius, *B* 187, **30** 1718)

Solubility in ethyl alcohol + Aq at 25°

% C ₂ H ₅ OH in the solvent	% C ₂ H ₅ OH in the solution	% Ca(NO ₃) ₂ in the solution
0	0	57.5
18.3	3.5	56.1
39.2	8.1	55.2
59.2	14.1	52.9
80.4	22.3	50.2
90.4	29.4	49.0
99.4	31.1	49.7
99.4	31.2	52.0
99.4	29.5	56.2
60.1	28.3	58.9
60.1	27.8	60.0
60.1	27.3	60.7
60.1	26.5	62.3

(D'Ans and Siegler, Z phys Ch 1913, 82 42)

Calcium nitrate hydrazine, Ca(NO₃)₂ · 2N₂H₄ + H₂O

Ppt (Franzen, Z anorg 1908, 60 288)

Calcium nitrate tungstosilicate, Ca₂W₁₂SiO₄₀, Ca(NO₃)₂+13H₂O and +15H₂O Decomp by H₂O (Wyruboff, Chem Soc 1897, 72 (2) 176)**Cerous nitrate**, Ce(NO₃)₃ + 6H₂O

Not very deliquescent (Jolin)

Very sol in H₂O, sol in 2 pts alcohol (Vauquelin)

Sol in acetone (Eidmann, C C 1899 II 1014, Naumann, B 1904, 37 4328)

Ceric nitrate, Ce(NO₃)₄Deliquescent Decomp by hot H₂O (Berzelius)

Sol in alcohol (Dumas)

Basic compounds containing 12 mols or less CeO₂ to 1 mol N O₅ may be obtained, which are sol in H₂O (Ordway)**Cerous cobaltous nitrate**, 2Ce(NO₃)₃ · 3Co(NO₃)₂ + 24H₂O

Deliquescent Easily forms supersaturated solutions (Lange, J pr 82 129)

1 l sat solution in HNO₃ + Aq (sp gr 1.325) contains 103.3 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)**Ceric cobaltous nitrate**, CeCo(NO₃)₆ + 8H₂ODecomp by H₂O when heated, sol in cold H₂O, sl sol in HNO₃ (Meyer, Z anorg 1901, 27 376)**Cerous magnesium nitrate**, 2Ce(NO₃)₃ · 3Mg(NO₃)₂ + 24H₂OSlightly deliquescent Easily sol in H₂O or alcohol, and easily forms supersaturated solutions (Holzmann, J pr 75 330)1 l sat solution in HNO₃ + Aq (sp gr 1.325) contains 63.8 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)**Ceric magnesium nitrate**, CeMg(NO₃)₆ + 8H₂ODecomp by H₂O, sol in HNO₃ + Aq without decomp (Meyer, Z anorg 1901, 27 373)**Cerous manganous nitrate**, 2Ce(NO₃)₃ · 3Mn(NO₃)₂ + 24H₂OSol in H₂O (Lange, J pr 82 129)1 l sat solution in HNO₃ + Aq (sp gr 1.325) contains 193.1 g hydrous salt at 16° (Jantsch)**Ceric manganous nitrate**, CeMn(NO₃)₆ + 8H₂ODecomp by H₂O and dil HNO₃, sol in conc HNO₃ without decomp (Meyer, Z anorg 1901, 27 377)**Cerous nickel nitrate**, 2Ce(NO₃)₃ · 3Ni(NO₃)₂ + 24H₂OEasily sol in H₂O (Holzmann, J pr 75 321)1 l sat solution in HNO₃ + Aq (sp gr 1.325) contains 80.3 g hydrous salt at 16° (Jantsch)**Ceric nickel nitrate**, CeNi(NO₃)₆ + 8H₂ODecomp by H₂O when heated, sol in H₂O in the cold, sl sol in HNO₃ (Meyer, Z anorg 1901, 27 375)**Cerous potassium nitrate**, Ce(NO₃)₃ · 2KNO₃ + 2H₂OSol in H₂O (Lange, J pr 82 136)**Ceric potassium nitrate**, CeK(NO₃)₆Sol in H₂O with decomp (Meyer, Z anorg 1901, 27 370)+1½H₂O Efflorescent (Holzmann, J pr 75 324)**Ceric rubidium nitrate**, CeRu(NO₃)₆Very sol in H₂O, sl sol in HNO₃ (Meyer)**Ceric sodium nitrate**

Deliquescent Decomp by recrystallization (Holzmann)

Cerous thalious nitrate, [Ce(NO₃)₃]Tl + 4H₂OVery hygroscopic Decomp by H₂O (Jantsch, Z anorg 1911, 69 229)**Cerous zinc nitrate**, 2Ce(NO₃)₃ · 3Zn(NO₃)₂ + 24H₂OSol in H₂O Easily forms supersat solutions (Lange, J pr 82 129)1 l sat solution in HNO₃ + Aq (sp gr 1.325) contains 124.1 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)**Ceric zinc nitrate**, ZnCe(NO₃)₆ + 8H₂ODecomp by H₂O, sol in HNO₃ + Aq (Meyer, Z anorg 1901, 27 374)

Ceroceric zinc nitrate (?), $\text{Ce}_2\text{O}_3 \cdot 2\text{ZnO}$, $6\text{N}_2\text{O}_5 + 18\text{H}_2\text{O}$ (?)

Easily sol in H_2O (Holzmann, J pr 75 321)

Chromic nitrate, basic, $\text{Cr}_2\text{O}(\text{NO}_3)_4$

Sol in H_2O (Lowel)
+ $12\text{H}_2\text{O}$ Sol in H_2O (Ordway)

Chromic nitrate, $\text{Cr}(\text{NO}_3)_3 + 9\text{H}_2\text{O}$

Very sol in H_2O and alcohol (Lowel)
Melts in its crystal H_2O at 36.5° Sat
 $\text{Cr}(\text{NO}_3)_3 + \text{Aq}$ boils at 125.6° (Ordway)

Sp gr of $\text{Cr}(\text{NO}_3)_3 + \text{Aq}$
M = concentration of solution in gram
mols

W = wt of 25 cc of solution
M 0 0934 0 1868 0 3736 0 5604 0 9340
W 25 4300 25 8328 26 7302 27 5524 29 3072

M 1 1208 1 3076 1 4944 1 8680

W 30 0668 30 8464 31 6327 33 3379

(Jones and Getman, Z phys Ch 1904, 49 426)

Sol in acetone (Naumann, B 1904, 37 4328, Eidmann, C C 1899, II 1014)

Chromic nitrate chloride, $\text{CrCl}_2(\text{NO}_3)$

Sol in H_2O and alcohol (Schiff, A 124 177)

$\text{Cr}(\text{NO}_3)_2\text{Cl}$ (Schiff)

Chromic nitrate sulphate, $\text{Cr}_2(\text{SO}_4)(\text{NO}_3)_4$

Hygroscopic Completely sol in H_2O
 $\text{Cr}_2(\text{SO}_4)_2(\text{NO}_3)_2$ Sol in H_2O (Schiff, A 124 174)

Cobaltous nitrate, basic, $6\text{CoO} \cdot \text{N}_2\text{O}_5 + 5\text{H}_2\text{O}$

Ppt Gradually sol in H_2O with deposition of CoO (Winkelblech, A 13 155)

Sol in cold HCl , and $\text{HNO}_3 + \text{Aq}$ De-
comp by hot $\text{KOH} + \text{Aq}$

$4\text{CoO} \cdot \text{N}_2\text{O}_5 + 6\text{H}_2\text{O}$ Ppt (Habermann, M 5 432)

Cobaltous nitrate, $\text{Co}(\text{NO}_3)_2$

Deliquescent in moist air Very sol in H_2O

See +3, 6, and $9\text{H}_2\text{O}$

Sp gr of aqueous solution at 17.5° con-
taining

5 10 15 20% $\text{Co}(\text{NO}_3)_2$,
1 0462 1 0906 1 1378 1 1936

25 30 35 40% $\text{Co}(\text{NO}_3)_2$
1 2538 1 3190 1 3896 1 4662

Sp gr of sat solution = 1 5382

(Franz, J pr (2) 5 274)

Sp gr of $\text{Co}(\text{NO}_3)_2 + \text{Aq}$ at room temp
containing

8 28 15 96 24 528% $\text{Co}(\text{NO}_3)_2$

1 0732 1 1436 1 2288

(Wagner, W Ann 1883, 18 268)

Sp gr of $\text{Co}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Co}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0728
$\frac{1}{2}$ -normal	1 0369
$\frac{1}{4}$ -normal	1 0184
$\frac{1}{8}$ -normal	1 0094

(Wagner, Z phys Ch 1890, 5 37)

Sp gr at 20° of $\text{Co}(\text{NO}_3)_2 + \text{Aq}$ containing

M g mols $\text{Co}(\text{NO}_3)_2$ per liter

M 0 01 0 025 0 05 0 075

Sp gr 1 001496 1 003863 1 007579 1 011289

M 0 10 0 25 0 5 0 75

Sp gr 1 015084 1 03737 1 07415 1 11204

M 1 0 1 5 2 0

Sp gr 1 14612 1 21720 1 28576

(Jones and Pearce, Am Ch J 1907, 38 715)

Sol in liquid NH_3 (Guntz, Bull Soc 1909 (4) 5 1009)

100 g sat solution in glycol contains 80 g
 $\text{Co}(\text{NO}_3)_2$ (de Coninck, C C 1905, II 883)

Sol in ethyl acetate (Naumann, B 1904 37 3601)

+ $3\text{H}_2\text{O}$ Solubility in H_2O

Sat solution contains at

55° 62° 70° 84° 91° mpt

61 74 62 88 64 89 68 84 77 21% $\text{Co}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 408)

+ $6\text{H}_2\text{O}$ Melts in its crystal H_2O at 56°
(Ordway), 38° (Tilden)

Solubility in H_2O

Sat solution contains at

-21° -10° -4° 0°

41 55 43 69 44 85 45 66% $\text{Co}(\text{NO}_3)_2$,

+ 18° 41° 56° mpt

49 73 55 96 62 88% $\text{Co}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 408)

Moderately sol in liquid NH_3 (Franklin
Am Ch J 1898, 20 827)

Easily sol in alcohol Sol in 1 pt stron

alcohol at 12.5° (Wenzel)

Easily sol in acetone (Krup, und M'Elroy

J Anal Ch 6 184)

Sol in methyl acetate (Naumann, E

1909, 42 3790)

Difficultly sol in ethyl acetate (Nau

mann, B 1910, 43 314)

+ $9\text{H}_2\text{O}$ Solubility in H_2O

Sat solution contains at

-26° -23.5° -20.5°

39 45 40 40 42 77% $\text{Co}(\text{NO}_3)_2$

Cryohydrate is formed at -29° (Funk

Z anorg 1899, 20 409)

Cobaltous didymium nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{D}_1(\text{NO}_3)_2 + 48\text{H}_2\text{O}$

Very deliquescent (Frerichs and Smith, A 191 331)

Cobaltous gadolinium nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{Gd}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in HNO_3 (sp gr 1.325) contains 451.4 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 303)

Cobaltous lanthanum nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{La}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 109.2 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 303)

Cobaltous neodymium nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{Nd}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 151.6 g hydrous salt at 16° (Jantsch)

Cobaltous praseodymium nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{Pr}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 12.99 g hydrous salt at 16° (Jantsch)

Cobaltous samarium nitrate, $3\text{Co}(\text{NO}_3)_2$, $2\text{Sm}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 34.27 g hydrous salt at 16° (Jantsch)

Cobaltous thorium nitrate, $\text{CoTh}(\text{NO}_3)_6 + 8\text{H}_2\text{O}$

Hydroscopic, sol in $\text{HNO}_3 + \text{Aq}$ (Meyer, Z anorg 1901, 27 387)

Cobaltous nitrate ammonia, $\text{Co}(\text{NO}_3)_2 \cdot 6\text{NH}_3 + 2\text{H}_2\text{O}$

Decomp by H_2O with separation of basic nitrate (Fromy)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Hess)

Cobaltous nitrate cupric oxide, $\text{Co}(\text{NO}_3)_2 \cdot 3\text{CuO} + 3\text{H}_2\text{O}$

Ppt (Maulhe, C R 1902, 134 234)

Cobaltous nitrate hydrazine, $\text{Co}(\text{NO}_3)_2 \cdot 3\text{N}_2\text{H}_4$

Decomp by hot H_2O (Franzen, Z anorg, 1908, 60 274)

Cupric nitrate, basic, $2\text{CuO} \cdot \text{N}_2\text{O}_5$

(Ditte, A ch 1879, (5) 18 339)

$4\text{CuO} \cdot \text{N}_2\text{O}_5 + 3\text{H}_2\text{O}$ Insol in H_2O Easily sol in acids (Graham, A 29 13)

Insol in H_2O , easily sol in acids (Athanasescu, Bull Soc 1895, (3) 11 1113)

$+ 3\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , and decomp by heat (Casselmann, Z anal 4 24)

Cupric nitrate, $\text{Cu}(\text{NO}_3)_2$

Deliquescent Very easily sol in H_2O or alcohol, also in moderately conc $\text{HNO}_3 + \text{Aq}$, but is precipitated from conc aqueous solution by $\text{HNO}_3 + \text{Aq}$ of 1.522 sp gr (Mitscherlich, Pogg 18 159)

Sat $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ contains at

-10°	-3°	$+3^\circ$
38.8	41.6	44.5% $\text{Cu}(\text{NO}_3)_2$

8°	20°	32°
48.5	54.1	61.2% $\text{Cu}(\text{NO}_3)_2$

(Etard, A ch 1894, (7) 2 528)

See +3, 6, and $9\text{H}_2\text{O}$

Sp gr of $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ at 17.5° containing

5	10	15% anhydrous salt,
1.0452	1.0942	1.1442

20	25	30% anhydrous salt,
1.2036	1.2644	1.3298

35	40	45% anhydrous salt
1.3974	1.4724	1.5576

(B Franz, J pr (2) 5 274)

Sp gr of $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ at 15°

% $\text{Cu}(\text{NO}_3)_2$	Sp gr
5.22	1.046
10.44	1.094
15.67	1.146
20.85	1.202
26.12	1.262
35.00	1.377

(Long, W Ann 1880, 11 39)

Sp gr of $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

18.99	26.68	46.71% $\text{Cu}(\text{NO}_3)_2$
1.1774	1.2637	1.5363

(Wagner, W Ann 1883, 18 272)

Sp gr of $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Cu}(\text{NO}_3)_2 + \frac{1}{2}\text{Aq}$	Sp gr
1-normal	1.0755
$\frac{1}{2}$ " "	1.0372
$\frac{1}{4}$ " "	1.0185
$\frac{1}{8}$ " "	1.0092

(Wagner, Z phys Ch 1890, 5 38)

Sp gr of $\text{Cu}(\text{NO}_3)_2 + \frac{1}{2}\text{Aq}$ at 12.5°

% $\text{Cu}(\text{NO}_3)_2$	1	5	10	14
Sp gr	1.0059	1.0320	1.0655	1.0916

% $\text{Cu}(\text{NO}_3)_2$	20	24	30	34
Sp gr	1.1350	1.1716	1.2320	1.2712

% $\text{Cu}(\text{NO}_3)_2$	40	44	50	56
Sp gr	1.3320	1.3749	1.4440	1.5205

(Hassenfratz, Muspratt, 1893, 4 2243)

Sp gr at 20° of $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ containing
 M g mols salt per liter
 M 0 01 0 025 0 05 0 075
 Sp gr 1 001504 1 004076 1 007859 1 011715

M 0 25 0 50 0 75 0 935
 Sp gr 1 040290 1 07723 1 11469 1 14262

Sp gr 1 5 2 0
 M 1 22618 1 29262
 (Jones and Pearce, Am Ch J 1917, **38** 719)

Sat $\text{Cu}(\text{NO}_3)_2 + \text{Aq}$ boils at about 173°
 (Griffiths)

Insol in fuming HNO_3 (Ditte, A ch 1879 (5) **18** 339)

Solubility of $\text{Cu}(\text{NO}_3)_2 + \text{Pb}(\text{NO}_3)_2$ in H_2O
 at 20°

Sp gr	In 1 l of solution				Solid phase
	Cu(NO ₃) ₂		Pb(NO ₃) ₂		
	g	g mol	g	g mol	
1 304	70 5	0 375	359 5	1 086	Pb(NO ₃) ₂
1 322	139 2	0 742	257 2	0 777	
1 321	226 0	1 207	175 1	0 529	
1 343	301 8	1 608	133 4	0 403	
1 360	341 8	1 821	117 8	0 356	
1 451	519 4	2 767	70 0	0 213	
1 546	681 7	3 632	44 0	0 133	
1 622	798 1	4 252	28 1	0 080	
1 700	943 2	5 028	17 2	0 052	
					Pb(NO ₃) ₂ + Cu(NO ₃) ₂ · 6H ₂ O

(Fedotieff, Z anorg 1911, **73** 178)

Very sol in liquid NH_3 (Guntz, Bull Soc 1909, (4) **5** 1007)

Easily sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 827)

Insol in liquid HF (Franklin, Z anorg 1905, **46** 2)

Insol in ethyl acetate (Naumann, B 1910, **43** 314)

Sl sol in benzonitrile (Naumann, B 1914, **47** 1369)

+3 H_2O Melts in crystal H_2O at 114 5°
 (Ordway, Tilden, Chem Soc **45** 409)

Solubility in H_2O

Sat solution contains at

25° 30° 40° 50°
 60 01 60 44 61 51 62 62% $\text{Cu}(\text{NO}_3)_2$,
 60° 70° 80° 114 5° Mpt
 64 17 65 79 67 51 77 59% $\text{Cu}(\text{NO}_3)_2$

(Funk, Z anorg 1899, **20** 413)

100 pts HNO_3 dissolve 2 pts at 13°, considerably more on heating (Ditte, A ch 1879, (5) **18** 339)

Sol in 1 pt strong alcohol at 12 5° (Wenzel)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

+6 H_2O Efflorescent Melts in crystal H_2O at 38° (Ordway)

Solubility in H_2O

Sat solution contains at

—21° —10° 0° +10°
 39 52 42 08 45 00 48 79 % $\text{Cu}(\text{NO}_3)_2$,

18° 20° 26 4° mpt
 53 86 55 58 63 39% $\text{Cu}(\text{NO}_3)_2$
 (Funk, Z anorg 1899, **20** 413)

Sat solution of $\text{Cu}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$ in H_2O at 20° contains 5 04 g mol per l Sp gr of sat solution = 1 688 (Fedotieff, Z anorg 1911, **73** 78)

Sat solution of $\text{Cu}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$ in H_2O contains 45 0 g $\text{Cu}(\text{NO}_3)_2$ in 100 g solution at 0°, 53 9 g at 18° (Mylus, Z anorg 1912, **74** 411)

+9 H_2O

Solubility in H_2O

Sat solution contains at

—23° —21° —20°
 36 08 37 38 40 92% $\text{Cu}(\text{NO}_3)_2$

Cryohydrate is formed at —24° (Funk, Z anorg 1899, **20** 414)

Cupric nitrate ammonia (Cuprammonium nitrate), $\text{Cu}(\text{NO}_3)_2 \cdot 4\text{NH}_3$

Easily sol in H_2O , from which it can be recrystallized Sol in alcohol (Berzelius)

Sol in 1 pt liquid NH_3 (Horn, Am Ch J 1908, **39** 216)

$\text{Cu}(\text{NO}_3)_2 \cdot 5\text{NH}_3$ (Horn, Am Ch J 1907, **37** 620)

4 $\text{Cu}(\text{NO}_3)_2 \cdot 23\text{NH}_3$ (Horn)

Cupric nitrate hydrazine, $\text{Cu}(\text{NO}_3)_2 \cdot \text{N}_2\text{H}_4$

Decomp by H_2O (Hofmann und Marburg, A 1899, **305** 221)

Cupric nitrate mercuric oxide, $\text{Cu}(\text{NO}_3)_2 \cdot \text{HgO} + 3\text{H}_2\text{O}$

Sol in HCl , HNO_3 and H_2SO_4 (Imzi, Gazz ch it 1913, **43** (2) 709)

Didymium nitrate, basic, $4\text{Dy}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5 + 15\text{H}_2\text{O}$

Insol in H_2O (Maignac)

2 $\text{Dy}_2\text{O}_3 \cdot 3\text{N}_2\text{O}_5$ (Beccard A ch (6) **14** 257)

Didymium nitrate, $\text{Dy}_2(\text{NO}_3)_6$

Anhydrous Very sol in H_2O As sol in 96% alcohol as in H_2O , and the solution is not precipitated by much ether Insol in pure ether (Maignac, A ch (3) **36** 161)

Moderately sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 827)

Sol in acetone (Naumann, B 1904, **37** 4328, Eidmann, C C **1899**, II 1014)

+6 H_2O Very deliquescent (Clevc, Bull Soc (2) **43** 361)

Didymium nickel nitrate, $2D_1(NO_3)_3$, $3Ni(NO_3)_2 + 36H_2O$

Very deliquescent (Frenchs and Smith, A 191 355)

See Neodymium and praseodymium

Didymium zinc nitrate, $2D_1(NO_3)_3$, $3Zn(NO_3)_2 + 69H_2O$

Very deliquescent (F and S)

See Neodymium and praseodymium

Dysprosium nitrate, $Dy(NO_3)_3 + 5H_2O$

Very sol in H_2O , less sol in $H_2O + HNO_3$
Sol in alcohol (Urban, C R 1908, 146 129)

Erbium nitrate, basic, $2Er_2O_3$, $3N_2O_5 + 9H_2O$

Decomp by H_2O Sl sol in HNO_3 (Bahr and Bunsen)

$3Er_2O_3$, $4N_2O_5 + 20H_2O$ (Cleve, Bull Soc (2) 21 344)

Erbium nitrate, $Er(NO_3)_3 + 6H_2O$

Easily sol in H_2O , alcohol, and ether (Hoglund)

Sol in acetone (Naumann, B 1904, 37 4328)

Gadolinium nitrate, $Gd(NO_3)_3 + 6\frac{1}{2}H_2O$

Sol in H_2O (Benedicks, Z anorg 1900, 22 406)

+5H O Sol in HNO_3 (B)

Gadolinium magnesium nitrate, $2Gd(NO_3)_3$, $3Mg(NO_3)_2 + 24H_2O$

1 l sat solution in $HNO_3 + Aq$ (sp gr 1 325) contains 352 3 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 303)

Gadolinium nickel nitrate, $2Gd(NO_3)_3$, $3Ni(NO_3)_2 + 24H_2O$

1 l sat solution in $HNO_3 + Aq$ (sp gr 1 325) contains 400 8 g hydrous salt at 16° (Jantsch)

Gadolinium zinc nitrate, $2Gd(NO_3)_3$, $3Zn(NO_3)_2 + 24H_2O$

1 l sat solution in $HNO_3 + Aq$ (sp gr 1 325) contains 472 7 g hydrous salt at 16° (Jantsch)

Gallium nitrate, $Ga(NO_3)_3$

Very deliquescent, and sol in H_2O (Dupré)

Glucinum nitrate, basic, $2Glo$, $N_2O_5 + 3H_2O$ (?)

Sol in H_2O

$3Glo$, N_2O_5 Sol in H_2O (Ordway, Sill Am J (2) 26 205)

Compounds more basic than this are insol in H_2O (Ordway)

Glucinum nitrate, $Gl(NO_3)_2 + 3H_2O$

Very deliquescent (Joy, Sill Am J (2) 36 90)

Easily sol in H_2O and alcohol (Vauquelin)
Melts in its crystal H_2O at 29.4° (Ordway)

Sat $Gl(NO_3)_2 + Aq$ boils at 140.5° (Ordway)

Gold (auric) nitrate, basic, Au_2O_3 , $N_2O_5 + \frac{2}{3}H_2O$, or **Auryl nitrate**, $(AuO)NO_3 + \frac{1}{3}H_2O$

(Schottlander, A 217 364)

$2Au_2O_3$, $N_2O_5 + 2H_2O = Au_4O_6(NO_3)_2 + 2H_2O$ Slowly sol in $HNO_3 + Aq$ at 100° , (Schottlander, A 217 356)

Gold (auric) nitrate, $Au(NO_3)_3 + xH_2O$

Decomp by H_2O Sol in acetone (Hanriot and Raoult, C R 1912, 155 1086)

Gold (auric) hydrogen nitrate, $4u(NO_3)_3$, $HNO_3 + 3H_2O$

Decomp by H_2O Sol in $HNO_3 + Aq$ (Schottlander, A 217 356)

Gold (auric) potassium nitrate, $KAu(NO_3)_4$

Easily sol in H_2O

HK $Au(NO_3)_3$ Decomp immediately by H_2O

$2KAu(NO_3)_4$, $K_2HAu(NO_3)_6$ (Schottlander, J B 1884 453)

Gold (auric) rubidium nitrate, $RbAu(NO_3)_4$

Easily sol in H_2O

HRb $_2$ $Au(NO_3)_6$ As above (Schottlander)

Gold (auric) thallium nitrate, $TlAu(NO_3)_4$

Easily sol in H_2O

$6AuO_3$, $2TlO_3$, $3N_2O_5 + 15H_2O$ Ppt (Schottlander)

Indium nitrate, $In(NO_3)_3 + 4\frac{1}{2}H_2O$

Very deliquescent Easily sol in H_2O and absolute alcohol (Winkler)

+1 $\frac{1}{2}$ H O

Iron (ferrous) nitrate, $Fe(NO_3)_2 + 6H_2O$

100 pts of crystals dissolve in 50 pts H_2O at 0° , sp gr of solution = 1 44, 40 8 pts H_2O at 15° , sp gr of solution = 1 48, 33 3 pts H_2O at 25° , sp gr of solution = 1 50 (Ordway, Sill Am J (2) 40 325)

Sat solution contains at

-9° 0° $+18^\circ$ 24° 60.5° Mpt
39 68 41 53 45 14 46 51 62 50% $Fe(NO_3)_2$
(Funk, Z anorg 1899, 20 406)

Sat solution of $Fe(NO_3)_2 + 6H_2O$ in H_2O contains 41 5% $Fe(NO_3)_2$ at 0° , 45 1% at 18° (Mylius, Z anorg 1912, 74 411)

+9H₂O Solubility in H₂O
Sat solution contains at
-27° -21 5° -19° -15 5°
35 66 36 10 36 56 37 17% Fe(NO₃)₂
Cryohydrate is formed at -28° (Funk,
Z anorg 1899, 20 407)
Fe(NO₃)₂+Aq decomposes on heating, less
rapidly when dil, more readily in presence of
excess of acid (Ordway)

Iron (ferric) nitrate, basic, 36Fe₂O₃, N₂O₅+48H₂O (?)

Easily sol in H₂O Sl sol in dil HNO₃+Aq, very sl sol in alcohol (Hausmann, A 89 111)

8Fe₂O₃, N₂O₅+12H₂O Sl sol in H₂O, very sl sol in cold or warm dil HNO₃+Aq, more easily sol in hot HCl+Aq (Hausmann)

+xH₂O Sol in H₂O, completely pptd from aqueous solution by NaCl, NH₄Cl, KI, KClO₃, Na₂SO₄, CaSO₄, ZnSO₄, CuSO₄, KNO₃, NaNO₃, Ba(C₂H₃O₂)₂, or Zn(C₂H₃O₂)₂+Aq. More slowly pptd by NH₄NO₃, Mg(NO₃)₂, Ba(NO₃)₂, or Pb(NO₃)₂+Aq. Not pptd by alcohol, Pb(C₂H₃O₂)₂, Cu(C₂H₃O₂)₂, Hg(CN)₂, AgNO₃, or As₂O₃+Aq (Ordway, Sill Am J (2) 9 30)

4Fe₂O₃, N₂O₅+1½H₂O Easily sol in H₂O, sl sol in dil HNO₃+Aq, and in alcohol (Hausmann)

+3H₂O Insol in H₂O or HNO₃+Aq, sol in HCl+Aq (Scheurer-Kestner, C R 87 927)

+9H₂O Not deliquescent, easily sol in H₂O (Ordway)

3Fe₂O₃, N₂O₅+2H₂O Insol in H₂O (Scheurer-Kestner)

2Fe₂O₃, N₂O₅+H₂O Decomp by H₂O (Scheurer-Kestner)

+8H₂O (S-K)

Fe₂O₃, N₂O₅ Decomp by H₂O (S-K)

Fe₂O₃, 2N₂O₅ Sol in H₂O or alcohol in all proportions Insol in HNO₃+Aq

N₂O₅ with 1, 2, 3, 4, 5, 6, and 8Fe₂O₃ forms compounds, sol in H₂O (Ordway)

Solubility determinations show that there are no definite basic nitrates of iron formed from solutions at 25°, and that the solid phase under these conditions is a solid solution of Fe₂O₃, HNO₃ and H₂O. The normal salt, Fe₂O₃, 3N₂O₅, 18H₂O is stable in solutions containing about 30-45% N₂O₅. In higher concentrations of nitric acid it appears to be metastable and a new salt, Fe₂O₃, 4N₂O₅, 18(?)H₂O is the stable form (Cameron, J phys Chem 1909, 13 252)

Iron (ferric) nitrate, Fe(NO₃)₃

+H₂O (Scheurer-Kestner, A ch (3) 65 113)

+6H₂O Deliquescent, and sol in any amount of H₂O (Schonbein, Pogg 39 141)

Sol in acetone (Naumann, B 1904, 37 4328)

+9H₂O Deliquescent Sol in H₂O as alcohol Sl sol in HNO₃+Aq 2 pts sa with 1 pt H₂O lower the temperature 18 5 (Scheurer-Kestner)

Sp gr of solution at 17 5° containing
5 10 15 20 25% Fe(NO₃)₃
1 0398 1 0770 1 1182 1 1612 1 2110

30 35 40 45 50% Fe(NO₃)₃
1 2622 1 3164 1 3746 1 4338 1 4972
55 60 65% Fe(NO₃)₃
1 5722 1 6572 1 7532

(Franz, J pr (2) 5 274)

Nearly insol in conc HNO₃+Aq at tem below 15 5°

Easily sol in alcohol

Melts in crystal H₂O at 47 2° (Ordway)

Sat Fe(NO₃)₃+Aq boils at 125° (Ordway)

Lanthanum nitrate, La(NO₃)₃+6H₂O

Very deliquescent, easily sol in H₂O as alcohol (Mosander) Melts in its cryst H₂O at 40°, boils at 124 5° (Ordway)

La(NO₃)₃+Aq sat at 25% contains 60 17

La(NO₃)₃, or 100 g H₂O dissolve 151 1

La(NO₃)₃ at 25° (James and Whittemor

J Am Chem Soc 1912, 34 1169)

Sol in acetone (Naumann, B 1904, 3 4328, Eidmann, C C 1899, II 1014)

Lanthanum magnesium nitrate, 2La(NO₃)₃, 3Mg(NO₃)₂+24H₂O

Deliquescent in moist air (Holzmunn, pr 75 350)

1 l sat solution in HNO₃+Aq (sp gr 1 325) contains 63 8 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)

Lanthanum manganous nitrate, 2La(NO₃)₃, 3Mn(NO₃)₂+24H₂O

Sol in H₂O (Damour and Deville)

1 l sat solution in HNO₃+Aq (sp gr 1 325) contains 193 1 g hydrous salt at 16° (Jantsch)

Lanthanum nickel nitrate, 2La(NO₃)₃, 3Ni(NO₃)₂+36H₂O

Very sol in H₂O (French and Smith, 191 355)

+24H₂O 1 l sat solution in HNO₃, Aq (sp gr 1 325) contains 90 3 g hydrous salt at 16° (Jantsch)

Lanthanum rubidium hydrogen nitrate, [La(NO₃)₄]Rb, HNO₃+6H₂O

Sol in H₂O and HNO₃ (Jantsch, Z anorg 1911, 69 225)

Lanthanum thallous nitrate, [La(NO₃)₃]Tl₂, 4H₂O

Hygroscopic (Jantsch, Z anorg 1911, 69 228)

Lanthanum zinc nitrate, $2\text{La}(\text{NO}_3)_3 \cdot 3\text{Zn}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$

Very sol in H_2O (Damour and Deville, J B 1858 135)

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 124.1 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)
+ $69\text{H}_2\text{O}$ (Frerichs and Smith, A 191 355)

Lead nitrate, basic, $2\text{PbO} \cdot \text{N}_2\text{O}_5 + \text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$

Sol in 5.15 pts H_2O at 19.2° (Pohl, W A B 6 597) Very sl sol in cold, much more in hot H_2O (Berzelius) Sol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (Guignet, C R 56 358)

Insol in H_2O , sol in acids (Athanescio, Bull Soc 1895, (3) 13 178)

+ $2\text{H}_2\text{O}$ (André, C R 100 639)
 $3\text{PbO} \cdot \text{N}_2\text{O}_5 + 1\frac{1}{2}\text{H}_2\text{O}$ Sl sol in pure H_2O Insol in H_2O containing HCl (Berzelius)

+ $3\text{H}_2\text{O}$ Sol in 119.2 pts cold, and 10.5 pts boiling H_2O Sol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$, but sl sol in $\text{KNO}_3 + \text{Aq}$ (Vogel, jr A 94 97)

= $10\text{PbO} \cdot 3\text{N}_2\text{O}_5 + 5\text{H}_2\text{O}$ (Wakemann and Wells, Am Ch J 9 299)

+ $4\text{H}_2\text{O}$ (André, C R 100 639)
 $6\text{PbO} \cdot \text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Nearly insol in H_2O (Lowe, J pr 98 385)

$10\text{PbO} \cdot 3\text{N}_2\text{O}_5 + 4\text{H}_2\text{O}$ Less sol in H_2O than $\text{Pb}(\text{NO}_3)\text{OH}$, and not decomp by boiling H_2O (Wakemann and Wells, Am Ch J 9 299)

Lead nitrate, $\text{Pb}(\text{NO}_3)_2$

Sol in H_2O with absorption of much heat (Rose)

1 pt $\text{Pb}(\text{NO}_3)_2$ dissolves in $7\frac{1}{2}$ pts cold H_2O (Mitscherlich)

1 pt $\text{Pb}(\text{NO}_3)_2$ dissolves in 1.989 pts H_2O at 17° and forms a liquid of 1.3978 sp gr (Karsten)

1 pt $\text{Pb}(\text{NO}_3)_2$ dissolves in 1.707 pts H_2O at 22.3° in 1.585 pts H_2O at 24.7° (Kopp)

Sol in 1.87 pts H_2O at 17.5° (Schiff A 109 326)

100 pts $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ sat at 102.2° contain 52.5 g $\text{Pb}(\text{NO}_3)_2$ 100 pt H_2O dissolve 110.526 pts $\text{Pb}(\text{NO}_3)_2$ (C riffs)

cold H_2O and much less hot H_2O (Wittstein)

100 pts boiling H_2O dissolve 13 pts $\text{Pb}(\text{NO}_3)_2$ (Ure s Diet)

100 pts $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ sat at $19-20^\circ$ contain 35.80 pts salt (v Hauer, W A B 53, 2 221)

1 pt dissolves
at 0° 10° 25° 45° 65° 85° 100°
in 2.58 2.07 1.65 1.25 0.99 0.83 0.72 pts H_2O

(Kremers, Pogg 92 497)

1 l $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ sat at 15° contains 461.49 g $\text{Pb}(\text{NO}_3)_2$ and 928.58 g H_2O , and has sp gr 1.39 (Michel and Krafft, A ch (3) 41 471)

Solubility in 100 pts H_2O at t°

t°	Pts $\text{Pb}(\text{NO}_3)_2$	t°	Pts $\text{Pb}(\text{NO}_3)_2$	t°	Pts $\text{Pb}(\text{NO}_3)_2$
0	36.5	36	65.9	72	99.7
1	37.4	37	66.7	73	100.7
2	38.3	38	67.6	74	101.7
3	39.1	39	68.5	75	102.6
4	39.8	40	69.4	76	103.6
5	40.5	41	70.3	77	104.6
6	41.2	42	71.2	78	105.6
7	42.0	43	72.1	79	106.6
8	42.8	44	73.0	80	107.6
9	43.6	45	74.0	81	108.6
10	44.4	46	74.9	82	109.6
11	45.2	47	75.9	83	110.6
12	46.0	48	76.8	84	111.5
13	46.8	49	77.7	85	112.5
14	47.5	50	78.7	86	113.5
15	48.3	51	79.6	87	114.5
16	49.1	52	80.5	88	115.4
17	49.9	53	81.5	89	116.4
18	50.7	54	82.4	90	117.4
19	51.5	55	83.3	91	118.4
20	52.3	56	84.3	92	119.4
21	53.1	57	85.2	93	120.3
22	53.9	58	86.1	94	121.3
23	54.7	59	87.1	95	122.3
24	55.6	60	88.0	96	123.2
25	56.4	61	89.0	97	124.2
26	57.3	62	90.0	98	125.2
27	58.1	63	90.9	99	126.1
28	59.0	64	91.9	100	127.0
29	59.8	65	92.8	101	128.0
30	60.7	66	93.8	102	128.9
31	61.6	67	94.8	103	129.9
32	62.4	68	95.7	104	130.9
33	63.3	69	96.7	104.7	131.5
34	64.1	70	97.7		
35	65.0	71	98.7		

(Mulder, Scheik Verhandel 1864 66)

100 g H_2O dissolve 52.76 g $\text{Pb}(\text{NO}_3)_2$ at 17° (Euler, Z phys Ch 1904, 49 315)

Solubility of $\text{Pb}(\text{NO}_3)_2$ in H_2O at $20^\circ = 152$ g mol per l Sp gr of sat solution = 1.419 (Fedotieff, Z anorg 1911, 73 178)

Sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 0° contains 26.7% $\text{Pb}(\text{NO}_3)_2$, at 18° , 29.1% $\text{Pb}(\text{NO}_3)_2$. (Myhus, Z anorg 1912, 74 411)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 19.5°

$\text{Pb}(\text{NO}_3)_2$ %	Sp gr	$\text{Pb}(\text{NO}_3)_2$ %	Sp gr
5	1.045	25	1.266
10	1.093	30	1.334
15	1.144	35	1.414
20	1.203		

(Kremers, calculated by Gerlach, Z anal 8 286)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 17.5°			
$\text{Pb}(\text{NO}_3)_2$	Sp gr	$\text{Pb}(\text{NO}_3)_2$	Sp gr
5	1.044	25	1.263
10	1.092	30	1.333
15	1.144	35	1.409
20	1.200	sat sol	1.433

(Gerlach, Z anal 27 283)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ sat at 8° = 1.372 (Anthon)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 17.5°			
$\text{Pb}(\text{NO}_3)_2$	Sp gr	$\text{Pb}(\text{NO}_3)_2$	Sp gr
1	1.0080	20	1.1902
2	1.0163	21	1.2016
3	1.0247	22	1.2132
4	1.0331	23	1.2251
5	1.0416	24	1.2372
6	1.0502	25	1.2495
7	1.0591	26	1.2620
8	1.0682	27	1.2747
9	1.0775	28	1.2876
10	1.0869	29	1.3007
11	1.0963	30	1.3140
12	1.1059	31	1.3276
13	1.1157	32	1.3416
14	1.1257	33	1.3558
15	1.1359	34	1.3702
16	1.1463	35	1.3848
17	1.1569	36	1.3996
18	1.1677	37	1.4146
19	1.1788		

(Schriff, calculated by Gerlach, Z anal 8 286)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at t°		
t°	% $\text{Pb}(\text{NO}_3)_2$	Sp gr
14	5	1.0451
14	10	1.0939
14.5	15	1.1468
14.3	20	1.2045
15	25	1.2678
15	32.28	1.3716

(Long, W Ann 1880, 11 40)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing17.93 32.22% $\text{Pb}(\text{NO}_3)_2$
1.1786 1.3619

(Wagner, W Ann 1883, 18 267)

Sp gr of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ at 25°	
Concentration of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1.1380
$1/2$ "	1.0699
$1/4$ "	1.0351
$1/8$ "	1.0175

(Wagner, Z phys Ch 1890, 5 36)

$\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ containing 15.93% $\text{Pb}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1.1558$
 $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ containing 30.57% $\text{Pb}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1.3436$
 $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ containing 30.69% $\text{Pb}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1.3465$
 (Le Blanc and Rohland, Z phys Ch 1896, 19 279)

Sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ boils at 103.5° (Kremers)Sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ boils at 102.2°, and contains 140 pts $\text{Pb}(\text{NO}_3)_2$ to 100 pts H_2O (Griffiths)Sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ boils at 103.5° (Gerlach, Z anal 26 427)B-pt of $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ containing pts $\text{Pb}(\text{NO}_3)_2$ to 100 pts H_2O , according to Gerlach (Z anal 26 449)

B-pt	Pts $\text{Pb}(\text{NO}_3)_2$	B-pt	Pts $\text{Pb}(\text{NO}_3)_2$
100.5°	11	102.5°	87
101	26	103	111
101.5	44	103.5	137
102	65		

Insol in conc $\text{HNO}_3 + \text{Aq}$ Solubility of $\text{Pb}(\text{NO}_3)_2 + \text{Ba}(\text{NO}_3)_2$ See under $\text{Ba}(\text{NO}_3)_2$ Solubility of $\text{Pb}(\text{NO}_3)_2 + \text{Cu}(\text{NO}_3)_2$ See under $\text{Cu}(\text{NO}_3)_2$ Sol in sat $\text{KNO}_3 + \text{Aq}$ without pptn, 100 pts H_2O at 18.75° dissolving 114 pts mixed salt, viz 84.1 pts $\text{Pb}(\text{NO}_3)_2$ and 29.9 pts KNO_3 (Karsten)100 pts H_2O dissolve 119.6 pts $\text{Pb}(\text{NO}_3)_2$ and 67.1 pts KNO_3 at 21.2° (Rudorff, B 6 484)100 g H_2O dissolve 95.39 g $\text{Pb}(\text{NO}_3)_2$ and 61.05 g KNO_3 at 20° (Le Blanc and Noyes Z phys Ch 1890, 6 386)Sol in sat $\text{NaNO}_3 + \text{Aq}$ without pptn, 100 pts H_2O at 18.75° dissolving 121.9 pts mixed salt, viz 87.8 pts $\text{Pb}(\text{NO}_3)_2$ and 34.1 pts NaNO_3 (Karsten)Solubility of $\text{Pb}(\text{NO}_3)_2 + \text{NaNO}_3$

Solid phase = $\text{Pb}(\text{NO}_3)_2$		
t° of saturation	% NaNO_3	% $\text{Pb}(\text{NO}_3)_2$
32	34.42	19.69
35.5	34.15	20.33
39.5	33.71	21.35
44	33.35	22.19
49.1	32.94	23.15
55	32.60	23.93
58	32.47	24.24
62	32.33	24.57
65	32.14	24.89

Solubility of $\text{Pb}(\text{NO}_3)_2 + \text{NaNO}_3$ —Continued

Solid phase = NaNO_3		
t° of saturation	% NaNO_3	% $\text{Pb}(\text{NO}_3)_2$
21	40 97	13 62
26 5	42 04	13 38
31	43 18	12 88
38 8	44 63	12 78
41	45 11	12 94
44 25	46 03	12 45
51	47 28	12 50
58	49 03	11 76
64	49 92	11 56

(Isaac, Chem Soc 1908, 93 398)

Also sol in $\text{KNO}_3 + \text{NaNO}_3 + \text{Aq}$
 100 pts sat $\text{Pb}(\text{NO}_3)_2 + \text{Sr}(\text{NO}_3)_2 + \text{Aq}$
 contain 45 98 pts of the two salts at $19\ 20^\circ$
 (v Hauer, J pr 98 137)

Solubility of $\text{Pb}(\text{NO}_3)_2 + \text{Sr}(\text{NO}_3)_2$ at 25°

G per 100 cc		Mol per cent in solid phase	
$\text{Pb}(\text{NO}_3)_2$	$\text{Sr}(\text{NO}_3)_2$	$\text{Pb}(\text{NO}_3)_2$	$\text{Sr}(\text{NO}_3)_2$
46 31	0	100	0
50 47	4 56	99 05	0 95
53 92	8 14	98 11	1 89
45 34	17 81	97 02	2 98
44 48	18 74	96 06	3 94
25 23	35 03	83 84	16 16
19 13	37 54	32 88	67 12
0	71 04	0	100

(Fock, Z Kryst Min 1897, 28 365)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

100 pts alcohol of 0 9282 sp gr dissolve

at 4° 8° 22° 40° 50°
 4 96 5 82 8 77 12 8 14 9 pts $\text{Pb}(\text{NO}_3)_2$
 (Gerardin, A ch (4), 5 129)

100 pts absolute methyl alcohol dissolve
 1 37 pts at $20\ 5^\circ$

100 pts absolute ethyl alcohol dissolve 0 04
 pt at $20\ 5^\circ$ (de Bruyn Z phys Ch 10 783)

Very sl sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

Insol in cold, sl sol in hot CS_2 (Arcetow sk, Z anorg 1894, 6 257)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 21)

Solubility of $\text{Pb}(\text{NO}_3)_2$ in pyridine at t°

t°	G $\text{Pb}(\text{NO}_3)_2$ per 100 g $\text{C}_5\text{H}_5\text{N}$	Solid phase
—19 4	2 93	$\text{Pb}(\text{NO}_3)_2, 4\text{C}_5\text{H}_5\text{N}$
—14 5	2 14	"
—10	1 90	"
0	3 54	"
5 4	3 93	"
8 7	5 39	"
14 72	6 13	"
19 97	6 78	"
24 75	8 56	"
30 03	10 98	"
34 97	13 20	"
40 03	16 94	"
45	22 03	"
49 97	29 37	"
51 tr pt		" + $\text{Pb}(\text{NO}_3)_2, 3\text{C}_5\text{H}_5\text{N}$
59 52	36 70	$\text{Pb}(\text{NO}_3)_2, 3\text{C}_5\text{H}_5\text{N}$
70	47 29	"
80	61 60	"
89 93	90 21	"
94 94	128 06	"
96 tr pt		" + $\text{Pb}(\text{NO}_3)_2, 2\text{C}_5\text{H}_5\text{N}$
99 89	143 36	$\text{Pb}(\text{NO}_3)_2, 2\text{C}_5\text{H}_5\text{N}$
104 90	152	"
109 90	163 80	"

(Walton and Judd, J Am Chem Soc 1911, 33 1036)

Lead mercurous nitrate, $2\text{PbO}, 2\text{Hg}_2\text{O}, 3\text{N}_2\text{O}_5$

Decomp by H_2O Sol in warm dil HNO_3 ,
 or $\text{Hg}(\text{NO}_3)_2 + \text{Aq}$ without decomp (Stadler, A 87 129)

Lead silver nitrate, $\text{Pb}(\text{NO}_3)_2, 2\text{AgNO}_3$

Sol in H_2O (Sturenberg, Pogg 74 115)

Lead silver nitrate iodide, $\text{Pb}(\text{NO}_3)_2, 8\text{AgNO}_3, 4\text{AgI}$

Decomp by H_2O (Sturenberg)

$\text{Pb}(\text{NO}_3)_2, 2\text{AgNO}_3, 2\text{AgI}$ Decomp by
 H_2O (Sturenberg)

Lead nitrate nitrite, basic, $4\text{PbO}, \text{N}_2\text{O}_5, \text{N}_2\text{O}_3 + 2\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3, \text{Pb}(\text{OH})\text{NO}$

Sl sol in cold, easily in hot H_2O Sol in
 80 pts H_2O at 23° (Chevreul), 85 pts at old
 temp (Bromeis, A 72 38), 10 6 pts at 100°
 (Chevreul)

+ $2\text{H}_2\text{O}$

Solubility in acetic acid

Normality of acid	$\frac{\text{g PbO per}}{100 \text{ cc at}} \frac{\text{solution}}{\text{solution}}$	Normality of acid	$\frac{\text{g PbO per}}{100 \text{ cc at}} \frac{\text{solution}}{\text{solution}}$
0	0 601	0 25	5 450
0 05	1 323	0 50	9 690
0 10	2 185	0 75	15 874

(Chilesotti, Att Acad Linc 1908, (5) 17, II 475)

Formula is $3\text{Pb}(\text{OH})\text{NO}_3$, $5\text{Pb}(\text{OH})\text{NO}_2 + \text{H}_2\text{O}$ (v Lorenz, W A B 84, 2 1133)
 $+3\text{H}_2\text{O}$ (v Lorenz)
 4PbO , N_2O_5 , $3\text{N}_2\text{O}_3 + 4\text{H}_2\text{O}$ Sol in H_2O (Bromeis)
 6PbO , N_2O_5 , $2\text{N}_2\text{O}_3 + 3\frac{1}{2}\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $2\text{Pb}(\text{OH})\text{NO}_2 + \frac{1}{2}\text{H}_2\text{O}$ (v Lorenz)
 6PbO , $2\text{N}_2\text{O}_5$, $\text{N}_2\text{O}_3 + 3\frac{1}{2}\text{H}_2\text{O} =$
 $2\text{Pb}(\text{OH})\text{NO}_3$, $\text{Pb}(\text{OH})\text{NO}_2 + \frac{1}{2}\text{H}_2\text{O}$ (v Lorenz)
 7PbO , N_2O_3 , $\text{N}_2\text{O}_5 + 3\text{H}_2\text{O}$ Less sol in
 H_2O than 4PbO , N_2O_5 , $\text{N}_2\text{O}_3 + 2\text{H}_2\text{O}$, sol in
 cold conc $\text{HNO}_3 + \text{Aq}$ (Peligot, A 39 338)
 8PbO , N_2O_5 , $3\text{N}_2\text{O}_3 + 4\frac{1}{2}\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $3\text{Pb}(\text{OH})\text{NO}_2 + \frac{1}{2}\text{H}_2\text{O}$ (v Lorenz)
 10PbO , N_2O_5 , $4\text{N}_2\text{O}_3 + 5\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $4\text{Pb}(\text{OH})\text{NO}_2$ (v Lorenz)
 12PbO , N_2O_5 , $5\text{N}_2\text{O}_3 + 6\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $5\text{Pb}(\text{OH})\text{NO}_2$ (v Lorenz)
 10PbO , N_2O_5 , $2\text{N}_2\text{O}_3 + 4\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $2\text{Pb}(\text{OH})\text{NO}_2$, $2\text{PbO} + \frac{1}{2}\text{H}_2\text{O}$ (v Lorenz)
 14PbO , N_2O_5 , $3\text{N}_2\text{O}_3 + 6\text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_3$,
 $3\text{Pb}(\text{OH})\text{NO}_2$, $3\text{PbO} + \text{H}_2\text{O}$ (Bromeis)
 14PbO , $3\text{N}_2\text{O}_5$, $\text{N}_2\text{O}_3 + 6\text{H}_2\text{O} =$
 $3\text{Pb}(\text{OH})\text{NO}_3$, $\text{Pb}(\text{OH})\text{NO}_2$, $3\text{PbO} + \text{H}_2\text{O}$
 (Bromeis)
 16PbO , $2\text{N}_2\text{O}_5$, $3\text{N}_2\text{O}_3 + 6\text{H}_2\text{O} =$
 $4\text{Pb}(\text{OH})\text{NO}_3$, $6\text{Pb}(\text{OH})\text{NO}_2$, 5PbO , $\text{Pb}(\text{OH})_2$
 (v Lorenz)
 16PbO , $3\text{N}_2\text{O}_5$, $5\text{N}_2\text{O}_3 + 10\text{H}_2\text{O} =$
 $3\text{Pb}(\text{OH})\text{NO}_3$, $5\text{Pb}(\text{OH})\text{NO}_2 + \text{H}_2\text{O}$ (v
 Lorenz)
 26PbO , $6\text{N}_2\text{O}_5$, $7\text{N}_2\text{O}_3 + 21\text{H}_2\text{O} =$
 $6\text{Pb}(\text{OH})\text{NO}_3$, $7\text{Pb}(\text{OH})\text{NO}_2 + 4\text{H}_2\text{O}$ (v
 Lorenz)

Lead nitrate phosphate, $\text{Pb}(\text{NO}_3)_2$, $\text{Pb}_3(\text{PO}_4)_2 + 2\text{H}_2\text{O}$

Completely insol in cold H_2O Decomp by boiling H_2O into its constituents Sol in a little conc $\text{HNO}_3 + \text{Aq}$ without decomp (Gerhardt, A 72 83)

Lead nitrate phosphite, $\text{Pb}(\text{NO}_3)_2$, PbHPO_3

Decomp by H_2O Sol in $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$ (33.3 g per litre) dissolves 1 g salt at 15° If less than 31 g per litre of $\text{Pb}(\text{NO}_3)_2$ are present the salt is decomp (Amat, A ch (6) 24 317)

Lead nitrate potassium nitrite, $\text{Pb}(\text{NO}_3)_2$, $2\text{KNO}_2 + \text{H}_2\text{O}$

Difficultly sol in H_2O (Lang, J B 1862 102)

3PbO , $3\text{K}_2\text{O}$, $4\text{N}_2\text{O}_3$, $2\text{N}_2\text{O}_5 + 3\text{H}_2\text{O}$ Sol in H_2O (Hayes, Sill Am J (2) 31 226)

Lithium nitrate, LiNO_3

Very deliquescent, and sol in H_2O

100 pts H_2O dissolve

at 0° 20° 40° 70° 100° 110°

48 3 75 7 169 4 196 1 227 3 256 4 pts LiNO_3

(Kremers, Pogg 99 47)

Forms supersaturated solutions with e , which crystallize when temp is lowered to $+1^\circ$ (Kremers, Pogg 92 520)

Sat solution boils at over 200° (Kremers, Pogg 99 43)

1 pt LiNO_3 dissolves in 200 pts HN (Schultz, Zeit Ch (2) 5 531)

100 pts of the sat solution contain at

64.2° 70.9°

64.9 66.1 pts anhydrous salt

(Donnan and Burt, Chem Soc 1903, 3 339)

See $+\frac{1}{2}\text{H}_2\text{O}$, and $3\text{H}_2\text{O}$

Sp gr of $\text{LiNO}_3 + \text{Aq}$ at 19.5° contain g pts LiNO_3 in 100 pts H_2O

12.7	14.2	26.4	41.8 pts LiN
1.069	1.077	1.134	1.197

54.8	57.5	77.4	79.4 pts LiN
1.245	1.255	1.315	1.319

(Kremers, Pogg 114 45)

Sp gr of $\text{LiNO}_3 + \text{Aq}$

g LiNO_3 in 1000 g of solution	Sp gr $16/16^\circ$
0	1.000000
4.8526	1.002469
10.9128	1.0055495
17.9016	1.009113

(Dijken, Z phys Ch 1897, 24 109)

Sp gr $20\frac{1}{4}^\circ$ of a normal solution of $\text{LiNO}_3 = 1.03803$, of a 0.5-normal solution = 1.0183 (Haigh, J Am Chem Soc 1912, 34 1151)

Very easily sol in liquid NH_3 (Franklin Am Ch J 1898, 20 828)

Sol in strong alcohol

Sol in acetone (Eidmann, C C 189 II 1014, Naumann, B 1904, 37 4328)

Solubility in acetone = 0.343 g mol per at 18° (Roshdestwensky and McBride Chem Soc 1911, 99 2140)

Insol in benzonitrile (Naumann, I 1914, 47 1370)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

$+\frac{1}{2}\text{H}_2\text{O}$ Solubility in H_2O

100 pts of the sat solution contain at

43.6° 50.5° 55.0° 60.0°

60.8 61.3 63.0 63.6 pts anhydrous salt

61.1° is the temp at which $\text{LiNO}_3 + \frac{1}{2}\text{H}_2\text{O}$ goes over into LiNO_3 (Donnan and Burt Chem Soc 1903, 83 339)

Solubility in H_2O

100 pts of the sat solution contain pts anhydrous salt at t°

t	Pts anhydrous salt
0 10	34 8
10 50	37 9
12 10	38 2
13 75	39 3
19 05	40 4
22 10	42 9
27 55	47 3
29 47	53 67
29 78	55 09
29 87	56 42
29 86	56 68
29 64	57 48
29 55	58 03

Mpt of $\text{LiNO}_3 + 3\text{H}_2\text{O}$ is 29 88°

(Donnan and Burt, Chem Soc 1903, 83 337)

Magnesium nitrate, basic, $\text{Mg}_3\text{N}_2\text{O}_8$

Insol in H_2O and alcohol Sol in acids (Chodnew, A 71 241)

$+5\text{H}_2\text{O}$ Decomp by H_2O (Didier, C R 1896, 122 936)

Magnesium nitrate, $\text{Mg}(\text{NO}_3)_2$

Anhydrous Deliquescent

Sol in 1 pt H_2O at 15 6° Sol in 4 pts abs alcohol at 15 6 and 2 pts at boiling temp Moresol in alcohol of 0 817 sp gr than in that of 0 900 (Kirwan)
Sol in 0 3458 pt strong alcohol at 82 5° (Wenzel)
Sol in 10 pts strong alcohol at 15° (Bergmann)
Sol in 9 pts strong alcohol on heating (Bergmann)

Solubility in H_2O in presence of the anhydrous salt

Sat solution contains at

89° 77 5° 67°
63 14 65 67 67 55% $\text{Mg}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 396)

See +6, and $9\text{H}_2\text{O}$

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 14°

% $\text{Mg}(\text{NO}_3)_2$ 6 H_2O	Sp gr	% $\text{Mg}(\text{NO}_3)_2$ 6 H_2O	Sp gr
1	1 0034	30	1 1347
5	1 0202	35	1 1649
10	1 0418	40	1 1909
15	1 0639	45	1 2176
20	1 0869	49	1 2397
25	1 1103		

(Oudemans, Z anal 7 419)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 21°

% $\text{Mg}(\text{NO}_3)_2$ +6 H_2O	Sp gr	% $\text{Mg}(\text{NO}_3)_2$ +6 H_2O	Sp gr
2	1 0078	28	1 1216
4	1 0158	30	1 1312
6	1 0239	32	1 1410
8	1 0321	34	1 1508
10	1 0405	36	1 1608
12	1 0490	38	1 1709
14	1 0577	40	1 1811
16	1 0663	42	1 1914
18	1 0752	44	1 2019
20	1 0843	46	1 2124
22	1 0934	48	1 2231
24	1 1026	50	1 2340
26	1 1120		

(Schriff, calculated by Gerlach, Z anal 8 286)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 18°

% $\text{Mg}(\text{NO}_3)_2$	Sp gr	% $\text{Mg}(\text{NO}_3)_2$	Sp gr
5	1 0378	15	1 1181
10	1 0763	17	1 1372

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

18 62 34 19 39 77% $\text{Mg}(\text{NO}_3)_2$
1 1025 1 2000 1 4298

(Wagner, W Ann 1883, 18 273)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0512
$\frac{1}{2}$ - "	1 0259
$\frac{1}{4}$ - "	1 0130
$\frac{1}{8}$ - "	1 0066

(Wagner, Z phys Ch 1890, 5 38)

Sp gr of solution sat at 18° = 1 384, containing 43 1% $\text{Mg}(\text{NO}_3)_2$ (Mylhus, B 1897, 30 1718)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$

$\frac{1}{2}$ $\text{Mg}(\text{NO}_3)_2$ g in 1000 g of solution	Sp gr 16°/16°
0	1 000000
0 8099	1 000660
1 5621	1 001253
3 3398	1 002539
7 4410	1 005523
15 161	1 011151
29 356	1 021580
58 353	1 043329
81 025	1 060773

(Dijken, Z phys Ch 1897, 24 107)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 20°
 p = per cent strength of solution, d = observed density, w = volume concentration in grams per cc ($\frac{pd}{100} = w$)

p	d	w
35 02	1 3110	0 46695
31 15	1 2655	0 39420
25 03	1 2057	0 30172
19 55	1 1551	0 22585
13 43	1 1023	0 14815
10 09	1 0753	0 10850
6 650	1 0480	0 06968
4 672	1 0330	0 04826
4 001	1 0276	0 04112
1 372	1 0085	0 01383

(Barnes J phys Chem 1898, 2 545)

Sp gr of $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 20° containing
 M g mols of salt per liter
 M 0 02 0 05 0 10 0 15
 Sp gr 1 00224 1 005626 1 011118 1 016557

M 0 20 0 50 1 00 1 274
 Sp gr 1 022026 1 054804 1 107865 1 136615
 (Jones and Pearce, Am Ch J 1907, 38 707)

Less sol in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ than in H_2O (Dijonval)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)
 $+2\text{H}_2\text{O}$ Mpt 127° (Wasiljew, C C 1909, II 1966)

$+4\text{H}_2\text{O}$ Mpt 45.5° (W)
 $+6\text{H}_2\text{O}$ Deliquescent Sol in H_2O and alcohol Sol in 0.5 pt cold H_2O , and 9 pts cold alcohol of 0.84 sp gr, very sl sol in abs alcohol (Graham)

Melts in its crystal H_2O at 90° , and the resulting liquid boils at 143.4° (Ordway, Sil Am J (2) 27 14)

Solubility in H_2O

Sat solution contains at

-18° -4.5° 0° 18°
 38 03 39 50 39 96 42 33% $\text{Mg}(\text{NO}_3)_2$,
 40° 80° 90° (mpt)
 45 87 53 69 57 81% $\text{Mg}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 395)

$+9\text{H}_2\text{O}$ Solubility in H_2O

Sat solution contains at

-23° -20.5° -18°
 35 44 36 19 38 03% $\text{Mg}(\text{NO}_3)_2$

Cryohydrate is formed at -29° (Funk, Z anorg 1899, 20 398)

Magnesium neodymium nitrate, $3\text{Mg}(\text{NO}_3)_2$, $2\text{Nd}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 97.7 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 303)

Magnesium praseodymium nitrate, $3\text{Mg}(\text{NO}_3)_2$, $2\text{Pr}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 77.0 g hydrous salt at 16° (Jantsch)

Magnesium samarium nitrate, $3\text{Mg}(\text{NO}_3)_2$, $\text{Sm}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$

(Demarçay, C R 1900, 130 1187)
 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 24.55 g hydrous salt at 16° (Jantsch)

Magnesium thorium nitrate, $\text{MgTh}(\text{NO}_3)_6 + \text{H}_2\text{O}$

Hydroscopic, sol in HNO_3 (Meyer, Z anorg 1901, 27 385)

Magnesium nitrate ammonia, $\text{Mg}(\text{NO}_3)_2$, 6NH_3

Sl sol in liquid NH_3 (Franklin, J A Chem Soc 1913, 35 1459)

Manganous nitrate, basic, 2MnO , N_2O $+ 3\text{H}_2\text{O}$

Sol in H_2O (Gorgeu)

Manganous nitrate, $\text{Mn}(\text{NO}_3)_2$

Deliquescent Easily sol in H_2O & c alcohol

See +3, and $6\text{H}_2\text{O}$

Sp gr of $\text{Mn}(\text{NO}_3)_2 + \text{Aq}$ at 8°

% $\text{Mn}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$	Sp gr	% $\text{Mn}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$	Sp gr
5	1 0253	45	1 270
10	1 0517	50	1 304
15	1 0792	55	1 345
20	1 1078	60	1 386
25	1 1137	65	1 428
30	1 1688	70	1 472
35	1 2012	71	1 481
40	1 2352		

(Oudemans, Z anal 7 421)

Sp gr of aqueous solutions containing

10 20 30 % $\text{Mn}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$
 6 237 12 474 18 711% $\text{Mn}(\text{NO}_3)_2$,
 1 052 1 107 1 165

40 50 60 % $\text{Mn}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$
 24 948 31 185 37 422% $\text{Mn}(\text{NO}_3)_2$,
 1 230 1 302 1 381

70 80 % $\text{Mn}(\text{NO}_3)_2 + 6\text{H}_2\text{O}$
 43 659 49 896% $\text{Mn}(\text{NO}_3)_2$,
 1 466 1 558

(Gerlach, Z anal 28 477)

Sp gr of $\text{Mn}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

18 309 29 602 49 309% $\text{Mn}(\text{NO}_3)_2$
 1 1482 1 3227 1 5056

(Wagner, W Ann 1883, 18 271)

Sp gr of $\text{Mn}(\text{NO}_3)_2 + \text{Aq}$ at 25°	
Concentration of $\text{Mn}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0690
$\frac{1}{2}$ - " "	1 0349
$\frac{1}{4}$ - " "	1 0174
$\frac{1}{8}$ - " "	1 0093

(Wagner, Z phys Ch 1890, 5 39)

Sol in liquid NH_3 (Guntz, Bull Soc 1909, (4) 5 1006)Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)+ H_2O Deliquescent (Guntz, Bull Soc 1909 (4) 5 1005)+ $3\text{H}_2\text{O}$ From solution in HNO_3 (Schultz-Sellack, Zeit Ch 1870 646)Solubility in H_2O

Sat solution contains at

27°	29°	30°	34°	35°	mpt
65 66	66 99	67 38	71 31	76 82%	$\text{Mn}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 403)

+ $6\text{H}_2\text{O}$ Melts in its crystal H_2O at 25.8° and boils at 129.4° (Ordway)Solubility in H_2O

Sat solution contains at

-29°	-26°	-21°	-16°	-5°
42 29	43 15	44 30	45 52	48 88%

 $\text{Mn}(\text{NO}_3)_2$

0°	$+11^\circ$	18°	25.8°	mpt
50 49	54 50	57 33	62 37%	$\text{Mn}(\text{NO}_3)_2$

Cryohydrate is formed at -36° (Funk, Z anorg 1899, 20 403)**Manganous neodymium nitrate**, $3\text{Mn}(\text{NO}_3)_2, 2\text{Nd}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$ 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 296 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 303)**Manganous praseodymium nitrate**, $3\text{Mn}(\text{NO}_3)_2, 2\text{Pr}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$ 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 234 g hydrous salt at 16° (Jantsch)**Manganous samarium nitrate**, $3\text{Mn}(\text{NO}_3)_2, 2\text{Sm}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$ 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325) contains 50.04 g hydrous salt at 16° (Jantsch)**Manganous thorium nitrate**, $\text{MnTh}(\text{NO}_3)_6 + 8\text{H}_2\text{O}$

Ppt (Meyer, Z anorg 1901, 27 388)

Manganous nitrate cupric oxide, $\text{Mn}(\text{NO}_3)_2, 3\text{CuO} + 3\text{H}_2\text{O}$

Ppt (Mailhe, C R 1902, 134 234)

Manganous nitrate hydrazine, $\text{Mn}(\text{NO}_3)_2, 2\text{N}_2\text{H}_4$ Not decomp by H_2O (Franzen, Z anorg 1908, 60 286)**Mercurous nitrate, basic**, $2\text{Hg}_2\text{O}, \text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Ppt Decomp by boiling with H_2O (Marignac, A ch (3) 27 332)Slowly sol in cold, rapidly in hot $\text{HCl} + \text{Aq}$, insol in NH_4Cl and $\text{NH}_4\text{NO}_3 + \text{Aq}$ + $10\text{H}_2\text{O}$ Slowly sol in normal HNO_3 (Reuss, Dissert 1886) $4\text{Hg}_2\text{O}, 3\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Sol in a small quantity of H_2O , decomp by a large amt of H_2O or by warm H_2O (Rose, Pogg 83 154)Is $3\text{Hg}_2\text{O}, 2\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ according to Gerhardt+ $5\text{H}_2\text{O}$ (Reuss, Dissert 1886) $5\text{Hg}_2\text{O}, 3\text{N}_2\text{O}_5 + 2\text{H}_2\text{O}$ (Marignac) Is $2\text{Hg}_2\text{O}, \text{N}_2\text{O}_5 + \text{H}_2\text{O}$ (Lefort, A 56 247)Sol in boiling, less sol in cold H_2O (Marignac, l c)+ $4\text{H}_2\text{O}$, and + $6\text{H}_2\text{O}$ (Reuss, Dissert 1886) $8\text{Hg}_2\text{O}, 5\text{N}_2\text{O}_5 + 5\text{H}_2\text{O}$, and + $11\text{H}_2\text{O}$ (Reuss) $11\text{Hg}_2\text{O}, 6\text{N}_2\text{O}_5 + 25\text{H}_2\text{O}$ (Reuss) $16\text{Hg}_2\text{O}, 9\text{N}_2\text{O}_5 + 19\text{H}_2\text{O}$, + $23\text{H}_2\text{O}$, and + $31\text{H}_2\text{O}$ (Reuss) $3\text{Hg}_2\text{O}, \text{N}_2\text{O}_5 + 2\text{H}_2\text{O}$ (Cox, Z anorg 1904, 40 177)**Mercurous nitrate**, Hg_2NO_3 Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)Fairly sol in boiling CS_2 (Arcetowski, Z anorg 1894, 6 257)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methylamine (Franklin, J Am Chem Soc 1906, 28 1419)

+ H_2O Completely sol in a little warm H_2O , but decomp by more H_2O Completely sol as acid salt in H_2O containing HNO_3 (Marignac, A ch (3) 27 332)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

+ $1\frac{1}{4}\text{H}_2\text{O}$, + $1\frac{1}{2}\text{H}_2\text{O}$, + $1\frac{1}{2}\text{H}_2\text{O}$, etc (Reuss, Dissert 1896)**Mercuric nitrate, basic**, $6\text{HgO}, \text{N}_2\text{O}_5 (?)$ Insol in hot H_2O (Kane) $3\text{HgO}, \text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Decomp to oxide by washing with cold H_2O Sol in dil $\text{HNO}_3 + \text{Aq}$ (Millon, A ch (3) 18 361) $2\text{HgO}, \text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Sl deliquescent Decomp by H_2O , sol in dil $\text{HNO}_3 + \text{Aq}$ (Millon)+ $2\text{H}_2\text{O}$ Decomp by cold H_2O Deliquescent Sol in H_2O containing HNO_3 (Marignac)+ $3\text{H}_2\text{O}$ (Ditte, J B 1854 366)**Mercuric nitrate**, $\text{Hg}(\text{NO}_3)_2$ Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Neither dissolved nor attacked by liquid NO_2 (Frankland, Chem Soc 1901, **79** 1361)

Sol in benzonitrile (Naumann, B 1914, **47** 1369)

Sol in acetone (Naumann, B 1904, **37** 4328)

Difficultly sol in ethyl acetate (Naumann, B 1910, **43** 314)

Sol in methylal (Eidmann, C C 1899 II, 1014)

+ $\frac{1}{2}\text{H}_2\text{O}$ Deliquescent Very sol in a little H_2O H_2O precipitates basic salt from conc $\text{Hg}(\text{NO}_3)_2 + \text{Aq}$ Insol in alcohol Decomposed by ether (Millon)

+ H_2O Extraordinarily sol in H_2O (Cox, Z anorg 1904, **40** 159)

+ $8\text{H}_2\text{O}$ Melts at 6° in crystal H_2O (Ditte)

Mercuriomercuric nitrate, Hg_2O , 2HgO , N_2O_5

Boiling H_2O gradually dissolves out $\text{Hg}_2(\text{NO}_3)_2$, and leaves residue of HgO and Hg (Brooks, Pogg **66** 63)

$2\text{Hg}_2\text{O}$, HgO , $\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ (Rây, Chem Soc 1905, **87** 175)

Hg_2O , 2HgO , $\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ (Rây)

Mercurous hydrogen nitrate, 4HgNO_3 , HNO_3 , + $8\text{H}_2\text{O}$

(Reuss, Dissert 1886)

5HgNO_3 , $3\text{HNO}_3 + 26\text{H}_2\text{O}$ (Reuss)

Mercuric silver nitrate, $\text{Hg}(\text{NO}_3)_2$, 2AgNO_3

Easily sol in H_2O without decompos (Berzelius)

Mercurous strontium nitrate, 2SrO , $2\text{Hg}_2\text{O}$, $3\text{N}_2\text{O}_5$

Decomp by H_2O Much more sol in H_2O than the corresponding Ba compound

Readily sol in warm dil $\text{HNO}_3 + \text{Aq}$ or $\text{Hg}_2(\text{NO}_3)_2 + \text{Aq}$ without decomposition (Stadeler, A **87** 131)

Mercurous thallous nitrate, HgNO_3 , TiNO_3

Miscible with H_2O (Retgers, N Jahrb Miner, 1896 II, 183)

Mercuric nitrate bromide, $\text{Hg}(\text{NO}_3)_2$, HgBr_2 (Morse, Z phys Ch 1902, **41** 733)

Mercuric nitrate cadmium oxide, $\text{Hg}(\text{NO}_3)_2$, $\text{CdO} + 2\text{H}_2\text{O}$

Ppt (Mailhe, Bull Soc 1901, (3) **25** 788) + $3\text{H}_2\text{O}$ Decomposed by H_2O (Mailhe)

Mercuric nitrate cobaltous oxide, $\text{Hg}(\text{NO}_3)_2$, $\text{CoO} + 3\text{H}_2\text{O}$

Ppt (Mailhe, C R 1901, **132** 1275)

+ $4\text{H}_2\text{O}$ Decomposed by H_2O (Mailhe, A ch 1902, (7) **27** 369)

Mercuric nitrate cupric oxide, $\text{Hg}(\text{NO}_3)_2$, $\text{CuO} + 2\text{H}_2\text{O}$, and + $4\text{H}_2\text{O}$

(Mailhe, Bull Soc 1901, (3) **25** 791)

+ $5\text{H}_2\text{O}$ Decomposed by H_2O (Mailhe, A ch 1902, (7) **27** 365)

Mercuric nitrate cyanide, $\text{Hg}(\text{NO}_3)_2$, $\text{Hg}(\text{CN})_2$

Very sol in H_2O Very sol in methyl alcohol and solution is not decomposed at bp Ethyl alcohol apparently decomposed it (Prussia, Gazz ch it 1898, **28** (2) 115)

Mercurous nitrate hydrazine, 2HgNO_3 , N_2H_4

Decomposed by H_2O Stable in dil HNO_3 , Aq solution (Hofmann and Marburg, A 1899, **305** 215)

Ppt, very unstable (Hofmann, B 1897, **30** 2021)

$\text{Hg}(\text{NO}_3)_2$, N_2H_4 Sol in dil HCl and HNO_3 (Hofmann and Marburg, A 1897, **305** 215)

Ppt, sol in acids, decomposed by alkali (Hofmann, B 1897, **30** 2021)

Mercuric nitrate iodide, $\text{Hg}(\text{NO}_3)_2$, 2HgI_2

Decomposed by long boiling with H_2O (Rau, gel, Jahrb Pharm **11** 396)

$2\text{Hg}(\text{NO}_3)_2$, 3HgI_2 Easily decomposed by H_2O , less easily by alcohol or ether (Riegel, $\text{Hg}(\text{NO}_3)_2$, HgI_2 Decomposed very quickly by $\text{HNO}_3 + \text{Aq}$ or alcohol of 0.814 sp g (Souville, J Pharm **26** 474)

Mercuric nitrate manganous oxide, $\text{Hg}(\text{NO}_3)_2$, $\text{MnO} + 2\text{H}_2\text{O}$

Decomposed by H_2O (Mailhe, Bull Soc 1901, (3) **25** 790)

+ $3\text{H}_2\text{O}$ (Mailhe)

+ $4\text{H}_2\text{O}$ (Mailhe, A ch 1902, (7) **27** 370)

Mercuric nitrate nickel oxide, $\text{Hg}(\text{NO}_3)_2$, $\text{NiO} + 2\text{H}_2\text{O}$

(Mailhe, Bull Soc 1901, (3) **25** 788)

+ $4\text{H}_2\text{O}$ Decomposed by H_2O (Mailhe, A ch 1902, (7) **27** 369)

Mercurous nitrate phosphate, HgNO_3 , $\text{Hg}_3\text{PO}_4 + \text{H}_2\text{O}$

Insol in H_2O , but decomposed by boiling with H_2O with $\text{H}_3\text{PO}_4 + \text{Aq}$ or alcohol Completely sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$ Decomposed by cold $\text{KOH} + \text{Aq}$, and warm $\text{K}_2\text{CO}_3 + \text{Aq}$ (Wittstein)

2HgNO_3 , Hg_2O , $5\text{Hg}_3\text{PO}_4 + \text{H}_2\text{O}$ (Haael, A **262** 192)

Mercuric nitrate silver bromide, $\text{Hg}(\text{NO}_3)_2$, AgBr

(Morse, Z phys Ch 1902, **41** 733)

Mercuric nitrate silver cyanide, basic,
 $\text{Hg}(\text{OH})\text{NO}_3, \text{AgCN} + 2\text{H}_2\text{O}$
 (Schmidt, Z anorg 1895, 9 431)
 $\text{Hg}(\text{OH})\text{NO}_3, 5\text{Ag}_2\text{O}, 20\text{AgCN} + 7\text{H}_2\text{O}$
 (Schmidt)

Mercuric nitrate silver iodide, $\text{Hg}(\text{NO}_3)_2$,
 $2\text{AgI} + \frac{1}{2}\text{H}_2\text{O}$
 Decomp by H_2O (Preuss, A 29 328)

Mercuric nitrate sulphide, $\text{Hg}(\text{NO}_3)_2, 2\text{HgS}$
 Very sl sol in hot H_2O Insol in $\text{HNO}_3 + \text{Aq}$
 Decomp by hot H_2SO_4 or aqua regia,
 also by hot $\text{HCl} + \text{Aq}$ (Barfoed, J pr 93 230)

Sol in aqua regia (Denigès, Bull Soc 1915, (4) 17 355)
 $2\text{Hg}(\text{NO}_3)_2, \text{HgO}, 6\text{HgS} + 12\text{H}_2\text{O}$ Insol
 in H_2O , and $\text{HNO}_3 + \text{Aq}$ of 1 2 sp gr (Gramp, J pr (2) 14 299)

Mercuric nitrate zinc oxide, $\text{Hg}(\text{NO}_3)_2, \text{ZnO} + \text{H}_2\text{O}$

Ppt Decomp by H_2O (Mailhe, C R 1901, 132 1274)

Molybdenum nitrate, $\text{Mo}_2\text{O}_5, \text{N}_2\text{O}_5$ (?)
 Sol in dil $\text{HNO}_3 + \text{Aq}$ (Berzelius)
 $\text{MoO}_2, 2\text{N}_2\text{O}_5$ (?) Sol in dil $\text{HNO}_3 + \text{Aq}$
 (Berzelius)

Neodymium nickel nitrate, $2\text{Nd}(\text{NO}_3)_3$,
 $3\text{Ni}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$
 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325)
 contains 116 6 g hydrous salt at 16°
 (Jantsch, Z anorg 1912, 76 303)

Neodymium rubidium nitrate, $[\text{Nd}(\text{NO}_3)_3]\text{Rb}_2$
 $+ 4\text{H}_2\text{O}$
 Hygroscopic (Jantsch, Z anorg 1911, 69 230)

Neodymium zinc nitrate, $2\text{Nd}(\text{NO}_3)_3$,
 $3\text{Zn}(\text{NO}_3)_2 + 24\text{H}_2\text{O}$
 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1 325)
 contains 177 g hydrous salt at 16°
 (Jantsch)

Nickel nitrate, basic
 Insol in H_2O (Proust)
 $9\text{NiO}, 2\text{N}_2\text{O}_5 + 5\text{H}_2\text{O}$ Insol in cold or hot
 H_2O (Habermann, M 5 432)
 $5\text{NiO}, \text{N}_2\text{O}_5 + 4\text{H}_2\text{O}$ Not decomp by boil-
 ing H_2O (Roussseau and Tite, C R 114 1184)

Nickel nitrate, $\text{Ni}(\text{NO}_3)_2$
 Solubility in H_2O See +3, 6, and $9\text{H}_2\text{O}$
 Sp gr of aqueous solution at 17.5° contain-
 ing

5	10	15	20	% $\text{Ni}(\text{NO}_3)_2$
1 0463	1 0903	1 1375	1 1935	
25	30	35	40	% $\text{Ni}(\text{NO}_3)_2$
1 2534	1 3193	1 3896	1 4667	

(Franz, J pr (2) 5 295)

Sp gr of $\text{Ni}(\text{NO}_3)_2 + \text{Aq}$ containing g
 $\text{Ni}(\text{NO}_3)_2$ (anhydrous) in 1000 g H_2O at
 24.4°

91 5 g (= $\frac{1}{2}$ mol) 183 274 5 369 460 5 549
 1 073 1 141 1 205 1 266 1 324 1 378

(Gerlach, Z anal 28 468)

Sp gr of $\text{Ni}(\text{NO}_3)_2 + \text{Aq}$ at room temp
 containing

16 493 30 006 40 953% $\text{Ni}(\text{NO}_3)_2$
 1 1363 1 2776 1 3879

(Wagner, W Ann 1883, 18 269)

Sp gr of $\text{Ni}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Ni}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0755
$\frac{1}{2}$ - "	1 0381
$\frac{1}{4}$ - "	1 0192
$\frac{1}{8}$ - "	1 0096

(Wagner, Z phys Ch 1890, 5 39)

Sp gr at 20° of $\text{Ni}(\text{NO}_3)_2 + \text{Aq}$ containing
 M g mols of salt per liter

M 0 01 0 025 0 05 0 075
 Sp gr 1 001521 1 003882 1 007792 1 011541

M 0 1 0 25 0 5 0 75
 Sp gr 1 015307 1 03837 1 07611 1 11310

M 1 0 1 5 2 0
 Sp gr 1 14562 1 22134 1 29459

(Jones and Pearce, Am Ch J 1907, 38 720)

Sol in liquid NH_3 (Guntz, Bull Soc 1909 (4) 5 1008)

Moderately sol in liquid NH_3 (Franklin,
 Am Ch J 1898, 20 828)

Solubility in glycol = 7 5% (de Coninck,
 C C 1905, II 1234)

Insol in benzonitrile (Naumann, B 1914,
 47 1370)

+ $3\text{H}_2\text{O}$ Solubility in H_2O

Sat solution contains at

58° 60° 64° 70°

61 61 61 99 62 76 63 95% $\text{Ni}(\text{NO}_3)_2$,

90° 95° mpt

70 16 77 12% $\text{Ni}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 411)

+ $6\text{H}_2\text{O}$ Not deliquescent in dry air Sol
 in 2 pts cold H_2O and in alcohol (Tupputi)
 Mpt of $\text{Ni}(\text{NO}_3)_2 + 6\text{H}_2\text{O} = 56.7^\circ$ (Ord-
 way, Tilden, Chem Soc 45 409)

Sat solution boils at 136.7° (Ordway)

Solubility in H_2O

Sat solution contains at

-21° -12.5° -10° -6°
 39 94 41 59 42 11 43 00% $\text{Ni}(\text{NO}_3)_2$,

0° $+20^\circ$ 41° 56.7° mpt
 44 32 49 06 55 22 62 76% $\text{Ni}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 410)

Sat solution of $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ contains 44.3% $\text{Ni}(\text{NO}_3)_2$ at 0° , and 48.7% $\text{Ni}(\text{NO}_3)_2$ at 18° (Mylius, Z anorg 1912, 74 411)
 Sp gr of $\text{Ni}(\text{NO}_3)_2 \cdot \text{Aq}$ containing in 1000 g H_2O at 24.4° , g $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$
 145.5 g (= $\frac{1}{2}$ mol) 291 436.5 582
 1 069 1 128 1 179 1 224

727.5 873 1018.5 1164
 1 264 1 299 1 329 1 357
 (Gerlach, Z anal 28 468)

Sol in $\text{NH}_4\text{OH} + \text{Aq}$
 Insol in absolute alcohol
 Sl sol in acetone (Krug and M'Elroy)
 Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)
 Insol in ethyl acetate (Naumann, B 1910, 43 314)
 + $9\text{H}_2\text{O}$ Solubility in H_2O
 Sat solution contains at
 -23° -21° -10.5°
 39.02 39.48 44.13% $\text{Ni}(\text{NO}_3)_2$
 Cryohydrate is formed at -27° (Funk, Z anorg 1899, 20 411)

Nickel praseodymium nitrate, $3\text{Ni}(\text{NO}_3)_2 \cdot 3\text{Pr}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$
 solution in $\text{HNO}_3 + \text{Aq}$ (sp gr contains 9.28 g hydrous salt at 16°)
 (Funk, Z anorg 1912, 76 303)

Nickel samarium nitrate, $3\text{Ni}(\text{NO}_3)_2 \cdot 2\text{Sm}(\text{NO}_3)_3 + 24\text{H}_2\text{O}$
 1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 29.11 g hydrous salt at 16° (Jantsch)

Nickel thorium nitrate, $\text{NiTh}(\text{NO}_3)_6 + 8\text{H}_2\text{O}$
 Sol in $\text{HNO}_3 + \text{Aq}$ (Meyer, Z anorg 1901, 27 387)

Nickel uranyl nitrate, $10\text{Ni}(\text{NO}_3)_2 \cdot 3(\text{UO}_2)(\text{NO}_3)_2$
 Sol in H_2O and acids, insol in aq alkali (Lancien, C C 1912, I 208)

Nickel nitrate ammonia, $\text{Ni}(\text{NO}_3)_2 \cdot 4\text{NH}_3 + 2\text{H}_2\text{O}$
 Efflorescent Easily sol in cold H_2O , decomp by boiling Insol in alcohol (Erdmann, J pr 97 395, Ephraim, B 1913, 46 3106)
 + $1\frac{1}{2}\text{H}_2\text{O}$ (André, C R 106 936)

Nickel nitrate chloride ammonia, $6\text{Ni}(\text{NO}_3)_2 \cdot \text{NiCl}_2 \cdot 30\text{NH}_3 + 16\text{H}_2\text{O}$
 Sol in H_2O with decomp (Schwarz, W A B 1850 272)

Nickel nitrate cupric oxide, $\text{Ni}(\text{NO}_3)_2 \cdot 3\text{CuO} + 3\text{H}_2\text{O}$
 Ppt (Mahle, C R 1902, 134 234)

Nickel nitrate hydrazine, $\text{Ni}(\text{NO}_3)_2 \cdot 3\text{N}_2\text{H}_4$
 Insol in H_2O Decomp by hot H_2O
 Easily sol in dil acids (Franzen, Z anorg 1908, 60 267)

Palladium nitrate, basic, $\text{Pd}(\text{NO}_3)_2 \cdot 3\text{F} + 4\text{H}_2\text{O}$
 Ppt Insol in H_2O (Kane)

Palladium nitrate, $\text{Pd}(\text{NO}_3)_2 + x\text{H}_2\text{O}$
 Very deliquescent, and sol in H_2O decomp by much H_2O or alcohol (Kane)
 Decomp by cold or hot H_2O (Rose, A 3 143)

Platinic nitrate, $\text{Pt}(\text{NO}_3)_4$ (?)
 Known only in solution, which is decomposed on evaporating (Berzelius)
 $\text{Pt}(\text{NO}_3)_2 \cdot 3\text{PtO}_2 + 5\text{H}_2\text{O}$ Insol in F (Prost, Bull Soc (2) 46 156)

Platinum nitrate sulphocarbamide, $\text{Pt}(\text{NO}_3)_2 \cdot 4\text{CS}(\text{NH}_2)_2$
 Very sol in H_2O Unstable (Kurnok, J pr 1894, (2) 50 490)

Potassium nitrate, KNO_3
 Not deliquescent, but, according to Mulder, 100 pts KNO_3 under a bell jar with H_2O take up 339 pts H_2O in 22 days, and small amounts finally deliquesce completely
 Sol in H_2O with absorption of heat
 16 pts $\text{KNO}_3 + 100$ pts H_2O at 13.2° lower the temperature 10.2° If the initial temperature is 23° it falls to 12.8° , if 0° it does not fall below -2.7° , which is the freezing-point of the mixture (Rudorff, Pogg 136 276)

$\text{KNO}_3 + \text{Aq}$ sat at 18.1° has 1.1601 sp gr and contains 22.72% KNO_3 or 100 pts H_2O at 18.1° dissolve 29.45 pts KNO_3 (Karsten 1840)

Sol in 3.745 pts H_2O at 15° (Gerlach)
 Sol in 3 pts H_2O at 21° (Schniff A 109 326) and solution has 1.1683 sp gr
 Sol in 3 pts cold and 0.5 pt boiling H_2O (our cryo)

$\text{KNO}_3 + \text{Aq}$ sat at 18° has sp gr 1.161 and contains 21.63% KNO_3 or 100 pts H_2O dissolve 27.61 pts KNO_3 at 18°
 Sol in 4 pts H_2O at 16° and 0.2 pt at 10° (Rifault)

100 pts H_2O at 114° dissolve 284.61 pts (Crichton)

Sol in 7 pts cold and 1 pt boiling H_2O (Erdmann)
 Sol in 6.15 pts cold H_2O at 18.7° (Abel)
 100 pts H_2O at 15° dissolve 26.6 pts at 10° (Ure's Dictionary)

$\text{KNO}_3 + \text{Aq}$ sat at 10° contains 33.3% (1 lb in 1 lb H_2O)
 $\text{KNO}_3 + \text{Aq}$ sat in the cold contains 22.7% (our cryo)
 $\text{KNO}_3 + \text{Aq}$ sat at 12.5° contains 24.8% (Hsenfratz)

Solubility of KNO_3 in 100 pts H_2O t°

t°	Pts KNO_3	t	1 ts 1	NO_3
0	13.2	45.10	7	7
5	16.7	54.72	9	1
11.67	22.2	65.45	12	5
17.91	29.3	79.72	16	2
24.94	38.4	97.66	23	4

(Gay-Lussac, A ch 11 314)

Solubility of KNO_3 in 100 pts H_2O at t°

t°	Pts KNO_3
16 0	26 7
29	43 5
44 2	71 4

(Nordenskjold, Pogg 136 312)

100 pts H_2O dissolve at
 10° 18° 27° 41° 53°
 21 2 27 9 40 1 66 3 93 3 pts KNO_3
 (Gerardin, A ch (4) 5 150)

100 pts KNO_3 +Aq sat at 14° contain
 16 34 pts KNO_3 , at 15° , 18 81 pts KNO_3
 (v Hauer, J pr 98 177)

100 pts H_2O dissolve at
 4° 16 3° 68 3°
 16 27 2 132 1 pts KNO_3
 (Andreae, J pr (2) 29 456)

Solubility in 100 pts H_2O at t°

t°	Pts KNO_3	t°	Pts KNO_3	t°	Pts KNO_3
0	13 3	39	62	78	165
1	13 8	40	64	79	168
2	14 6	41	66	80	172
3	15 5	42	68	81	175
4	16 4	43	70	82	179
5	17 1	44	72	83	182
6	17 8	45	74	84	185
7	18 5	46	76	85	189
8	19 3	47	78	86	192
9	20 2	48	81	87	196
10	21 1	49	83	88	199
11	22 0	50	86	89	203
12	23 0	51	88	90	206
13	24 0	52	91	91	210
14	25 0	53	93	92	214
15	26 0	54	96	93	218
16	27 0	55	98	94	222
17	28 1	56	101	95	226
18	29 1	57	103	96	230
19	30 2	58	106	97	234
20	31 2	59	108	98	238
21	32 3	60	111	99	243
22	33 5	61	113	100	247
23	34 7	62	116	101	252
24	36 0	63	119	102	256
25	37 3	64	121	103	261
26	38 6	65	124	104	266
27	40 0	66	127	105	272
28	41 4	67	130	106	278
29	42 9	68	133	107	284
30	44 5	69	136	108	289
31	46 0	70	139	109	295
32	48	71	142	110	301
33	50	72	146	111	307
34	52	73	149	112	313
35	54	74	152	113	319
36	56	75	155	114	326
37	58	76	159	114 1	327 4
38	60	77	162		

(Mulder, Scheik Verhandel 1864 89)

100 pts H_2O dissolve 493 pts KNO_3 at
 125° (Tilden and Shenstone, Phil Trans
 1884 23)

Rhombohedral KNO_3 is more easily soluble
 than the prismatic, and easily forms super-
 saturated solutions (Frankenheim)

Sat KNO_3 +Aq contains at

139° 158° 160° 175° 180°
 79 8 83 7 83 9 84 0 84 2% KNO_3

190° 215° 225° 258° 283°
 86 0 89 0 90 4 91 6 96 5% KNO_3

(Étard, A ch 1894, (7) 2 526)

Solubility in 100 pts H_2O at t°

t°	G KNO_3	Sp gr $t^\circ/4^\circ$
0 40	13 43	1 0817
14 90	25 78	1 1389
30 80	47 52	1 2218
44 75	74 50	1 3043
60 05	111 18	1 3903
76	156 61	1 4700
91 65	210 20	1 5394
114*	311 64	1 6269

* B-pt of sat solution

(Berkeley, Phil Trans 1904, 203, A 189)

100 g H_2O dissolve 37 79 g KNO_3 at 25°
 100 g H_2O dissolve 3 08 g equiv KNO_3
 at 20° , 3 27 at $21 5^\circ$ (Euler, Z phys Ch
 1904, 49 312)

1 l H_2O dissolves 384 48 g KNO_3 at 25°
 (Armstrong and Eyre, Proc Roy Soc 1910,
 A, 84 123)

1 l sat KNO_3 +Aq contains 2 8 g mols
 KNO_3 (Rosenheim and Weinheber, Z
 anorg 1911, 69 263)

100 g H_2O dissolve 38 485 g KNO_3 at 25°
 (Haigh, J Am Chem Soc 1912, 34 1148)

Sat KNO_3 +Aq contains at
 50° 58° 62° 68°
 46 39 51 55 53 64 57 04% KNO_3
 (Tschugaeff, Z anorg 1914, 86 160)

Solubility in H_2O

100 g of the sat solution contain at

$9 1^\circ$ 21 1° 35°
 16 76 24 77 35 01 g KNO_3

(Findlay, Chem Soc 1914, 105 780)

Sp gr of solution sat at 15° =1 134
 (Michel and Kraftt)

Sp gr of solution sat at 16° =1 138
 (Stolba, J pr 97 503)

Sp gr of solution sat at 18° =1 1601, and
 contains 29 45% KNO_3 (Karsten)

Sp gr of KNO_3 +Aq at $19 5^\circ$

% KNO_3	Sp gr	% KNO_3	Sp gr
4 871	1 0307	17 965	1 1198
9 618	1 0618	21 488	1 1457
14 044	1 0920		

(Kremers, Pogg 95 120)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 21°

% KNO_3	Sp gr	% KNO_3	Sp gr
1	1 0058	13	1 0819
2	1 0118	14	1 0887
3	1 0178	15	1 0956
4	1 0239	16	1 1026
5	1 0300	17	1 1097
6	1 0363	18	1 1169
7	1 0425	19	1 1242
8	1 0490	20	1 1316
9	1 0555	21	1 1390
10	1 0621	22	1 1464
11	1 0686	23	1 1538
12	1 0752	24	1 1613

(Schiff, A 110 75)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 15°

% KNO_3	Sp gr	% KNO_3	Sp gr
1	1 00641	12	1 07905
2	1 01283	13	1 08596
3	1 01924	14	1 09286
4	1 02566	15	1 09977
5	1 03207	16	1 10701
6	1 03870	17	1 11426
7	1 04534	18	1 12150
8	1 05197	19	1 12875
9	1 05861	20	1 13599
10	1 06524	21	1 14361
11	1 07215		

(Gerlach, Z anal 8 286)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 17.5°

% KNO_3	Sp gr	% KNO_3	Sp gr	% KNO_3	Sp gr
1	1 006	8	1 051	15	1 099
2	1 012	9	1 058	16	1 106
3	1 019	10	1 065	17	1 113
4	1 025	11	1 072	18	1 120
5	1 032	12	1 078	19	1 127
6	1 038	13	1 085	20	1 134
7	1 045	14	1 092		

(Hager, Comm 1883)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 18°

% KNO_3	Sp gr	% KNO_3	Sp gr
5	1 0305	20	1 133
10	1 0632	22	1 148
15	1 097		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 20° , containing mols KNO_3 in 100 mols H_2O

Mols KNO_3	Sp gr	Mols KNO_3	Sp gr
0.5	1 01730	4	1 12264
1	1 03373	5	1 14888
2	1 06524		

(Nicol, Phil Mag (5) 16 122)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 25°

Concentration of $\text{KNO}_3 + \text{Aq}$	Sp gr
1-normal	1 0605
$\frac{1}{2}$ -"	1 0305
$\frac{1}{4}$ -"	1 0161
$\frac{1}{8}$ -"	1 0075

(Wagner, Z phys Ch 1890, 5 37)

Sp gr of $\text{KNO}_3 + \text{Aq}$ at 20.1°

p = per cent strength of solution, d = served density, w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
25.54	1 1783	0 30095
21.95	1 1510	0 25270
17.88	1 1200	0 20033
13.93	1 0913	0 15203
8.706	1 0553	0 09186
5.393	1 0331	0 05571
4.389	1 0264	0 04506
2.848	1 0165	0 02895
2.030	1 0113	0 02053
0.741	1 0030	0 00743

(Barnes, J Phys Chem 1898, 2 544)

Sp gr $20^\circ/4^\circ$ of a normal solution of KNO_3 = 1.05954, of a 0.5 normal solution = 1.029 (Haigh, J Am Chem Soc 1912, 34 1151)

Sp gr of sat $\text{KNO}_3 + \text{Aq}$ at t°

t°	G KNO_3 sol in 100 g H_2O	Sp gr
0	13.27	1 054
10	20.89	1 120
20	31.59	1 161
30	45.85	1 212
40	63.90	1 282
50	85.51	1 339
60	109.00	1 403
70	138.00	1 446

(Tschernaj, J Russ Phys Chem Soc 1902, 44 1565)

The saturated solution boils at 114.1° (Muller), 114.5° (Griffiths), 115.9° (Legrand), 117° (Mardun), 117° (Magnus), 118° (Kremers), 118.6° (Le Page)

The saturated solution forms a crust at 111° , and boils at 115° , highest temperature served, 115.3° (Gerlach, Z anal 26 426)

B-pt of KNO_3 +Aq containing pts KNO_3 to 100 pts H_2O G=according to Gerlach (Z anal 26 444), L=according to Legrand (A ch (2) 62 426)

B pt	G	L	B pt	G	L
100 5°	7 5		107°	120 5	119 0
101	15 2	12 2	108	141 5	140 6
101 5	23		109	164	163 0
102	31	26 4	110	188 5	185 9
102 5	39		111	215	209 2
103	47 5	42 2	112	243	233 0
103 5	56		113	274	257 6
104	64 5	59 6	114	306	283 3
104 5	73		115	338 5	310 2
105	82	78 3	115 9		335 1
106	101	98 2			

1 pt KNO_3 dissolves in 14 pts HNO_3 , at 20° in 38 pts, and at 123° in 1 pt HNO_3 +Aq of 1 423 sp gr (Composition $2\text{HNO}_3, 3\text{H}_2\text{O}$) (Schultz, Zeit Ch (2) 5 531)

Solubility of KNO_3 in HNO_3 at 0°

G per 100 cc solution		Sp gr
KNO_3	HNO_3	
12 65	0 00	1 079
10 02	3 71	
8 38	8 38	1 093
7 49	13 58	1 117
7 49	19 47	1 144
7 68	30 04	1 202
10 42	42 86	1 289
28 64	75 95	1 498

(Engel, C R, 1887, 104 913)

Solubility in HNO_3 +Aq

Solution temp	% by wt KNO_3	Solid phase
-6°	24 4	$\text{KNO}_3, 2\text{HNO}_3$ (solution in HNO_3) (stable)
+14 0	32 6	"
17 0	34 8	"
19 5	37 2	"
22 0	44 5	(mpt)
21 5	47 8	(Solution in KNO_3) (labile)
21 5	48 6	"
20 0	50 9	"
-4 0	37 2	$\text{KNO}_3, \text{HNO}_3$ (labile)
+16 5	44 5	"
22 5	47 2	(stable)
23 5	47 8	"
25 5	48 6	"
27 0	49 4	"
29 0	50 1	(labile)
30 5	50 9	"
21 0	49 4	KNO_3 (labile)
39 0	50 9	(stable)
50 0	51 7	"

(Groschuff, Z anorg 1904, 40 10)

Sol in sat NH_4Cl +Aq Solution thus obtained contains 43 07 pts mixed salts, or 100 pts H_2O dissolve 75 66 pts mixed salts, viz 38 62 pts KNO_3 and 39 84 pts NH_4Cl (Karsten) See also under NH_4Cl

Solubility of KNO_3 + K_2CO_3 and KHCO_3 in H_2O , see under K_2CO_3 and KHCO_3

Sol in sat BaCl_2 +Aq with pptn of $\text{Ba}(\text{NO}_3)_2$

Sol in sat NH_4NO_3 +Aq, at first without pptn, but afterwards NH_4NO_3 is pptd (Karsten)

Sol in NH_4NO_3 +Aq with pptn of NH_4NO_3 (Rudorff, B 6 485)

See also under NH_4NO_3

Sol in sat $\text{Ba}(\text{NO}_3)_2$ +Aq, but soon a double salt separates (Karsten)

See also under $\text{Ba}(\text{NO}_3)_2$

Sol in $\text{Ca}(\text{NO}_3)_2$ +Aq (Longchamp)

See also under $\text{Ca}(\text{NO}_3)_2$

Sol in sat $\text{Pb}(\text{NO}_3)_2$ +Aq without pptn 100 pts H_2O dissolve 119 6 pts $\text{Pb}(\text{NO}_3)_2$ and 67 1 pts KNO_3 at 21 2° (Rudorff, B 6 484) See also under $\text{Pb}(\text{NO}_3)_2$

Solubility in AgNO_3 +Aq at t°

t°	Sat solution contains		
	% KNO_3	% AgNO_3	% total salt
-7	10 5	39 4	49 9
-7 5	10 5	40 5	51 0
-4	11 3	42 5	53 8
+20	23 6	46 4	70 0
33	26 3	50 9	77 2
34	27 3	51 1	78 4
36	29 4	52 0	81 4
38			81 7
46			82 3
54	33 1	55 0	88 1
54		55 8	
61			89 5
68	34 3	54 6	88 9
96	37 8	55 4	93 2
105	38 5	55 6	94 1
142	41 5	55 8	97 3

(Étard, A ch 1894, (7) 3 286)

Solubility of mixed crystals of KNO_3 and AgNO_3 in H_2O at 25°

G per l		Mg mols per l		Mol % AgNO_3 in solution	Mol % AgNO_3 in solid phase
AgNO_3	KNO_3	AgNO_3	KNO_3		
45 9	321 8	270	3180	7 83	0 2896
110 7	322 6	6513	3184	16 96	0 6006
176 8	333 7	1040	3298	23 97	0 9040
259 6	364 0	1258	3597	29 81	1 054
365 6	456 4	2151	4511	32 28	1 604
507 9	387 2	2988	3816	43 85	2 439
745 9	398 6	4388	3960	57 70	8 294

(Herz, Z Kryst Min 1897, 23 405)

Solubility of $\text{KNO}_3 + \text{AgNO}_3$ at 30°

Composition of the solution		Solid phase
% KNO_3	% AgNO_3	
0	73 0	AgNO_3
5 53	71 65	"
11 22	69 01	$\text{AgNO}_3 + \text{AgNO}_3, \text{KNO}_3$
13 44	65 08	$\text{AgNO}_3, \text{KNO}_3$
17 38	57 85	"
25 05	46 32	$\text{KNO}_3 + \text{AgNO}_3, \text{KNO}_3$
25 00	46 45	"
26 58	39 09	KNO_3
29 22	23 59	"
30 45	11 51	"
31 30	0	"

(Schrenemakers, Z phys Ch 1909, 65 576)

 $\text{KNO}_3 + \text{NaNO}_3$

100 pts H_2O dissolve 34 53 pts KNO_3 and 91 16 pts NaNO_3 at 15.6° , and solution has sp gr = 1 478 (Page and Keightley)

100 pts $\text{KNO}_3 + \text{NaNO}_3 + \text{Aq}$ sat at 14° contain 52 17 pts of the two salts, sat at 13° contain 53 15 pts of the two salts (v Hauer)

100 pts H_2O dissolve at 18.75° 29 45 pts KNO_3 and 89 53 pts NaNO_3 , if sat $\text{KNO}_3 + \text{Aq}$ is treated with NaNO_3 , and 35 79 pts KNO_3 and 88 00 pts NaNO_3 by the opposite process 134 38 pts of the two salts are dissolved if a mixture of the salts is treated with H_2O at 18.75° (Karsten)

100 pts H_2O dissolve 39 34 pts KNO_3 and 94 60 pts NaNO_3 , or 133 94 pts of the two salts at 20° (Nicol, Phil Mag (5) 13 385)

Solubility of mixtures of KNO_3 and NaNO_3

% NaNO_3 in mixture before solution	Total amt mixed salts dissolved in 100 pts H_2O at 20°	Pts NaNO_3 dissolved	Pts KNO_3 dissolved	% NaNO_3 in mixture after solution and evap to dryness
100	86 8	86 8	0	100
90	109 6	96 4	13 2	88
80	136 5	98 0	38 5	71 8
70	136 3			
60	137 6	90 0	47 6	65 4
50	106 1	66 0	40 1	62 2
45 7*	88 0	53 3	34 7	60 6
40	81 1	45 6	35 6	56 2
30	73 5			
20	54 1	20 8	33 3	38 5
10	40 9	9 4	31 5	22 9
0	33 6	0	33 6	0

* $\text{NaNO}_3 + \text{KNO}_3$

(Carnelley and Thomson, Chem Soc 53 782)

Solubility of $\text{KNO}_3 + \text{NaNO}_3$ in H_2O at 10°

In 1000 cem H_2O		Solid phase
NaNO_3	KNO_3	
805 0		NaNO_3
848 3	301 9	$\text{NaNO}_3, \text{KNO}_3$
	208 9	KNO_3

(Kremann and Zitek, M 1909, 30 325)

Solubility of $\text{KNO}_3 + \text{NaNO}_3$ in H_2O at 24.2°

In 1000 cem H_2O		Solid phase
NaNO_3	KNO_3	
913 58		NaNO_3
910 60	123 60	"
1019 65	435 85	$\text{NaNO}_3, \text{KNO}_3$
1018 40	437 70	"
931 30	422 00	KNO_3
346 70	390 00	"
	377 35	"

(Kremann and Zitek)

Solubility of $\text{KNO}_3 + \text{NaNO}_3$ in H_2O at 25°

% KNO_3	% NaNO_3	Solid phase
38 70	39 62	
41 60	66 31	KNO_3
46 35	100 10	"
39 08	98 99	$\text{KNO}_3 + \text{NaNO}_3$
20 98	94 44	NaNO_3
		"

(Uyeda, Mem Col Sc Kyoto, 1910, 2 245)

Solubility in $\text{NaNO}_3 + \text{Aq}$ at 20° , 30° , 40° and 91° . Data, given in the original, show that each salt increases the solubility of the other (Leather, Mem Dept Agric India 1914, 3 177, Chem Soc 1915, 108 (2), 13)

100 pts H_2O dissolve 28 92 pts KNO_3 , 53 68 pts NaNO_3 , and 26 44 pts NaCl at 15.6° , and solution has sp gr = 1 44 (Pag and Keightley, Chem Soc (2) 10 566)

Solubility of $\text{KNO}_3 + \text{NaNO}_3 + \text{NaCl}$ in H_2O at 25°

% KNO_3	% NaNO_3	% NaCl	Solid phase
38 44	22 87	32 58	
38 5	44 40	27 67	$\text{NaCl} + \text{KNO}_3$
42 55	63 26	23 59	"
17 77	61 12	23 94	$\text{NaNO}_3, \text{KNO}_3 + \text{NaCl}$
28 08	62 92	23 70	"
44 72	82 82	9 56	"

(Uyeda, Mem Col Sc Kyoto, 1910, 2 245)

 $\text{KNO}_3 + \text{Sr}(\text{NO}_3)_2$

1 l H_2O sat with both salts at 25° contain 552 g $\text{KNO}_3 + 1074$ g $\text{Sr}(\text{NO}_3)_2$ (Le Blanc and Noyes, Z phys Ch 1890, 6 386)

Solubility of $\text{KNO}_3 + \text{Sr}(\text{NO}_3)_2$ at t°

t°	% KNO_3	% $\text{Sr}(\text{NO}_3)_2$	Solid phase
20	22 90	5 49	KNO_3
	21 70	9 17	"
	21 01	17 10	"
	19 60	31 24	"
	19 49	34 91	"
	19 69	39 56	$\text{KNO}_3 + \text{Sr}(\text{NO}_3)_2, 4\text{H}_2\text{O}$
	17 56	40 37	$\text{Sr}(\text{NO}_3)_2, 4\text{H}_2\text{O}$
	12 65	41 12	"
	10	40 70	"
40	30 26	23 70	KNO_3
	26 90	38 52	$\text{KNO}_3 + \text{Sr}(\text{NO}_3)_2, 4\text{H}_2\text{O}$
	22 50	40 22	$\text{Sr}(\text{NO}_3)_2, 4\text{H}_2\text{O}$
	11 19	44 19	"
	0	47 7	"

(Findlay, Morgan and Morris, Chem Soc 1914, 105 779)

 $\text{KNO}_3 + \text{TiNO}_3$

100 g H_2O dissolve 43.5 g $\text{TiNO}_3 + 104.2$ g KNO_3 at 58° (Rabe, Z anorg 1902, 31 156)

Solubility of mixed crystals of $\text{KNO}_3 + \text{TiNO}_3$ in H_2O at 25°

G per l		Sp gr
TiNO_3	KNO_3	
0 00	351 0	1 2632
2 37	329 0	1 1903
6 15	332 4	1 1956
17 64	333 7	1 2050
49 74	333 3	1 2196
63 60	321 0	1 2436
86 18	330 5	1 2617
123 8	428 3	1 2950
101 3	245 1	1 2050
116 1	0 0	1 0964

(Herz, Z Kryst Min 1897, 28 405)

 $\text{KNO}_3 + \text{KBr}$

Solubility in $\text{KBr} + \text{Aq}$

1 litre of the solution contains

at 14.5		at 25.2	
Mol KBr	Mol KNO_3	Mol KBr	Mol KNO_3
0 0	2 228	0 0	3 217
0 356	2 026	0 38	3 026
0 784	1 835	0 93	2 689
1 092	1 730	1 37	2 492
1 577	1 589	2 08	2 216
2 542	1 406	2 87	1 958
3 536	1 308	3 55	1 807

(Touren, C R 1900, 130 910)

 $\text{KNO}_3 + \text{KCl}$

100 pts H_2O dissolve pts of the two salts

	At 12.9°	At 15.3°
	18 8	18 9
KNO_3	28 5	29 8
KCl		

(Kopp)

100 pts H_2O dissolve 315.2 pts KCl and 19.1 pts KNO_3 at 20° (Rudorff, B 6 484)

100 pts H_2O dissolve 18.95 pts $\text{KNO}_3 + 32.84$ pts KCl , or 51.79 pts of the mixed salts at 20° (Nicol, Phil Mag (5) 31 385)

Solubility of KCl with addition of KNO_3 at 17.5°

Sp gr	100 ccm of solution contain g		
	KCl	H_2O	KNO_3
1 1730	29 39	87 85	0
1 1980	27 50	85 68	6 58
1 2100	27 34	84 76	8 83
1 2250	26 53	83 58	12 48
1 2360	25 98	82 84	14 83
1 2390	25 96	82 65	15 22
1 2388	25 95	82 43	15 49
1 2410	26 24	82 63	15 33

KNO_3 separated out in last four solutions

Solubility of KNO_3 with addition of KCl at 20.5°

Sp gr	100 ccm of solution contain g		
	KNO_3	H_2O	KCl
1 1625	27 68	88 51	0
1 1700	24 39	87 89	4 72
1 1765	22 44	87 47	7 74
1 1895	20 23	86 48	12 23
1 1983	18 96	85 69	15 15
1 2150	17 67	84 23	19 61
1 2265	17 11	83 40	22 17
1 2400	16 79	82 24	24 96

(Bodlander, Z phys Ch 7 359)

Solubility in KCl+Aq at t°

t°	Sat solution contains		
	% KNO ₃	% KCl	% total salt
—11 4	4 0	18 4	22 4
—11	3 9	18 1	22 0
—10	3 8	18 6	22 5
—4		19 7	
+2 5	6 3	19 9	26 2
4 5	7 3	20 7	28 0
4 5	7 8	19 8	27 6
8 5	7 9	20 9	28 8
10 5	8 4	21 0	29 4
13 5	8 9	21 8	30 7
14	10 2	21 3	31 5
17	9 7	22 6	32 3
23	12 5	21 8	34 3
27	14 9	21 3	36 2
29	16 1	21 0	37 1
34	18 9	21 2	39 3
36	18 9	21 6	40 5
37 5	19 2	21 6	40 8
39	21 0	21 0	42 0
42 5	21 8	20 9	42 7
48	25 3	20 3	45 6
50	28 3	20 8	49 1
52		20 2	
53			48 7
56	29 5	19 5	49 0
57	34 5	18 3	52 8
	35 4		
	40 5	17 3	57 8
81	47 1	15 4	62 5
85	48 2	15 3	63 5
90	52 8	13 3	66 1
96	54 1	12 6	68 7
97	56 6	12 4	69 0
104	59 9	10 8	70 7
105		10 9	
120	69 6	7 7	77 3
120	69 1	7 6	76 7

(Étard, A ch 1894, (7) 3 285)

Solubility in KCl+Aq

1 litre of the solution contains at			
14 5°		at 25 2	
Mol KCl	Mol KNO ₃	Mol KCl	Mol KNO ₃
0 0	2 228	0 0	3 217
0 182	2 172	0 26	3 086
0 424	2 057	0 66	2 853
0 880	1 830	1 35	2 510
1 778	1 576	2 08	2 218
2 204	1 515	2 78	2 015
2 635	1 423	3 04	1 946
3 172	1 355		

(Touren, C R 1900, 130 909)

Solubility of KCl in KNO₃+Aq

t°	Concentration of KNO ₃ % mol per l	G salt dissolved in 1 l H ₂ O	Molecular solubility
0°	0	283 55	3 81
"	1/4	284 25	3 81
"	1/2	283 60	3 81
"	1	287 60	3 86
25°	0	364 15	4 89
"	1/4	365 00	4 90
"	1/2	361 65	4 86
"	1	353 80	4 81
"	1 1/2	355 20	4 77

(Armstrong and Eyre, Proc R Soc (A) 191 84 127)

Solubility in KCl+Aq at 20°, 30°, 40° and 91°. Data, given in the original, show that each salt diminishes the solubility in H₂O of the other (Leather, Mem Dept Agric Indus 1914, 3 177 Chem Soc 1915, 108 (2) 13)

KNO₃+NaCl
NaCl is sol in sat KNO₃+Aq, and the mixed solution is capable of dissolving more KNO₃. An amount of H₂O, which, when pure, could only dissolve 100 pts KNO₃, can in this way be made to take up 152 64 pt (Longchamp, A ch (2) 9 8)

Sol in sat NaCl+Aq

100 pts H₂O dissolve

	Longchamp 4° (1)	Rüdorff		Page and Keightley 15 6° (4)
		14° (2)	18° (3)	
NaCl	35 96	38 5	38 9	39 5
KNO ₃	26 01	28 7	36 1	32 3
	61 97	67 2	75 0	71 8

	Karsten 18 75			Mulder At b pt (8)
	(5)	(6)	(7)	
NaCl	36 53	38 25	39 19	37 0
KNO ₃	33 12	29 45	38 53	306 1
	69 65	67 70	77 72	344 0

1, 2, 3, 4, and 8 Both salts in excess
5 Sat NaCl+Aq treated with KNO₃
6 Sat KNO₃+Aq treated with NaCl
7 The two salts simultaneously treated with H₂O
100 pts H₂O dissolve 31 44 pts KNO₃, 13 pts KCl, and 38 58 pts NaCl at 15 6°, an solution has sp gr = 1 33 (Page and Keightley)

Solubility in NaCl+Aq at t°

t°	Sat solution contains		
	% KNO ₃	% NaCl	% total salt
-22	7 3	22 5	29 8
-19 5	7 9	22 6	30 5
-15 5	8 7	22 1	31 8
-7	10 1	22 5	32 6
-6	10 9	23 0	33 9
-1	12 7	23 3	36 0
+1	12 9	23 8	36 7
+11	16 6	22 8	39 4
17	19 0	22 8	41 8
18	19 8	22 0	41 8
18	18 9	22 5	41 5
20 5	20 4	22 3	42 7
22		21 2	
22	21 8	20 7	42 5
26	20 7	22 3	43 0
27			45 0
30 5	24 7	20 7	45 4
32 5	25 0	20 2	45 2
32 5	25 9	20 2	46 1
33	26 7	20 7	47 4
35	27 9	20 2	48 1
39	29 8	19 5	49 3
42 2	31 1	20 0	51 1
50	38 5	16 5	55 0
54	39 4	17 1	56 5
58 5	40 9	15 3	56 2
70	49 7	14 0	63 7
76	53 9	13 6	67 5
79	54 8	12 9	67 7
84	57 4	12 6	70 0
90	61 4	10 4	71 8
96	64 7	9 5	74 2
105	70 0	9 0	79 0
106	69 9	9 3	79 2
107	71 3	8 4	79 7
115	72 2	9 0	81 2
122	73 8	8 0	81 8
127	73 6	7 9	81 5
127	72 9	8 8	81 7
127	73 0	7 6	80 6
128	74 2	7 9	82 1
132	75 7	7 6	83 3
145	77 7	7 6	85 3
170	80 7	5 8	86 5
171	79 1	5 9	85 0

(Étard, A ch 1894, (7) 3 283)

100 g H₂O dissolve 41.14 g KNO₃ and 38.25 g NaCl at 25°, 168.8 g KNO₃ and 39.81 g NaCl at 80° (Soch, J phys Ch 1898, 2 46)

See also under NaCl

Sol in sat CuSO₄+Aq, forming a double salt, which soon separates out

Very slowly and slightly sol in MgSO₄+Aq with pptn of MgSO₄ (Karsten)

KNO₃+K₂SO₄

Sat KNO₃+Aq dissolves some K₂SO₄, and sat K₂SO₄+Aq slowly dissolves some KNO₃

without pptn, but K₂SO₄ is afterwards pptd (Karsten)

100 pts H₂O dissolve

	Mulder 18 75° (1)	Karsten 18 75° (2)	Kopp		Mulder 18 75° (5)
			20° (3)	40° (4)	
KNO ₃	29 90	29 42	26 9	59 35	
K ₂ SO ₄		4 0	6 6	5 75	10 8

2 H₂O sat with KNO₃ and K₂SO₄ simultaneously, or to a sat solution of one salt the other was added

3 and 4 H₂O sat with both salts simultaneously

Mulder doubts the results of 3 and 4

Solubility in K₂SO₄+Aq at t°

t°	In 100 ccm of the solution		Sp gr of solution
	G KNO ₃	G K ₂ SO ₄	
15	216 5	50 7	1 165
25	308 5	47 66	1 210

(Euler, Z phys Ch 1914, 40 313)

Slowly sol in sat Na₂SO₄ at first without pptn, but afterwards K₂SO₄ or NaSO₄ separates out

Sol in sat ZnSO₄+Aq with pptn of double salt (Karsten)

Sol in sat KClO₃+Aq, from which solution it is not pptd by salts which would ppt it from aqueous solution (Karsten)

Hydrazine dissolves 21.7 pts KNO₃ at 12.5–13° (de Bruyn, R t c 1899, 18 297)

Neither dissolved nor attacked by liquid NO₂ (Frankland, Chem Soc 1901, 79 1361)

Very sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 829)

Insol in absolute alcohol, in dilute alcohol it dissolves proportional to the amount of H₂O present, but always less is dissolved than the H₂O would dissolve by itself (Gerardin)

100 pts alcohol containing % by weight of alcohol dissolve pts KNO₃ at 15°

10 20 30 40 50 60 80% alcohol
13.2 8.5 5.6 4.3 2.8 1.7 0.4 pts KNO₃

(Scheff, A 118 365)

Solubility in 100 pts alcohol at t° D = sp gr
of alcohol, S = solubility

D = 0.9904		D = 0.9848		D = 0.9793		D = 0.9726	
t°	S	t°	S	t°	S	t°	S
12	18 1	12	14 6	10	10 20	14	8 8
21	25 0	21	21 7	10	10 19	25	13 6
33	40 4	36	37 8	13	11 74	34	20 3
43	58 6	41	45 0	18	14 52	44	31 3
53	79 1	56	72 9	20	16 35	47	34 2
61	94 5			31	25 81	60	52 3
62	95 7			34	28 63		
				40	36 66		
				41	37 20		
				50	50 14		
				53	56 01		
				61	72 24		
				62	73 36		

D = 0.9573		D = 0.9390		D = 0.8967		D = 0.8429	
t°	S	t°	S	t°	S	t°	S
14	5 4	16	4 13	12	1 61	15	0 29
25	9 0	24	6 00	33	3 62	22	0 39
33	13 2	40	10 94	47	5 77	40	0 62
44	19 1	51	16 51	57	6 97	54	0 78
57	29 1	60	21 54			60	1 10
65	36 2	64	24 22				

(Gerardin, A ch (4) 5 151)

Solubility of KNO_3 in alcohol at 18°

Sp gr	100 cc contain g		
	Alcohol	Water	KNO_3
1.1475		89 63	25 12
1.1085	3 30	87 44	20 11
1.1010	5 24	86 26	18 60
1.0805	8 69	83 18	16 18
1.0655	14 08	77 93	14 54
1.0490	16 27	76 36	12 27
1.0375	19 97	72 93	10 85
0.9935	28 11	64 74	6 50
0.9585	37 53	54 21	4 11
0.9456	42 98	48 15	3 37
0.9050	51 23	27 32	1 95
0.8722	61 65	24 74	0 83
0.8375	69 60	13 95	0 20

(Bodlander, Z phys Ch 7 316)

Solubility in alcohol

Wt % alcohol	G KNO_3 per 100 g alcohol	
	at 30°	at 40°
0	45 6	64 5
8 25	32 3	47 1
17 0	22 4	33 3
25 7	15 1	24 1
35 0	11 4 (34 5°)	16 7
44 9	7 0	11 6 (44 $^\circ$)
54 3	4 5	7 2 (55 $^\circ$)
65 0	2 7	4 4
75 6	1 3	2 0 (76 30°)
88 0	0 4	0 6 (88 5°)

(Bathrick, J phys Ch 1896, 1 160)

Solubility of KNO_3 in ethyl alcohol + Aq at 30°

% by wt H_2O	% by wt alcohol	% by wt KNO_3
68 7	0	31 3
69 2	10 1	20 7
67 3	17 0	15 7
64 1	23 8	12 1
58 8	32 2	9 0
50 8	43 1	6 1
39 8	56 9	3 3
33 9	63 8	2 3
22 3	76 8	0 88
7 5	92 3	0 15

(Schrenemakers, Z phys Ch 1909, 65 556)

Solubility in ethyl alcohol at 25°

Concentration of alcohol in g mol per l H_2O	Solubility in 1 l H_2O	Mol solubility
0	384 48	3 80
$\frac{1}{4}$	368 30	3 64
$\frac{1}{2}$	354 40	3 50
1	327 00	3 22

(Armstrong and Lyre, Proc R Soc 191 (A) 84 127)

Solubility of KNO_3 in methyl alcohol + Aq at 30°

% by wt H_2O	% by wt alcohol	% by wt KNO_3
68 7	0	31 3
68 9	7 8	23 3
66 4	17 3	16 3
61 0	27 8	11 2
53 9	38 4	7 7
39 2	57 0	3 8
0 99	98 58	0 43

(Schrenemakers, Z phys Ch 1909, 65 556)

Solubility of $\text{KNO}_3 + \text{AgNO}_3$ in 51.6%
 $\text{C}_2\text{H}_5\text{OH} + \text{Aq}$ at 30°

% KNO_3	% AgNO_3	Solid phase
4.8	0	KNO_3
4.55	5.15	"
4.11	16.47	"
4.26	21.28	$\text{KNO}_3 + \text{AgNO}_3, \text{KNO}_3$
2.62	36.94	$\text{AgNO}_3, \text{KNO}_3 + \text{AgNO}_3$
0	37	AgNO_3

(Schreinemakers, Z phys Ch 1909, 65 556)

100 g 40% ethyl alcohol sat with $\text{KNO}_3 + \text{NaCl}$ at 25° contain 13.74 g $\text{KNO}_3 + 15.78$ g NaCl (Soch, J phys Ch 1898, 2 43)

Insol in propyl alcohol (Schlamp, Z phys Ch 1894, 14 277)

Almost insol in ether (Braconnot)

Very sl sol in acetone (Krug and M'Elroy)

Sol in acetone (Eidmann, C C 1899 II, 1014)

Solubility in acetone + Aq at 40°

Wt % acetone	G KNO_3 per 100 g solvent
0	64.5
8.5	51.3
16.8	38.9
25.2	22.8
34.3	24.7
44.1	17.0
53.9	11.9
64.8	7.2
76.0	3.0
87.6	0.7

(Bathrick, J phys Ch 1896, 1 160)

100 pts glycerine (sp gr 1.225) dissolve 10 pts KNO_3 (Vogel, N Rep Ph 16 557)

100 g trichlorethylene dissolve 0.01 g KNO_3 at 15° (Wester and Bruns, Pharm Weekbl 1914, 51 1443)

Insol in CS_2 (Arctowski, Z anorg 1894, 6 257)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

100 g H_2O sat with sugar and KNO_3 dissolve 224.7 g sugar + 41.9 g KNO_3 , or sat solution contains 61.36 g sugar + 11.45 g KNO_3 at 31.25° (Kohler, Z Ver Zuckerind 1897, 47 447)

Potassium hydrogen nitrate, $\text{KNO}_3, \text{HNO}_3$

Very hygroscopic. Decomp by H_2O (Groschuff, B 1904, 37 1489)

Potassium dihydrogen nitrate, $\text{KNO}_3, 2\text{HNO}_3$

Decomp by H_2O (Ditte, A ch (5) 18 320)

Solubility in H_2O

Solution temp	% by wt KNO_3	% by wt HNO_3	% by wt H_2O
mpt $+22^\circ$	44.5	55.5	0
20.5	44.1	55.0	0.9
18.0	43.8	54.5	1.7
12.0	43.0	53.6	3.4
6.0	42.3	52.7	5.0
0	41.6	51.8	6.6

(Groschuff, Z anorg 1904, 40 11)

Potassium silver nitrate, $\text{KNO}_3, \text{AgNO}_3$

Sol in H_2O (Russell and Maskelyne, Roy Soc Proc 26 357)

$3\text{KNO}_3, \text{AgNO}_3$ Sol in H_2O (Rose, Pogg 106 320)

Potassium thallic nitrate, $2\text{KNO}_3, \text{Th}(\text{NO}_3)_3 + \text{H}_2\text{O}$

Decomp by H_2O (Meyer, Z anorg 1900, 24 361)

Potassium thorium nitrate, $4\text{KNO}_3, \text{Th}(\text{NO}_3)_4$

Very sol in H_2O and alcohol (Berzelius)

Hygroscopic, very unstable (Meyer, Z anorg 1901, 27 379)

Hygroscopic, sol in dil $\text{HNO}_3 + \text{Aq}$ (Meyer, Z anorg 1901, 27 378)

Potassium thorium hydrogen nitrate, $3\text{KNO}_3, \text{Th}(\text{NO}_3)_4, 3\text{HNO}_3$

Decomp in the air (Meyer, B 1900, 33 2140)

$+4\text{H}_2\text{O}$ Sol in HNO_3 of 1.2 sp gr Effloresces in the air (Meyer, Z anorg 1901, 27 380)

Potassium uranyl nitrate, $\text{K}(\text{UO})_2(\text{NO}_3)_3$

Decomp by H_2O Sol in conc HNO_3 (Meyer, B 1903, 36 4057)

Solubility in H_2O at t°

t	In 100 pts of the solution			Solid phase
	Pts by wt UO	Pts by wt K	Pts by wt NO	
0.5	31.98	1.72		Double salt + KNO_3
13.0	33.40	2.74		
25.0 a)	37.08	4.05	23.49	
b)	37.06	3.98	23.46	
45.0	42.18	5.16		Double salt
59.0	41.67	6.03		
80.6 a)	43.72	6.42		
b)	43.70	6.34		

Potassium uranyl nitrate is decomp by H_2O at temp below 60° , above 60° it is sol in H_2O without decomp

(Rimbach, B 1904, 37 473)

Potassium nitrate barium sulphate, KNO_3 , 2BaSO_4

Easily decomp Sol in conc H_2SO_4
(Silberberger, M 1904, 25 251)

Potassium nitrate phosphomolybdate

See Phosphomolybdate nitrate, potassium

Potassium nitrate sulphate, KNO_3 , KHSO_4

Decomp by H_2O and alcohol (Jacquelin)

Potassium nitrate sulphotungstate, 2KNO_3 , K_2WS_4 (?)

Very sol in hot or cold H_2O Insol in alcohol (Berzelius)

Potassium nitrate tungstate (?)

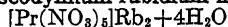
100 pts boiling H_2O dissolve 5 pts salt
(Storer's Dict, p 393)

Potassium nitrate zinc iodide

Permanent Easily sol in H_2O Insol in alcohol (Anthon)

Praseodymium nitrate, $\text{Pr}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$

Sol in H_2O (von Schule, Z anorg 1898, 18 355)

Praseodymium rubidium nitrate,

Hygroscopic (Jantsch, Z anorg 1911, 69 230)

Praseodymium sodium nitrate, $\text{Pr}(\text{NO}_3)_3$, $2\text{NaNO}_3 \cdot \text{H}_2\text{O}$

Sol in H_2O (von Schule, Z anorg 1898, 18 356)

Praseodymium zinc nitrate, $2\text{Pr}(\text{NO}_3)_3$, $3\text{Zn}(\text{NO}_3)_2 \cdot 24\text{H}_2\text{O}$

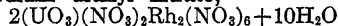
1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 14.69 g hydrous salt at 16°
(Jantsch, Z anorg 1912, 76 321)

Radium nitrate

Has apparently the same solubility in H_2O as the corresponding Ba comp (Curie, Dis sert 1903)

Rhodium nitrate, $\text{Rh}(\text{NO}_3)_3 \cdot 2\text{H}_2\text{O}$ (?)

Deliquescent Sol in H_2O Insol in alcohol (Claus)

Rhodium uranyl nitrate,

Sol in H_2O and acids, insol in aq alkalis
(Lancien, C C 1912, I 208)

Rubidium nitrate, RbNO_3

100 pts H_2O dissolve 20.1 pts at 0° , 43.5 pts at 10° (Bunsen)

Solubility in H_2O at t°

t°	G PbNO_3 per 100 g		t°	G RbNO_3 per 100 g	
	H_2O	Solu tion		H_2O	Sol tic
0	19.5	16.3	60	200	66
10	33.0	24.8	70	251	71
20	53.3	34.6	80	309	75
30	81.3	44.8	90	375	78
40	116.7	53.9	100	452	81
50	155.6	60.9	118.3	617	86

(Berkeley, Trans Roy Soc 1904, 203 207)

100 g H_2O dissolve 66.855 g RbNO_3 at 25° (Haigh, J Am Chem Soc 1912, 1148)

Sp gr $20^\circ/4^\circ$ of a normal solution of RbNO_3 = 1.100835, of a 0.5 normal solution = 1.049 (Haigh, J Am Chem Soc 1912, 34 1151)

Sp gr of $\text{RbNO}_3 + \text{Aq}$

G-equiv RbNO_3 per l

at 18° =	0.5035	1.006
Sp gr at $6^\circ/6^\circ$	1.05342	1.106
Sp gr at $18^\circ/18^\circ$	1.05226	1.101
Sp gr at $30^\circ/30^\circ$	1.05156	1.102

G-equiv RbNO_3 per l

at 18° =	2.000	2.681
Sp gr at $6^\circ/6^\circ$	1.20655	
Sp gr at $18^\circ/18^\circ$	1.20302	1.270
Sp gr at $30^\circ/30^\circ$	1.20036	1.267

(Clausen, W Ann 1914, (4) 44 1069)

Easily sol in HNO_3 (Schultz, Zeit f 1902, 5 531)

Sol in acetone (Eidmann, C C 1899, I 1014, Naumann, B 1904, 37 4328)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Rubidium hydrogen nitrate, RbNO_3 , HNO_3

Fairly stable in air (Wells, Am Ch J 1901, 26 273)

Rubidium dithydrogen nitrate, RbNO_3 , 2HNO_3

Decomp rapidly in air (Wells, Am Ch J 1901, 26 273)

2RbNO_3 , 5HNO_3 Decomp by H_2O
Known only in solution in $\text{HNO}_3 + \text{aq}$
(Ditte, A ch (5) 18 320)

Rubidium silver nitrate, RbNO_3 , AgNO_3

Sol in H_2O (Russell and Maskelyne, R y Soc Proc 26 357)

Rubidium thorium nitrate, $\text{Rb}_2\text{Th}(\text{NO}_3)_6$

Sl sol in HNO_3 , decomp by H_2O (Me r, Z anorg 1901, 27 384)

Rubidium uranyl nitrate, $\text{Rb}(\text{UO}_2)(\text{NO}_3)_3$

Decomp by H_2O Sol in conc HNO_3
(Meyer, B 1903, 36 4057)

Solubility of H_2O at t°

t°	In 100 pts of the solution				Solid phase
	Pts by wt UO_2	Pts by wt NO_3	Pts by wt Rb	Pts by wt total salt	
25	a) 35 42	19 72	4 63	59 57	Double salt + RbNO_3
80	b) 35 40	19 76	4 67	59 64	Double salt
	a) 34 64		11 01	69 46	
	b) 34 68		11 01	69 52	

Rubidium uranyl nitrate is decomp by H_2O at low temp, at 80° it is sol in H_2O without decomp

(Rumbach, B 1904, 37 476)

Samarium nitrate, $\text{Sm}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$

Easily sol in H_2O (Cleve, C N 48 74)
Very hygroscopic (Demargay, C R 1900, 130 1187)

Samarium zinc nitrate, $2\text{Sm}(\text{NO}_3)_3 \cdot 3\text{Zn}(\text{NO}_3)_2 \cdot 24\text{H}_2\text{O}$

1 l sat solution in $\text{HNO}_3 + \text{Aq}$ (sp gr 1.325) contains 36.47 g hydrous salt at 16° (Jantsch, Z anorg 1912, 76 321)

Scandium nitrate, basic

Sol in H_2O (Nilson, B 13 1444)
 $\text{ScOH}(\text{NO}_3) + \text{H}_2\text{O}$ (Crookes, Roy Soc Proc 1908, 80 A 518)
 $\text{Sc}_2\text{O}(\text{NO}_3)_4$ (Crookes)

Scandium nitrate, $\text{Sc}(\text{NO}_3)_3$

(Crookes, Roy Soc Proc 1908, 80 A, 518)
 $+4\text{H}_2\text{O}$ Very sol in H_2O (Crookes)

Silver nitrate, AgNO_3

100 pts H_2O at 11° dissolve 127.7 pts (Schnauss, Arch Pharm (2) 82 260)

100 pts H_2O dissolve at

0° 19.5° 54° 85° 110°
121.9 227.3 500 714 1111 pts AgNO_3

(Kremers, Pogg 92 497)

100 pts H_2O dissolve 1622.5 pts at 125° , and 1941.4 pts at 133° (Tilden and Shentstone, Phil Trans 1884 23)

Sat solution boils at 125° (Kremers)

Solubility in H_2O at t°

Sat $\text{AgNO}_3 + \text{Aq}$ contains % AgNO_3 at t°

t°	% AgNO_3	t°	% AgNO_3
-7°	46.2	36°	75.7
-7°	46.0	40°	76.8
-5°	47.6	45°	77.1
-1°	52.4	48°	78.5
-1°	51.9	73°	84.0
$+5^\circ$	56.3	122°	88.7
10	61.2	134°	92.1
15.5	66.1	135°	92.8
20	67.8	135°	92.7
26	71.1	148°	93.3
29	73.0	160°	95.2
31	73.8	182°	96.9

(Étard, A ch 1894, (7) 2 526)

100 g sat $\text{AgNO}_3 + \text{Aq}$ at 15.5° contain 65.5 g AgNO_3 (Greenish and Smith, Pharm Jour 1903, 71 881)

Solubility of AgNO_3 in H_2O at $30^\circ = 10.31$ mol-litre (Masson Chem Soc 1911 99)

C. K. Kohlrausch, *Ann. Phys. Chem.*, 1879, 27 284, and K=Kohlrausch (W Ann 1879 1), containing

	5	10	15	20% AgNO_3
C K	1.041	1.080	1.125	1.160
K M	1.0440	1.0901		1.1969
K	1.0422	1.0893	1.1404	1.1958

	25	30	35	40% AgNO_3
C K	1.206	1.251		
K M				1.4791
K	1.2555	1.3213	1.3945	1.4773

	45	50% AgNO_3
K	1.5705	1.6745

Sp gr of $\text{AgNO}_3 + \text{Aq}$ at 25°

Concentration of AgNO_3	Sp gr
1-normal	1.1386
$1/2$ - "	1.0692
$1/4$ - "	1.0348
$1/8$ - "	1.0173

(Wagner, Z phys Ch 1890, 5 40)

Sol in 500 pts HNO_3 , 30 pts 2HNO_3 , $3\text{H}_2\text{O}$ at 20° , and 6 pts 2HNO_3 , $3\text{H}_2\text{O}$ at 100° (Schultz, Zeit Ch 1869 531)
Insol in conc HNO_3 (Warren, C C 1897 I, 438)

Solubility of AgNO_3 in $\text{HNO}_3 + \text{Aq}$ at 25°

G mol per l		G AgNO_3 per l	Sp gr 25°
HNO_3	AgNO_3		
0	10 31	1752	2 3921
0 404	9 36	1591	2 2754
0 962	8 08	1373	2 1243
1 698	6 54	1111	1 9402
2 834	4 526	769 1	1 7052
4 497	2 590	440 1	1 4980
5 992	1 698	288 6	1 4195
8 84	0 843	143 2	1 3818
12 53	0 347	58 90	1 3976

(Masson, Chem Soc 1911, **99** 1132)

$\text{AgNO}_3 + \text{NH}_4\text{NO}_3$ Solubility of AgNO_3
in $\text{NH}_4\text{NO}_3 + \text{Aq}$ See under NH_4NO_3
 $\text{AgNO}_3 + \text{KNO}_3$ Solubility of AgNO_3
+ KNO_3 in H_2O See under KNO_3

 $\text{AgNO}_3 + \text{AgNO}_2$ Solubility of $\text{AgNO}_3 + \text{AgNO}_2$ at 18°

G per l		G per l	
AgNO_3	AgNO_2	AgNO_3	AgNO_2
0 000	3 184	3 512	2 201
0 439	3 042	7 024	1 799
0 878	2 926	14 048	1 480
1 756	2 601		

(Naumann and Rucker, B 1905, **38** 2293)See also under AgNO_2 Insol in liquid CO_2 (Buchner, Z phys Ch 1906, **54** 674)Very sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 829)

Sol in 4 pts boiling alcohol

Sol in 10 pts alcohol (Dumas)

Sol in 11 pts alcohol of 90% (Hager)

Solubility in 100 pts alcohol of given vol %
at t°

t°	95%	80%	70%	60%
15	3 8	10 3	22 1	30 5
50	7 3			58 1
75	18 3	42 0		89 0

t°	50%	40%	30%	20%	10%
15	35 8	56 4	73 7	107	158
50		98 3		214	
75		160		340	

(Eder, J pr (2) 17 44)

100 pts absolute methyl alcohol dissolve
3 72 pts at 19° , 100 pts absolute ethyl alcohol
dissolve 3 1 pts at 19° (de Bruyn, Z
phys Ch 10 783)

Only traces are sol in absolute alcohol
ether 100 pts of a mixture of 1 vol alcohol
(95 vol %) + 1 vol pure ether dissolve 1
pts AgNO_3 at 15° , 100 pts of 2 vols alcohol
+ 1 vol ether dissolve 2 3 pts AgNO_3
(Eder, J pr 1878, (2) 17 45)

Solubility of AgNO_3 in ethyl alcohol +
at 30°

% by wt H_2O	% by wt alcohol	% by wt AgNO_3
27 0		73 0
27 71	2 8	69 49
30 80	13 67	55 53
32 10	20 13	47 77
31 40	25 85	42 75
28 95	37 26	33 79
27 91	44 54	27 55
20 92	64 42	14 66
6 83	86 54	6 63

(Schreinemakers, Z phys Ch 1909, **65** 57)Solubility of $\text{AgNO}_3 + \text{KNO}_3$ in alcohol
See under KNO_3 Sol in methyl, ethyl, and isobutyl alcohol
 CCl_4 , CHCl_3 , acetone and pyridine (Wilco,
J phys Chem 1910, **14** 587)100 pts H_2O sat with ether dissolve 88
pts AgNO_3 at 15° (Eder, l c)

Sol in glycerine

Sol in benzonitrile 100 g benzonitrile
dissolve about 105 g AgNO_3 at 18° (Na
mann and Schier, B 1914, **47** 1369)1 pt acetonitrile dissolves about 1 5 p
 AgNO_3 (Scholl and Steinkopf, B 1906, **4**
4398)Easily sol in methyl, ethyl, and amine
(Shinn, J phys Chem 1907, **11** 53)Sol in acetone (Krug and McElroy,
Anal Ch 6 184)0 35 pts are sol in 100 pts acetone at 1
0 35 " " " " 100 " " " 5(Laszyznski, B 1894, **27** 2287)Sol in acetone and in methylal (Lidmar,
C C 1899, **11** 1014)1 g AgNO_3 is sol in 227 g acetone at 1
Sp gr of sat solution $18^\circ/4^\circ = 0 798$ (Na
mann, B 1904, **37** 4339)Insol in CS_2 (Arctowski, Z anorg 18,
6 257)Difficultly sol in methyl acetate (Na
mann, B 1909, **42** 3790)Insol in methyl acetate (Naumann,
1909, **42** 3790), ethyl acetate (Nauman,
B 1904, **37** 3601)Sol in urethane (Castoro, Z anorg 18,
20 61)100 g C_2H_5 dissolve 0 022 g AgNO_3 at 3
0 044 g at $40 5^\circ$ (Linebarger, Am J S
1895, **49** 48)Mol weight determined in piperidine,
pyridine and benzonitrile (Werner, Z anorg
1897, **15** pp 17, 23 and 32)

Solubility of AgNO_3 in pyridine at t°

t°	G AgNO_3 per 100 g $\text{C}_5\text{H}_5\text{N}$	Solid phase
-48 5°*	0	$\text{C}_5\text{H}_5\text{N}$
-50 5	3	"
-53	6	"
-59	9	"
-65		$\text{C}_5\text{H}_5\text{N} + \text{AgNO}_3, 6\text{C}_5\text{H}_5\text{N}$
-51 25	11 1	$\text{AgNO}_3, 6\text{C}_5\text{H}_5\text{N}$
-44	11 7	"
-40	12 2	"
-35	12 6	"
-30	13 9	"
-25	17 6	"
-24		" + $\text{AgNO}_3, 3\text{C}_5\text{H}_5\text{N}$
-22	18 8	$\text{AgNO}_3, 3\text{C}_5\text{H}_5\text{N}$
-10	20 03	"
0	22 34	"
+10	27 21	"
20	33 64	"
30	40 86	"
40	53 52	"
45	62 26	"
46	63 06	"
47	66 35	"
48	70 85	"
48 5		" + $\text{AgNO}_3, 2\text{C}_5\text{H}_5\text{N}$
45	69 85	$\text{AgNO}_3, 2\text{C}_5\text{H}_5\text{N}$
50	72 25	"
60	78 60	"
70	89 10	"
80	121 21	"
87	215 02	"
80	228 5	"
74	230 6	"
74	235 4	"
80	230 4	"
87	237 1	"
90	241 9	"
100	253 8	"
110	271 4	"

* M pt

(Kahlenberg and Brewer, J phys Ch 1908, 12 283)

Silver nitrate acetylide, $\text{AgNO}_3, \text{AgHC}_2$

(Willgerodt, B 1895, 28 2103)

 $\text{AgNO}_3, \text{Ag}_2\text{C}_2$ Ppt (Chavastelon, C R 1897, 124 1365) $2\text{AgNO}_3, \text{Ag}_2\text{C}_2$ (Chavastelon)Silver nitrate ammonia, $\text{AgNO}_3, \text{NH}_3$ Partly sol in H_2O , rather sol in alcohol
Sl sol in ether (Reychler, B 16 990)Very sol in liquid ammonia below -10°
(Joannis, C R 1894, 118 1151) $\text{AgNO}_3, 2\text{NH}_3$ Easily sol in H_2O (Mitscherlich)1 l alcohol dissolves 0.0383 g mols (Kuri-
low, C C 1903 II, 97) $\text{AgNO}_3, 3\text{NH}_3$ Completely sol in H_2O
(Rose, Pogg 20 153)Silver nitrate antimonide, $\text{AgNO}_3, \text{Ag}_3\text{Sb}$ Decomp at once by H_2O (Poleck and
Thummel, B 16 2435)Silver nitrate arsenide, $\text{AgNO}_3, \text{Ag}_3\text{As}$ Decomp at once by H_2O (Poleck and
Thummel)Silver nitrate bromide, $\text{AgNO}_3, \text{AgBr}$ Decomp immediately by H_2O or alcohol,
with separation of AgBr (Risse, A 111 39)Silver nitrate chloride, $\text{AgNO}_3, \text{AgCl}$ Quickly decomp with H_2O , more slowly
with absolute alcohol, not decomp by ether-
alcohol (Reichert, J pr 92 237)Silver nitrate cyanide, $2\text{AgNO}_3, \text{AgCN}$ Decomp by H_2O , not by alcohol (Hell-
wig, Z anorg 1900, 25 177)Silver nitrate iodide, $\text{AgNO}_3, \text{AgI}$ Cold H_2O separates AgI , which redissolves
on heating (Sturenberg, Arch Pharm (2)
143 12) Sol in little H_2O without decomp,
more H_2O separates AgI (Kremers, J pr
71 54) Insol in absolute alcohol Sol in
conc $\text{AgNO}_3 + \text{Aq}$ $2\text{AgNO}_3, \text{AgI}$ Sol in little but decomp by
more boiling H_2O (Risse, A 111 39)Silver nitrate mercuric oxide, $\text{AgNO}_3, 2\text{HgO}$ Decomp by H_2O Sol in HNO_3 and
 H_2SO_4 (Fincl, Gazz ch it 1910, 41 (2)
548)Silver nitrate phosphide, $3\text{AgNO}_3, \text{Ag}_3\text{P}$

(Warren, C N 56 113)

Silver nitrate silicide, $4\text{AgNO}_3, \text{AgSi}$

(Buchner, Ch Ztg 9 484)

Silver nitrate silicate, $2\text{AgNO}_3, 3\text{Ag}_2\text{SiO}_4$ Sol in dil $\text{HNO}_3 + \text{Aq}$, but SiO_2 separates
out after heating (Rousseau and Tite, C R
114 294)Silver nitrate sulphide, $\text{AgNO}_3, \text{Ag}_2\text{S}$ Decomp by H_2O (Poleck and Thummel,
B 16 2435)Silver nitrate sulphocyanide, $2\text{AgNO}_3,$
 AgSCN Decomp by H_2O , not by alcohol (Hellwig,
Z anorg 1900, 25 178)Sodium nitrate, NaNO_3 Deliquescent in moist air Sol in H_2O with
absorption of heat 75 pts NaNO_3 mixed
with 100 pts H_2O at 13° lower the tempera-
ture 18.5° (Rudorff, B 2 68)

Sol in 1.58 pts H_2O at -6°	} (Marx)
0.46 $+119^\circ$	
2.89 2°	} (Osann)
1.12 28°	
0.79 47°	} (Kopp)
1.14 18.5°	
1.136 18.75°	} (Karsten)
1.16 20°	
2 18.75°	(Schriff A 109 326)
	(Abl)

100 pts H ₂ O at t° dissolve pts NaNO ₃			
t°	Pts NaNO ₃	t	Pts NaNO ₃
-6	68 80	50	111 13
0	79 75	60	119 94
10	84 30	70	129 63
16	87 63	80	140 72
20	89 55	90	153 63
30	95 37	100	168 20
40	102 31	120	225 30

(Poggiale, A ch (3) 8 469)

100 pts H₂O at 119° dissolve 150 pts NaNO₃ (Grif fiths)
 NaNO₃+Aq sat at 18 75° has 1 3789 sp gr and 100 pts H₂O have dissolved 88 001 pts NaNO₃ (Karsten)

NaNO₃+Aq sat in cold contains 33 3% NaNO₃ (Fourcroy)

NaNO₃+Aq sat at 12 5° contains 34% NaNO₃ (Hassenratz)

100 pts H₂O at 15 5° dissolve 33 pts at 52° 100 pts NaNO₃ (Ure s Diet)

100 pts H₂O dissolve pts NaNO₃ at t°

t	Pts NaNO ₃	t°	Pts NaNO ₃
0	73 0	60 65	125 5
13 9	81 6	99 9	173 6
44 65	110 5	119 7	211 4

(Nordenskjold, Pogg 136 312)

100 pts H₂O dissolve pts NaNO₃ at t°

t°	Pts NaNO ₃	t°	Pts NaNO ₃
0	70 94	70	142 31
10	78 57	80	153 72
20	87 97	90	165 55
30	98 26	100	178 18
40	109 01	110	194 26
50	120 00	119 4	213 43
60	131 11		

(Maumené, C R 58 81)

100 pts NaNO₃+Aq sat at 14° contain 43 88 pts NaNO₃, at 15°, 44 53 pts NaNO₃ (v Hauer, J pr 98 137)

100 pts H₂O dissolve 84 21-84 69 pts NaNO₃ at 15 6°, and sat solution has sp gr 1 337-1 378 (Page and Keightley, Chem Soc (2) 10 556)

100 pts H₂O dissolve pts NaNO₃ at t°

t°	Pts NaNO ₃	t°	Pts NaNO ₃
0	66 69	18	83 62
2	70 97	21	85 73
4	71 04	26	90 33
8	75 65	29	92 93
10	76 31	36	99 39
13	79 00	51	113 63
15	80 60	68	125 07

Solubility is constant from 0° to -15 7°, when NaNO₃+7H₂O separates out (Ditte, C R 80 1164)

Solubility in 100 pts H₂O at t°

t°	Pts NaNO ₃	t°	Pts NaN
0	72 9	60	122
1	74 7	61	124
2	75 4	62	125
3	76 0	63	126
4	76 7	64	127
5	77 4	65	128
6	78 1	66	130
7	78 7	67	131
8	79 4	68	132
9	80 1	69	133
10	80 8	70	134
11	81 4	71	136
12	82 0	72	137
13	82 7	73	138
14	83 4	74	139
15	84 0	75	140
16	84 7	76	142
17	85 4	77	143
18	86 1	78	145
19	86 8	79	146
20	87 5	80	148
21	88 3	81	149
22	89 0	82	151
23	89 7	83	152
24	90 3	84	153
25	91 0	85	155
26	91 8	86	156
27	92 5	87	158
28	93 2	88	159
29	94 0	89	161
30	94 9	90	162
31	96 0	91	164
32	96	92	166
33	97	93	168
34	98	94	169
35	99	95	171
36	100	96	173
37	100	97	175
38	101	98	177
39	102	99	178
40	102	100	180
41	103	101	182
42	104	102	184
43	105	103	186
44	106	104	188
45	107	105	190
46	108	106	192
47	109	107	194
48	110	108	196
49	111	109	198
50	112	110	200
51	113	111	202
52	114	112	204
53	115	113	207
54	116	114	209
55	117	115	211
56	118	116	213
57	119	117	215
58	120	117 5	216 4
59	211		

(Mulder, Scheik Verhandel 1864 83)

Sat solution at b pt contains 216.4 pts NaNO_3 (Mulder) 218.5 pts NaNO_3 (Marx) 213.4 pts NaNO_3 (Maumené) 211.4 pts NaNO_3 (Nordenskjöld) 224.8 pts NaNO_3 (Legrand) 150 pts NaNO_3 (Griffiths)

Sat $\text{NaNO}_3 + \text{Aq}$ contains at
 120° 130° 172° 180° 199°
 66.8 67.5 77.1 78.1 82.0% NaNO_3 ,

220° 250° 255° 290° 313° (mpt)
 83.5 89.5 91.5 97.5 100% NaNO_3
 (Étard, A ch 1894, (7) 2 527)

100 g sat $\text{NaNO}_3 + \text{Aq}$ contain 42.47 g NaNO_3 at 0° (Coppadoro, Rass Mm 1911, XVII, 35 123)

100 g sat $\text{NaNO}_3 + \text{Aq}$ contain 49.16 g NaNO_3 at 30° (Coppadoro, Rass Mm 1912, 37 7)

100 g H_2O dissolve 92.14 g NaNO_3 at 25° (Haigh, J Am Chem Soc 1912, 34 1148)

The solubility of crystals on different faces has been determined by Lebrun (Belg Acad Bull 1913 953)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at 19.5°

% NaNO_3	Sp gr	% NaNO_3	Sp gr
12.057	1.0844	39.860	1.3176
22.726	1.1667	46.251	1.3805
31.987	1.2450		

(Kremers, Pogg 95 120)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at 20.2°

% NaNO_3	Sp gr	% NaNO_3	Sp gr
1	1.0065	26	1.1904
2	1.0131	27	1.1987
3	1.0197	28	1.2070
4	1.0264	29	1.2154
5	1.0332	30	1.2239
6	1.0399	31	1.2325
7	1.0468	32	1.2412
8	1.0537	33	1.2500
9	1.0606	34	1.2589
10	1.0676	35	1.2679
11	1.0746	36	1.2770
12	1.0817	37	1.2863
13	1.0889	38	1.2958
14	1.0962	39	1.3055
15	1.1035	40	1.3155
16	1.1109	41	1.3225
17	1.1184	42	1.3355
18	1.1260	43	1.3456
19	1.1338	44	1.3557
20	1.1418	45	1.3659
21	1.1498	46	1.3761
22	1.1578	47	1.3864
23	1.1659	48	1.3968
24	1.1740	49	1.4074
25	1.1822	50	1.4180

(Schriff, calculated by Gerlach, Z anal 8 280)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at 18°

% NaNO_3	Sp gr	% NaNO_3	Sp gr
5	1.0327	20	1.1435
10	1.0681	30	1.2278

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at 20°, containing mols NaNO_3 in 100 mols H_2O

Mols NaNO_3	Sp gr
2	1.05980
5	1.13813

(Nicol, Phil Mag (5) 16 122)

The saturated solution boils at 117.5° (Mulder)
 118.9° (Griffiths)
 119° (Marx)
 119.4° (Maumené)
 119.7° (Nordenskjöld)
 121° (Legrand)
 122–123° (Kremers)

$\text{NaNO}_3 + \text{Aq}$ forms a crust at 118°, and contains 194 pts NaNO_3 to 100 pts H_2O , highest temp observed, 120.5° (Gerlach, Z anal 26 427)

B-pt of $\text{NaNO}_3 + \text{Aq}$ containing pts NaNO_3 to 100 pts H_2O G=according to Gerlach (Z anal 26 433), L=according to Legrand (A ch (2) 59 431)

B pt	G	L	B pt	G	L
101°	9	9.3	112°	121.5	120.3
102	18.5	18.7	113	133	131.3
103	28	28.2	114	144.5	142.4
104	38	37.9	115	156	153.7
105	48	47.7	116	168.5	165.2
106	58	57.6	117	181	176.8
107	68	67.7	118	194	188.6
108	78.5	77.9	119	207.5	200.5
109	89	88.3	120	222	212.6
110	99.5	98.8	121		224.8
111	110.5	109.5			

50 pts NaNO_3 mixed with 100 pts snow at —1° gave a temp of —17.5° (Rudorff, Pogg 122 337)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at t°

G NaNO_3 dissolved in 100 g H_2O	G NaNO_3 in 100 g of the solution	t	Sp gr
4.166	4	17.8°	1.0276
11.111	10	13.9°	1.0704
25.000	20	12°	1.1441

(de Lannoy, Z phys Ch 1895, 18 465)

Sp gr of $\text{NaNO}_3 + \text{Aq}$ at 20° , when p = per cent strength of sol, d = observed density, w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
42 05	1 3380	0 56267
35 65	1 2765	0 45510
31 72	1 2407	0 39365
23 24	1 1696	0 27180
17 370	1 1228	0 19505
11 915	1 0819	0 12888
9 665	1 0656	0 10300
7 039	1 0468	0 07369
4 241	1 0273	0 04357
1 589	1 0096	0 01604

(Barnes, J phys Chem 1898, 2 545)

Sp gr $20^\circ/4^\circ$ of a normal solution of NaNO_3 = 1 05386, of a 0 5 normal solution = 1 02646 (Haugh, J Am Chem Soc 1912, 34 1151)

Sp gr of sat $\text{NaNO}_3 + \text{Aq}$ at t°

t°	G NaNO_3 sol in 100 g H_2O	Sp gr
-10	68 0	1 342
0	43 0	1 358
10	80 5	1 377
20	88 0	1 387
30	96 2	1 406
40	104 9	1 418
50	114 0	1 437
60	124 6	1 456
70	136 0	1 467

(Tschernaj, J Russ Phys Chem Soc 1912, 44 1565)

Sol in 66 pts HNO_3 , in 32 pts 2HNO_3 , $3\text{H}_2\text{O}$ at 32° , in 4 pts 2HNO_3 , $3\text{H}_2\text{O}$ at 123° (Schultz, Zeit Ch (2) 5 531)

Solubility in $\text{HNO}_3 + \text{Aq}$ at 0°

G per 100 cc of solution		Sp gr
NaNO_3	HNO_3	
56 5	0 00	1 341
54 2	1 67	1 338
51 48	3 59	1 331
48 42	5 55	1 324
44 88	7 92	1 312
41 44	10 65	1 308
33 61	17 02	1 291
29 86	20 33	1 285
26 46	23 48	1 282
20 00	30 26	1 276
15 32	36 09	1 276
10 97	44 76	1 291

(Engel, C R 1887, 104 911)

Solubility of NaNO_3 in $\text{NH}_4\text{OH} + \text{Aq}$ at 1°

G per 100 g H_2O		Sp gr
NH_3	NaNO_3	
13 87	75 03	1 253
17 28	73 99	1 233
20 38	73 18	1 212

(Fedotneff and Koltunoff, Z anorg 1914, 5 251)

$\text{NaNO}_3 + \text{Na}_2\text{CO}_3$ (See Na_2CO_3)

Sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$

Very rapidly sol in sat $\text{BaCl}_2 + \text{Aq}$ with pptn of $\text{Ba}(\text{NO}_3)_2$

Sol in sat $\text{KCl} + \text{Aq}$, with formation of KNO_3

Sol in sat $\text{NH}_4\text{NO}_3 + \text{Aq}$ (See NH_4NO_3)

Sol in sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$, with partial pptn of $\text{Ba}(\text{NO}_3)_2$ (See $\text{Ba}(\text{NO}_3)_2$)

Sol in sat $\text{Pb}(\text{NO}_3)_2 + \text{Aq}$, with subsequent pptn of $\text{Pb}(\text{NO}_3)_2$ (See $\text{Pb}(\text{NO}_3)_2$)

$\text{NaNO}_3 + \text{KNO}_3$

Sol in sat $\text{KNO}_3 + \text{Aq}$, solution thus made at 18° contains 54 33% mixed salt, or 100 pts H_2O dissolve 118 98 pts mixed salt, or 89 53 pts NaNO_3 and 29 45 pts KNO_3 (See KNO_3)

$\text{NaNO}_3 + \text{Sr}(\text{NO}_3)_2$

If $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ sat at $14 5^\circ$ is sat with NaNO_3 , 100 pts H_2O dissolve

NaNO_3	83 7	66 4	62)
$\text{Sr}(\text{NO}_3)_2$		51 0	
117 4			

(Mulder)

$\text{NaNO}_3 + \text{NaNO}_2$ See under NaNO_2

$\text{NaNO}_3 + \text{NaCl}$

100 pts H_2O dissolve 24 91 pts NaNO_3 + 54 55 pts NaNO_2 = 79 46 pts of the two salts at 20° (Nicol, Phil Mag (5) 31 386)

100 pts H_2O dissolve at $18 75^\circ$

	1	2	3	4	5	6
NaCl	36	25 22	24 96	24 98		4 6
NaNO_3		52 89	52 84	52 82	86 6	6 8

2 Sat $\text{NaCl} + \text{Aq}$ treated with NaNO_3

3 Sat $\text{NaNO}_3 + \text{Aq}$ treated with NaCl

4 Simultaneous treatment of the two salts by H_2O (Karsten)

6 Excess of both salts + Aq warmed and cooled to 20° (Rudorff, B 6 484)

Solubility of NaCl with addition of NaNO₃ at 15°

Sp gr	100 ccm contain in g		
	NaCl	H ₂ O	NaNO ₃
1 2025	31 78	98 47	0 00
1 2305	27 89	87 63	7 53
1 2580	26 31	86 25	13 24
1 2810	23 98	82 66	21 58
1 3090	22 30	80 42	28 18
1 3345	20 40	79 25	33 80
1 3465	19 40	77 37	37 88
1 3465	19 67	77 34	37 64

NaNO₃ separated in last two solutionsSolubility of NaNO₃ with addition of NaCl at 15°

Sp gr	100 ccm contain in g		
	NaNO ₃	H ₂ O	NaCl
1 3720	62 38	74 82	0
1 3645	56 56	75 69	4 00
1 3585	52 09	75 71	7 24
1 3530	47 08	76 86	11 36
1 3495	42 66	76 96	15 33
1 3485	39 90	77 14	17 81
1 3485	38 73	77 15	18 97
1 3485	38 02	77 49	19 34

NaCl separated in last two solutions
(Bodlander, Z phys Ch 7 360)Solubility of NaNO₃ in NaCl+Aq at 15°

Sp gr	G per 100 cc sat solution		
	NaCl	NaNO ₃	H ₂ O
1 3720	0	62 38	74 82
1 3645	4 0	56 76	75 69
1 3585	7 24	52 09	75 71
1 3530	11 36	47 08	76 86
1 3495	15 33	42 66	76 96
1 3485	17 81	39 90	77 14
1 3485	18 97*	38 73*	77 15
1 3485	19 34*	38 02*	77 49

* Solutions sat with both salts
(Bodlander, Z phys Ch 1891, 7 361)Solubility of NaNO₃+NaCl (g in 100 g H O) at 25°

NaNO ₃	NaCl	Solid phase
79 20	8 39	NaNO ₃
68 38	16 32	"
56 56	23 74	NaNO ₃ +NaCl
39 20	27 56	NaCl
20 17	31 48	"

(Uyeda, Mem Col Sc Kyoto, 1910, 2 245)

Solubility in NaCl+Aq at 20°, 30°, 40° and 91° Tables given in the original show that each salt diminishes the solubility of the other (Leather, Mem Dept Agric India, 1914, 3 177, Chem Soc 1915, 108 (2) 13)
See also under NaClNaNO₃+NaOHSolubility in NaOH+Aq at 0° NaNO₃=
mols NaNO₃ (in mg) in 10 ccm of solution,
Na₂O=mols Na₂O (in mg) in 10 ccm of solution

NaNO ₃	Na ₂ O	NaNO ₃ +Na ₂ O	Sp gr
66 4	0	66 4	1 341
62 5	2 875	65 375	1 338
57 15	6 1	63 25	1 333
47 5	12 75	60 25	1 327
29 5	26	55 5	1 326
17 5	39	56 5	1 332
13 19	45 875	59 065	1 356
6 05	60 875	66 925	1 401

(Engel, Bull Soc (3) 6 16)

Solubility in NaOH+Aq at 0°

G per 100 cc solution		Sp gr
NaOH	NaNO ₃	
0 0	56 50	1 341
2 30	53 19	1 338
4 89	48 63	1 333
10 21	40 42	1 327
20 83	25 10	1 326
31 25	14 89	1 332
36 76	11 22	1 356
48 75	5 15	1 401

(Engel, l c)

Easily sol in K₂SO₄+Aq without pptn
Easily sol in Na₂SO₄+Aq without pptn
Sol in MgSO₄+Aq, at first to a clear solution, but afterwards NaNO₃ is pptd
Very sol in sat CuSO₄+Aq, but double sulphate separates out
Very sol in ZnSO₄+Aq with pptn of double sulphate (Karsten)Solubility of NaNO₃ in Na₂S₂O₃+Aq at t°

t	% NaNO ₃	% Na ₂ S ₂ O ₃	Solid phase
9	33 31	12 26	NaNO ₃
	22 57	23 41	" + Na ₂ S ₂ O ₃ , 5H ₂ O
	4 22	34 77	Na ₂ S ₂ O ₃ , 5H ₂ O
25	35 42	12 72	NaNO ₃
	25 40	24 25	"
	19 90	31 81	" + Na ₂ S ₂ O ₃ , 5H ₂ O
	18 02	32 83	Na ₂ S ₂ O ₃ , 5H ₂ O
	4 33	40 50	"

(Kremann and Rothmund, Z anorg 1914, 86 373)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Easily sol in liquid HF (Franklin, Z anorg 1905, 46 2)

Hydrazine dissolves 26.6 pts NaNO_3 at $12.5-13^\circ$ (de Bruyn, R t c 1899, 18 297)

100 pts alcohol of 0.9 sp gr dissolve 10.5 pts NaNO_3 0.872 sp gr 6 pts 0.834 sp gr 0.38 pt insol in alcohol of 0.817 sp gr (Kurwan)

100 pts alcohol of 61.4% by weight dissolve 21.2 pts NaNO_3 at 26° (Pohl W A B 6 600)

100 pts alcohol of 62% Tr dissolve 7.4 pts NaNO_3 at 19.5°

100 pts alcohol of 93% Tr dissolve 0.93 pt NaNO_3 at 19.5° (Wittstein)

100 pts alcohol containing % alcohol by weight dissolve pts NaNO_3 at 15° , or 100 pts solution contain % NaNO_3

	10	20	30	40	60	80% alcohol
pts NaNO_3	65.3	48.8	35.5	25.8	11.4	2.8
% NaNO_3	39.5	32.8	26.2	20.5	10.2	2.7

(Schiff)

100 pts wood-spirit of 40% dissolve 32.3 pts NaNO_3 (Schiff, A 118 365)

Solubility in alcohol at 16.5°

Sp gr	100 ccm contain in g		
	Alcohol	Water	NaNO_3
1 3745	0	75 25	62 20
1 3162	6 16	70 82	54 64
1 2576	11 60	68 10	46 06
1 2140	16 49	65 04	39 87
1 1615	22 17	61 67	32 31
1 0855	32 22	52 92	23 41
1 0558	37 23	48 50	19 85
1 0050	43 98	42 78	13 74
0 9420	52 60	32 13	9 47
0 9030	60 00	25 65	4 65
0 8610	63 16	21 31	1 63

(Bodlander, Z phys Ch 7 317)

100 pts absolute methyl alcohol dissolve 0.41 pt at 25°

100 pts absolute ethyl alcohol dissolve 0.036 pt at 25° (de Bruyn, Z phys Ch 10 783)

Solubility in alcohol at 40°

Wt % alcohol	G NaNO_3 per 100 g alcohol + Aq
0	104 5
8 22	90 8
17 4	73 3
26 0	61 6
36 0	48 4
42 8	40 6
55 3	27 1
65 1	18 1
77 0	9 4
87 2	4 2

(Bathrick, J phys Ch 1896, 1 162)

Solubility in alcohol at 30°

Wt % alcohol in solvent	G NaNO_3 per 100 g	
	Solution	Water
0	49 10	96 45
5	46 41	91 15
10	43 50	85 55
20	37 42	74 75
30	31 31	65 10
40	25 14	55 95
50	18 94	46 75
60	12 97	37 25
70	7 81	28 25
90	1 21	12 25

(Taylor, J phys Ch 1897, 1 723)

Solubility in ethyl alcohol at 25°

(Concentration of alcohol in g mol er 1000 g H_2O)

Normality	Solubility in 1000 g H_2O	Mol solubil
	920 30	10 83
$\frac{1}{4}$	908 80	10 70
$\frac{1}{2}$	896 60	10 54
1	870 95	10 24
2	825 35	9 70

(Armstrong and Eyre, Proc R Soc 1910 (), 84 127)

Very sl sol in acetone (Klug and M J-roy, J Anal Ch 6 184)

Solubility of NaNO_3 in acetone at 40°

Wt % acetone	G NaNO_3 per 100 g acetone + Aq
0 0	105
8 47	91 2
16 8	78 3
25 2	66 4
34 3	57 9
44 1	46 2
53 9	32 8
64 8	23 0
76 0	10 8
87 6	3 2

(Bathrick, J phys Ch 1896, 1 162)

Solubility of NaNO_3 in acetone at 30°

Wt % acetone in solvent	G NaNO_3 per 100 g	
	Solution	Water
0	49 10	96 45
5	46 96	93 20
9 09	45 11	90 40
20	40 10	83 70
30	35 08	77 20
40	29 80	70 75
50	24 34	64 40
60	18 55	59 95
70	13 15	50 50
80	7 10	38 20
90	1 98	20 20

(Taylor, Z phys Ch 1897, 2 723)

Sol in glycerine

Insol in ethylamine (Shunn, J phys Chem 1907, 11 538)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Sodium thorium nitrate, $\text{NaTh}(\text{NO}_3)_6 + 9\text{H}_2\text{O}$ Hydroscopic, sol in dil HNO_3 and Aq (Meyer, Z anorg 1901, 27 331)**Sodium nitrate sulphate**, $\text{NaNO}_3, \text{Na}_2\text{SO}_4 + \frac{3}{2}\text{H}_2\text{O}$ Sol in H_2O (Marignac, Ann Min (5) 12 44)+ H_2O Min Darapskite**Sodium nitrate tungstosilicate**, $3\text{Na}_4\text{W}_{12}\text{SiO}_{40} + 4\text{NaNO}_3 + 45\text{H}_2\text{O}$

(Wyruboff, Chem Soc 1897, 72 (2) 174)

Strontium nitrate, $\text{Sr}(\text{NO}_3)_2$ Sol in 5 pts cold and 0.5 pt boiling H_2O (Dumas) 2 05 (Wittstein)2 at 18.75° (Abl)
100 pts sat $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at $19-20^\circ$ contain 45.49 pts $\text{Sr}(\text{NO}_3)_2$ (v Hauer J pr 98 137)1 pt $\text{Sr}(\text{NO}_3)_2$ dissolves in pts H_2O at t°

t°	Pts H_2O	t°	Pts H_2O	t°	Pts H_2O
0	2 32	25	1 10	75	0 99
10	1 73	50	1 02	100	0 94

(Kremers Pogg 92 499)

100 pts H_2O dissolve at 0° , 39.5 pts $\text{Sr}(\text{NO}_3)_2$ (Mulder), at 0° , 40.16 pts $\text{Sr}(\text{NO}_3)_2$ (Poggiale), at 0° , 43.1 pts $\text{Sr}(\text{NO}_3)_2$ (Kremers), at 100° , 101.1 pts $\text{Sr}(\text{NO}_3)_2$ (Mulder), at 100° , 106.5 pts $\text{Sr}(\text{NO}_3)_2$ (Kremers, Pogg 92 499), at 100° , 119.25 pts $\text{Sr}(\text{NO}_3)_2$ (Poggiale)

Solubility in 100 pts H_2O at t°

t°	Pts $\text{Sr}(\text{NO}_3)_2$	t°	Pts $\text{Sr}(\text{NO}_3)_2$	t	Pts $\text{Sr}(\text{NO}_3)_2$
0	39 5	36	90 7	73	96 0
1	41 2	37	90 8	74	96 2
2	42 8	38	91 0	75	96 4
3	44 3	39	91 1	76	96 5
4	45 8	40	91 3	77	96 7
5	47 3	41	91 4	78	96 8
6	48 8	42	91 5	79	97 0
7	50 3	43	91 6	80	97 2
8	51 8	44	91 8	81	97 4
9	53 4	45	91 9	82	97 5
10	54 9	46	92 1	83	97 7
11	56 5	47	92 2	84	97 9
12	58 0	48	92 3	85	98 0
13	59 6	49	92 5	86	98 2
14	61 2	50	92 6	87	98 4
15	62 8	51	92 8	88	98 6
16	64 4	52	92 9	89	98 8
17	66 0	53	93 1	90	99 0
18	67 6	54	93 2	91	99 2
19	69 2	55	93 4	92	99 4
20	70 8	56	93 5	93	99 6
21	72 5	57	93 6	94	99 8
22	74 1	58	93 8	95	100 0
23	75 8	59	93 9	96	100 2
24	77 4	60	94 0	97	100 4
25	79 0	61	94 2	98	100 6
26	80 7	62	94 3	99	100 9
27	82 4	63	94 5	100	101 1
28	84 1	64	94 6	101	101 3
29	85 8	65	94 8	102	101 6
30	87 6	66	94 9	103	101 8
31	89 5	67	95 1	104	102 0
31 3	90 0	68	95 2	105	102 3
32	90 2	69	95 4	106	102 5
33	90 3	70	95 6	107	102 7
34	90 5	71	95 7	107 9	102 9
35	90 6	72	95 9		

(Mulder, Scheik Verhandel 1864 114)

Sat $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ contains at

-6° $+14^\circ$ 20° 32°
24.5 35.9 39.8 46.9% SrNO_3 ,

53° 56° 76° 94° 110°
47.2 47.8 49.1 50.4 50.2% SrNO_3

(Etard, A ch 1894, (7) 2 528)

79.27 g anhydrous $\text{Sr}(\text{NO}_3)_2$ are sol in 100 g H_2O at 25° (Parsons and Carson, J Am Chem Soc 1910, 32 1385)

Solubility of $\text{Sr}(\text{NO}_3)_2$ in H_2O at t°

t°	G $\text{Sr}(\text{NO}_3)_2$ in 100 g H_2O	Sp gr
0 58	40 124	1 2856
14 71	60 867	1 3938
26 40	82 052	1 4883
29 06	87 648	1 5110
30 28	88 577	1 5144
32 58	88 943	1 5141
39 74	90 086	1 5128
47 73	91 446	1 5115
61 34	93 856	1 5105
68 96	95 576	1 5106
78 98	97 865	1 5109
88 94	100 136	1 5117

(Berkeley and Appleby, Proc R Soc 1911,
(A) 85 503)

100 g of the sat solution contain at 20° ,
41.43 g $\text{Sr}(\text{NO}_3)_2$ (Findlay, Chem Soc
1914, 105 782)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at 19.5°

$\text{Sr}(\text{NO}_3)_2$	Sp gr	$\text{Sr}(\text{NO}_3)_2$	Sp gr
1	1 009	21	1 192
2	1 017	22	1 202
3	1 025	23	1 213
4	1 034	24	1 223
5	1 041	25	1 233
6	1 049	26	1 246
7	1 059	27	1 257
8	1 068	28	1 268
9	1 076	29	1 280
10	1 085	30	1 292
11	1 095	31	1 304
12	1 103	32	1 316
13	1 113	33	1 330
14	1 122	34	1 340
15	1 131	35	1 354
16	1 140	36	1 367
17	1 150	37	1 381
18	1 160	38	1 395
19	1 170	39	1 410
20	1 181	40	1 422

(Kremers, calculated by Gerlach, Z anal 8
286)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at 23.4° a=no of
grms $\times \frac{1}{2}$ mol wt dissolved in 1000
grms H_2O , b=sp gr if a is $\text{Sr}(\text{NO}_3)_2$,
 $4\text{H}_2\text{O}$, $\frac{1}{2}$ mol wt = 142, c=sp gr if a is
 $\text{Sr}(\text{NO}_3)_2$, $\frac{1}{2}$ mol wt = 106

a	b	c	a	b	c
1	1 078	1 081	5	1 303	1 350
2	1 146	1 155	6	1 345	1 407
3	1 205	1 224	7	1 383	
4	1 257	1 284			

(Favre and Valson, C R. 79 968)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at 17.5°

% $\text{Sr}(\text{NO}_3)_2$	Sp gr	% $\text{Sr}(\text{NO}_3)_2$	Sp gr
10	1 083	40	1 422
20	1 180	Sat sol	1 52
30	1 294		

(Gerlach, Z anal 27 283)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at t°

t°	% $\text{Sr}(\text{NO}_3)_2$	Sp gr
14 0°	5	1 0420
14 3°	10	1 0859
14 5°	15	1 1319
14 5°	20	1 1816
14 5°	25	1 2364
14 4°	34 33	1 3470

(Long, W Ann 1880, 11 39)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at room tem
containing

10 29 21 19 32 61% $\text{Sr}(\text{NO}_3)_2$
1 0885 1 124 1 3067

(Wagner, W Ann 1883, 18 266)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0822
$\frac{1}{2}$ -normal	1 0419
$\frac{1}{4}$ -normal	1 0208
$\frac{1}{8}$ -normal	1 0104

(Wagner, Z phys Ch 1890, 5 40)

$\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ containing 10.50% $\text{Sr}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1.0905$

$\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ containing 25.51% $\text{Sr}(\text{NO}_3)_2$
has sp gr $20^\circ/20^\circ = 1.2440$

(Le Blanc and Rohland, Z phys Ch 1890,
19 279)

Sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ at 20° containi
M g mols of salt per liter

M 0 01 0 025 0 05 0 075
Sp gr 1 001525 1 004207 1 008391 1 0126

M 0 10 0 25 0 50 0 75
Sp gr 1 016834 1 04201 1 08312 1 12386

M 1 00
Sp gr 1 16354

(Jones and Pearce, Am Ch J 1907, 38 70)

B-pt of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$, containing pts $\text{Sr}(\text{NO}_3)_2$ to 100 pts H_2O

B-pt	Pts $\text{Sr}(\text{NO}_3)_2$	B pt	Pts $\text{Sr}(\text{NO}_3)_2$
100 5°	12	104°	81 4
101	24	104 5	89 6
101 5	34 8	105	97 6
102	45	105 5	105
102 5	54 4	106	112 2
103	63 6	106 3	116 5
103 5	72 6		

(Gerlach, Z anal 26 448)

Sat $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ boils at 106 8°, and contains 112 9 pts salt to 100 pts H_2O (Griffiths)

Sat $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ boils at 107 5–108° (Kremers), 107 9° (Mulder)

Sat $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ forms a crust at 106 3°, and contains 116 5 pts $\text{Sr}(\text{NO}_3)_2$ to 100 pts H_2O , highest temp observed was 107° (Gerlach, Z anal 26 427)

Very sl sol in conc HNO_3 or $\text{HCl} + \text{Aq}$ (Wurtz)

Insol in $\text{HNO}_3 + \text{Aq}$ (Schultz, Zeit Ch (2) 5 537)

Solubility in $\text{Sr}(\text{OH})_2, 8\text{H}_2\text{O} + \text{Aq}$ at 25°

Sp gr 25/25	G SrO as $\text{Sr}(\text{OH})_2$ in 100 g H_2O	G $\text{Sr}(\text{NO}_3)_2$ in 100 g H_2O
1 492	0 38	79 47
1 494	0 78	80 83

(Parsons, J Am Chem Soc 1910, 32 1388)

Very sol in liq NH_3 (Franklin, Am Ch J 1898, 20 829)

Sol in 8500 pts absolute alcohol Sol in 60,000 pts of a mixture of 1 pt ether and 1 pt alcohol (Rose, Pogg 110 296)

Sol in 4189 pts abs alcohol and in 199 87 pts ordinary rectified spirits (Hill, Pharm J 1888 (3) 19 420)

Solubility in ethyl alcohol + Aq at 25°

% $\text{C}_2\text{H}_5\text{OH}$ in the solvent	% $\text{C}_2\text{H}_5\text{OH}$ in the solution	% $\text{Sr}(\text{NO}_3)_2$ in the solution
99 4	99 38	0 02
79 2	77 15	2 60
59 9	53 6	10 5
40 65	32 35	20 5
20 6	13 8	33 2
18 8	12 35	34 3
16 25	10 45	35 7
15 05	9 5	36 7
10 0	6 0	40 05
6 0	3 45	42 7
0	0	46 6

$\text{Sr}(\text{NO}_3)_2$ is the solid phase in the solutions which are rich in alcohol, $\text{Sr}(\text{NO}_3)_2 + 4\text{H}_2\text{O}$ in

the solutions which contain small amounts of alcohol

(D'Ans and Siegler, Z phys Ch 1913, 82 39)

Not completely insol in boiling amyl alcohol, 30 cem dissolving about 1 mg (Browning, Sill Am J 143 52)

Perfectly anhydrous $\text{Sr}(\text{NO}_3)_2$ is sol in 83044 pts absolute ether-alcohol (1 1) (Fresenius, Z anal 32 190)

Solubility in organic solvents

Solvent	% $\text{Sr}(\text{NO}_3)_2$ in the solution at 25°
Methyl alcohol	1 26
Ethyl alcohol	0 02
Propyl alcohol	0 02
Isobutyl alcohol	0 01
Amyl alcohol	0 003
Acetone	0 02

(D'Ans and Siegler, Z phys Ch 1913, 82 44)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Sol in acetone (Eidmann, C C 1899 II, 1014)

Difficultly sol in acetone (Naumann, B 1904, 37 4323)

The composition of the hydrates formed by $\text{Sr}(\text{NO}_3)_2$ at different dilutions is calculated from determinations of the lowering of the fr-pt produced by $\text{Sr}(\text{NO}_3)_2$ and of the conductivity and sp gr of $\text{Sr}(\text{NO}_3)_2 + \text{Aq}$ (Jones, Am Ch J 1905, 34 305)

$+4\text{H}_2\text{O}$ Efflorescent

Solubility in ethyl alcohol + Aq at 25°

% $\text{C}_2\text{H}_5\text{OH}$ in the solvent	% $\text{C}_2\text{H}_5\text{OH}$ in the solution	% $\text{Sr}(\text{NO}_3)_2$ in the solution
0	0	44 25
4	1 7	42 5
6	2 6	42 1
10 8	4 95	40 4
16 0	7 95	37 6
20	12 35	34 3

(D'Ans and Siegler, Z phys Ch 1913, 82 39)

Tellurium nitrate, basic, $4\text{TeO}_2, \text{N}_2\text{O}_5 + 1\frac{1}{2}\text{H}_2\text{O}$

Very hygroscopic Easily decomp by H_2O Sol in $\text{HNO}_3 + \text{Aq}$, but more sol when dil than conc (Klein and Morel, Bull Soc (2) 43 205)

Tellurium nitrate, TeNO_3

Sol in acetone (Eidmann, C C 1899 II, 1014)

Terbium nitrate, $Tb(NO_3)_3 \cdot 6H_2O$

Sol in H_2O Sol in alcohol (Urban, C R 1908, 146 128)

Thallous nitrate, $TlNO_3$

1 pt $TlNO_3$ dissolves, according to C = Crookes, L = Lamy

at 15°	18°	58°	107°
in 9 4	10 3	2 3	0 17 pts H_2O
C	L	L	L

Sat $TlNO_3 + Aq$ contains at

3 5°	18°	32°	58°	95°
4 2	8 8	13 2	30 4	74 5% $TlNO_3$

107°	135°	145°	150°	155°
85	95	95 2	96 5	97% $TlNO_3$

(Étard, A ch 1894, (7) 2 527)

Solubility in H_2O at t°

t°	g $TlNO_3$ in 100 g H_2O	g mol $TlNO_3$ in 1 l
0	3 91	0 149
10	6 22	0 230
20	9 55	0 357
25		0 433
30	14 3	0 522
40	20 9	0 755
50	30 4	1 07
60	46 2	1 58
70	69 5	2 29
80	111	3 40
90	200	5 32
100	414	8 29
105	594	10 25

(Berkeley, Trans Roy Soc 1904, 203 A, 211)

Sp gr of $TlNO_3 + Aq$ at 25°

Concentration of $TlNO_3 + Aq$	Sp gr
$\frac{1}{4}$ -normal	1 0562
$\frac{1}{8}$ - " "	1 0283

(Wagner, Z phys Ch 1890, 5 40)

Solubility of $TlNO_3 + KNO_3$ (See KNO_3)

Insol in alcohol (Lamy)

Sol in acetone (Eidmann, Dissert 1899, Naumann, B 1904, 37 4328)

Thallous hydrogen nitrate, $TlNO_3 \cdot 2HNO_3$

(Wells, Am Ch J 1901, 26 273)

$TlNO_3 \cdot 3HNO_3$ (Ditte)

Thallic nitrate, $Tl(NO_3)_3 \cdot 3H_2O$

Effloresces in the air (Meyer, Z anorg 1900, 24 361)

+6 H_2O , or 8 H_2O Deliquescent Sol in H_2O

Thallic thallic nitrate, $2TlNO_3 \cdot Tl(NO_3)_3$

Decomp by H_2O (Wells, Am Ch J 1901, 26 278)

Thallic uranyl nitrate, $Tl(UO_2)(NO_3)_3$

Decomp in moist air Decomp by H (Meyer, B 1903, 36 4058)

Thorium nitrate, $ThO_2 \cdot 2N_2O_5 \cdot 6H_2O$

Crystallized SI hygroscopic (Ful, Zeit angew Ch 1897, 10 116)

+12 H_2O Very deliquescent, and sol in H_2O and alcohol

Difficultly sol in acetone (Naumann, J 1904, 37 4328)

Thorium zinc nitrate, $ZnTh(NO_3)_6 \cdot 8H_2O$

Sol in HNO_3 , very hygroscopic (Merz, Z anorg 1901, 27 386)

Thulium nitrate, $Tm_2(NO_3)_6 \cdot 8H_2O$

Deliquescent Can readily be cryst fr in HNO_3 (James, J Am Chem Soc 1911, 3 1344)

Tin (stannous) nitrate, basic, $2SnO \cdot N_2O_5$

Difficultly sol with partial decomp in H (Weber, J pr (2), 26 121)

Tin (stannous) nitrate, $Sn(NO_3)_2 \cdot 20H_2O$

Deliquescent, and easily decomp (Weber, J pr (2) 26 121)

Tin (stannic) nitrate, basic, $4SnO_2 \cdot N_2O_5 + 4H_2O$

(Thomas, Bull Soc 1896 (3) 15 312)

Tin (stannic) nitrate, $Sn(NO_3)_4$

Sol in H_2O , but decomp very soon n standing Stable in presence of conc HNO_3 + Aq at 90°, but decomp at 100° (Mor martin, Gazz ch it 22 384)

Insol in moderately conc HNO_3 , reacts by decomp by H_2O (Engel, C R 1897, 1 710)

Titanium nitrate, $5TiO_2 \cdot N_2O_5 \cdot 6H_2O$

Sol to a slight milkiness in cold H (Decomp on boiling (Merz, J pr 99 157)

Uranyl nitrate, basic

Sol in H_2O (Ordway, Sil Am J (2) 209)

Uranyl nitrate, $UO_2(NO_3)_2$

+ H_2O (de Forcrand, C R 1913, 1 1046)

Sol in fuming HNO_3 from which it can be cryst

+2 H_2O 52 39% is sol in dry ether at 54 25% " " " " " " " "

(Lebeau, Bull Soc 1911, (4) 9 300)

+2H₂O (Vasileff, C C 1910, II 1527)
 +3H₂O Mpt 121.5° (Vasileff)
 Cryst out of hot HNO₃+Aq (Ditte)
 100 pts HNO₃ dissolve 39 pts at 14°
 (Ditte, A ch 1879, (5) 13 337)
 +4H₂O (de Connck, C C 1901, I 1354)
 +6H₂O Deliquescent in moist, and efflorescent in dry air Sol in 0.5 pt cold H₂O, in 0.3 pt absolute alcohol, and in 4.0 pts ether (Bucholz)

Melts in crystal H₂O at 59.4° (Ordway)
 1 pt is sol in 2 pts H₂O at 12.9°-14.2°
 (de Connck, C R 1900, 131 1220)

Solubility in H₂O at t°

t°	% by wt UO ₂ (NO ₃) ₂ 6H ₂ O
-18 1	54 90
-12 1	58 00
-2 2	62 13
0	63 01
+12 3	67 36
25 6	72 83
36 7	78 05
45 2	82 96
71 8	86 32

(Vasileff, J Russ Phys Chem Soc 1910, 42 570)

Sp gr of (UO₂)(NO₃)₂+Aq at t°

t°	% salt	Sp gr
11 5	1	1 0049
12 4	2	1 0096
15 1	3	1 01401
14 1	4	1 0187
16 7	5	1 0230
14 1	6	1 8281
15 7	7	1 0236
15 2	8	1 0378
16 5	9	1 0410
15 2	10	1 0462
13 7	11	1 0504
11 5	12	1 0550
14 5	13	1 0594
11 3	14	1 0643
12 5	15	1 0680
13 2	16	1 0718

(de Connck, C R 1900, 131 1219)

Sp gr of a sat aq solution=1.7536 at 17°, containing 54.77% UO₂(NO₃)₂

Sp gr =1.0257 when 2.80% UO₂(NO₃)₂ is present (Vassiliev, C C 1912 I, 1430)

Sp gr of solution in HNO₃+Aq

Pts of salt in 100 pts HNO ₃ sp gr 1.153	1	2	3	4	5
Temp	11 0°	11 8°	11 3°	12 0°	11 6°
Sp gr of the solution	1 1585	1 1614	1 1663	1 1698	1 1751

(de Connck, C R 1901, 132 90)

Sp gr of solution in H₂SO₄+Aq

Pts of salt in 100 pts H ₂ SO ₄ sp gr 1.138	1 pt	2 pts	3 pts	4 pts	5 pts
Temp	11 2°	11 8°	10 7	12 0°	11 4°
Sp gr of solution	1 1427	1 1450	1 1511	1 1540	1 1576

(de Connck)

Very sol in dil HBr and selenic acid (d=1.4) Sol in conc H₂SO₄, HNO₃, dil HCl and less sol in conc HCl (de Connck, C R 1900, 131 1220)

Sp gr of solution in HBr+Aq of sp gr 1.21

Sp gr	% salt dissolved
1 2122	1
1 2168	2
1 2198	3
1 2250	4
1 2305	5

(de Connck, Belg Acad Bull 1901 222)

Insol in KOH+Aq, NaOH+Aq or NH₄OH+Aq Sol in lime water (de Connck, C R 1900, 131 1220)

Sl attacked by liquid NH₃ (Gore, Am Ch J 1898, 20 830)

At 15°, uranyl nitrate is sol in comm methyl alcohol, dil and conc ethyl alcohol, propyl and isobutyl alcohol, comm amyl alcohol, acetone, ether, ethyl acetate, dil and conc formic acid and dil acetic acid, sl sol in comm essence of terebenthine, insol in benzene (cryst), comm toluene and xylene, ligroin, CHCl₃, glycerine and CS₂ (de Connck, C R 1900, 131 1220)

1 pt is sol in 55 pts methyl alcohol at ca 11.8°

1 pt is sol in 30 pts ethyl alcohol (85°) at ca 12.9°

1 pt is sol in 65 pts acetone at ca 12.0°

1 pt is sol in 5.6 pts acetic acid (d=1.035) at ca 14.25°

(de Connck, C R 1900, 131 1304)

1 pt sol in 23.5 pts methyl alcohol at 11.2°

1 " " " 16.0 " ether " 11.9°

1 " " " 18.4 " ethyl acetate " 10.3°

1 " " " 5.3 " conc formic acid at 15.1°

(de Connck, C R 1901, 132 91)

Sp gr of solution in comm methyl alcohol at t°

t°	% salt	Sp gr referred to H ₂ O
11	1	0 8902
12 9	2	0 8938
12 2	3	0 9003
10 7	4	0 9068
12 8	5	0 9108

(de Connck, C R 1900, 131 1304)

Sp gr of solution in ethyl alcohol (85°) at t°

d₂=sp gr referred to alcohold₁=sp gr referred to H₂O

t°	% salt	d ₁	d ₂
11 9	1	0 8918	1 0060
12 2	2	0 8979	1 0127
11 6	3	0 9023	1 0177
13 1	4	0 9056	1 0227
11 7	5	0 9131	1 0280

(de Connck, C R 1900, 131 1219)

Sp gr of solution in acetic acid (d=1.055) at t°

d₁=sp gr referred to H₂Od₂=sp gr referred to acetic acid

t°	% salt	d ₁	d ₂
14 0	1	1 0387	1 0034
13 8	2	1 0434	1 0080
14 8	3	1 0469	1 0100
16 9	4	1 0505	1 0148
14 6	5	1 0564	1 0205
10 4	6	1 0626	1 0265
11 7	7	1 0662	1 0300

(de Connck, C R 1900, 131 1304)

When excess of UO₂(NO₃)₂ is shaken with ether at 7°, two layers are formed, the ether layer containing 59 g salt per 100 g solution and the aqueous layer 62.5 g salt per 100 g solution (Lebeau, C R 1911, 152 440)

Sol in nearly all proportions in glycerine (Postans, Pharm J 1883, (3) 13 752)

Sol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Sol in acetone (Eidmann, C C 1899 II, 1014, Naumann, B 1904, 37 4328)

+18H₂O Sat aq solution has D_{17°/17°}=1.7536 (Vasilieff, J Russ phys Chem Soc 1911, 43 1183)

Uranyl nitrate ammonia, (UO₂)(NO₃)₂, 2NH₃

(v Unruh, Dissert 1909)

(UO₂)(NO₃)₂, 3NH₃ (v Unruh)(UO₂)(NO₃)₂, 4NH₃ (v Unruh)

Uranyl nitrate phosphate, UO₂H₄(PO₄)₂, UO₂(NO₃)₂+14H₂O

Easily sol in warm H₂O, with gradual decomp. Easily sol in HNO₃, HCl, or H₂SO₄+Aq. Sol in acetic acid with decomp (Hentz, A 151 216)

Divanadyl nitrate (?)

Known only in solution. Decomp on evaporation

Ytterbium nitrate, basic

Easily sol in H₂O

Ytterbium nitrate

Very sol in H₂O

+3H₂O Ppt (Cleve, Z anorg 190 32 140)

+4H₂O (Cleve)

Yttrium nitrate, basic, 2Y₂O₃, 3N₂O₅+9H₂O

Deliquescent in moist air. Decomp b cold or boiling H₂O. Sol in a solution of yttrium nitrate without decomp (Bahr and Bunsen, A 137 1)

Yttrium nitrate, Y(NO₃)₃+6H₂O

Easily sol in H₂O, alcohol, or ether (Cleve)

141.6 grams are sol in 100 grams H₂O at 25° (James, J Am Chem Soc 1910, 3 876)

Zinc nitrate, basic, 8ZnO, N₂O₅+2H₂O

Insol in H₂O (Grouvelle, A ch 19 137 6ZnO, N₂O₅+8H₂O=Zn(NO₃)₂, 5Zn(OH

+3H₂O (Bertels, J B 1784 274)

5ZnO, N₂O₅+5½H₂O Insol in cold somewhat sol in hot H₂O (Havermann

+6H₂O Slowly decomp by cold H₂O (Rousseau and Tite)

9ZnO, 2N₂O₅ Decomp by H₂O (Vog and Reischauer, N Jahrb Pharm 11 137

4ZnO, N₂O₅+2H₂O (Schindler)

+3H₂O (Ordway, Sill Am J (2) 32 14 Gerhardt, J Pharm (3) 12 61)

Insol in H₂O, sol in dil acids (Athar asasco, Bull Soc 1896, 15 1080)

2ZnO, N₂O₅+3H₂O Decomp by H₂O, and slowly by alcohol (Wells, Am Ch J 9 304

7ZnO, 4N₂O₅+14H₂O=4Zn(NO₃)₂, 3Zn(OH)₂+11H₂O (Bertels)

Zinc nitrate, Zn(NO₃)₂

Very deliquescent. Easily sol in H₂O (alcohol)

Sp gr of Zn(NO₃)₂+Aq. F = according to Franz (J pr (2) 5 274) at 17.5°, O = according to Oudemans (Z anal 7 410) at 14°

	5	10	15%Zn(NO ₃)	
F	1 0496	1 0968	1 1476	
O	1 0425	1 087	1 1355	
	20	25	30%Zn(NO ₃)	
F	1 2024	1 2640	1 3265	
O	1 1875	1 245	1 305	
	35	40	45	50%Zn(NO ₃)
F	1 906	1 4572	1 5258	1 5984
O				

Calculated for Zn(NO₃)₂+6H₂O

	10	20	30	40	50% sal
F	1 05361	1 1131	1 1782	1 2496	1 3292

(Oudemans)

Zn(NO₃)₂+Aq when heated soon decomposes, with formation of an insol basic salt (Ordway)

Sp gr of $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$ at room temp containing

15 955 30 626 44 5% $\text{Zn}(\text{NO}_3)_2$
1 1155 1 2291 1 4367

(Wagner, W Ann 1883, 18 270)

Sp gr of $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Concentration of $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$	Sp gr
1-normal	1 0758
$\frac{1}{2}$ - "	1 0404
$\frac{1}{4}$ - "	1 0191
$\frac{1}{8}$ - "	1 0096

(Wagner, Z phys Ch 1890, 5 40)

Sp gr of $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$ at 16°

$\frac{1}{2}$ $\text{Zn}(\text{NO}_3)_2$ g per 1000 g of solution	Sp gr 16°/16°
0 0000	1 000000
0 9950	1 000814
2 0061	1 001646
4 1535	1 003413
8 1824	1 006733
17 7760	1 014702
34 5920	1 028890
68 6780	1 058644

(Dijken, Z phys Ch 1897, 24 108)

Sp gr of $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$ at 17.3°, when p = per cent strength of solution, d = observed density, w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
47 28	1 5504	0 73310
41 32	1 4579	0 60240
30 86	1 3136	0 40535
29 21	1 2933	0 37780
19 65	1 1830	0 23246
14 39	1 1284	0 16232
11 36	1 0988	0 12478
7 091	1 0597	0 07515
5 923	1 0491	0 06213
1 574	1 0118	0 01593
1 210	1 0087	0 01221

(Barnes, J Phys Chem 1898, 2 545)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

+ $\frac{1}{2}\text{H}_2\text{O}$ 100 pts HNO_3 dissolve 28 pts at 13°, 55 pts at 55° (Ditte, A ch 1879, (5) 18 335)

+ $2\text{H}_2\text{O}$ (Vasheff, C C 1909, II 1966)

+ $3\text{H}_2\text{O}$

Solubility in H_2O

Sat solution contains at

37° 40° 41° 43° 45 5° mpt
66 38 67 42 68 21 69 26 77 77% $\text{Zn}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 401)

+ $6\text{H}_2\text{O}$

Solubility in H_2O

Sat solution contains at

—18° —15° —13° —12°
44 63 45 26 45 51 45 75% $\text{Zn}(\text{NO}_3)_2$,

0° +12 5° 18° 25°
48 66 52 00 53 50 55 90% $\text{Zn}(\text{NO}_3)_2$,

36 4° (mpt) 36° 33 5°
63 63 64 73 65 83% $\text{Zn}(\text{NO}_3)_2$

(Funk, Z anorg 1899, 20 400)

100 g $\text{Zn}(\text{NO}_3)_2 + \text{Aq}$ sat at 0° contain 48 7 g $\text{Zn}(\text{NO}_3)_2$, at 18°, 53 5 g $\text{Zn}(\text{NO}_3)_2$ (Mylius, Z anorg 1910, 74 411)

Melts in its crystal H_2O at 36 4° (Ordway), 50° (Pierre), boils at 131° (Ordway)

Sp gr of solution sat at 18° = 1 664, and contains 53 9% $\text{Zn}(\text{NO}_3)_2$ (Mylius, B 1897, 30 1718)

Sol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

+ $9\text{H}_2\text{O}$

Solubility in H_2O

Sat solution contains at

—25° —22 5° —20° —18°
40 12 40 75 42 03 43 59% $\text{Zn}(\text{NO}_3)_2$

Cryohydrate is formed at —29°

(Funk, Z anorg 1899, 20 401)

Zinc nitrate ammonia, $\text{Zn}(\text{NO}_3)_2 \cdot 4\text{NH}_3$

Ppt (Ephram, B 1915, 48 638)

+ $\frac{2}{3}\text{H}_2\text{O}$

Deliquescent Sol in H_2O (André, C R 100 639)

13 ZnO , 3 N_2O_5 , 2 NH_3 + 18 H_2O

Insol in cold, decomp by warm H_2O (André, C R 1885, 100 640)

Zinc nitrate cupric oxide,

$\text{Zn}(\text{NO}_3)_2 \cdot 3\text{CuO} + 3\text{H}_2\text{O}$

(Mailhe, A ch 1902, (7) 27 169)

Zinc nitrate hydrazine, $\text{Zn}(\text{NO}_3)_2 \cdot 3\text{N}_2\text{H}_4$

Decomp by hot H_2O

Sol in NH_4OH (Hunzen, Z anorg 1908, 60 279)

Zirconium nitrate, basic, $3\text{ZrO}_2 \cdot 2\text{N}_2\text{O}_5$

Insol in H_2O

$\text{ZrO}_2 \cdot \text{N}_2\text{O}_5$ Easily sol in H_2O and alcohol + H_2O As above

Zirconium nitrate, $\text{Zr}(\text{NO}_3)_4 \cdot 5\text{H}_2\text{O}$ (?)

Deliquescent, and sol in H_2O

Nitric oxide, NO

See Nitrogen dioxide

Nitrilobromosmic acid

Ammonium nitriropentabromosmate,
 $[\text{OsNBr}_5](\text{NH}_4)_2 + \text{H}_2\text{O}$

Very sol in H_2O Decomp in dil aq solution

Stable in $\text{HBr} + \text{Aq}$

Insol in organic solvents (Werner, B 1906, 39 501)

Cesium hydrogen nitriropentabromosmate,
 $[\text{OsNBr}_5]_2\text{Cs}_2\text{H}$

Sl sol in H_2O (Werner)

Potassium nitrilotetrabromosmate,
 $[\text{OsNBr}_4]\text{K} + 2\text{H}_2\text{O}$

Very sol in H_2O Decomp in aq solution

Stable in $\text{HBr} + \text{Aq}$ Insol in organic solvents (Werner)

Rubidium nitriropentabromosmate,
 $[\text{OsNBr}_5]\text{Rb}_2$

Sol in H_2O Decomp in dil aq solution after a short time (Werner)

Nitriochlorosmic acid

Ammonium nitriropentachlorosmate,
 $(\text{OsNCl}_5)(\text{NH}_4)_2$

Sol in H_2O , insol in conc $\text{HCl} + \text{Aq}$ (Werner, B 1901, 34 2702)

Cesium nitriropentachlorosmate,
 $(\text{OsNCl}_5)_2\text{Cs}_2$

Sol in H_2O (Werner)

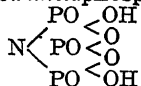
Potassium nitriropentachlorosmate,
 $(\text{OsNCl}_5)_2\text{K}_2$

Sol in H_2O , pptd by HCl , insol in organic solvents (Werner)

Rubidium nitriropentachlorosmate,
 $(\text{OsNCl}_5)_2\text{Rb}_2$

Sol in H_2O , decomp in dil neutral solution (Werner)

Nitrilotrimetaphosphoric acid, $\text{H}_2\text{NP}_3\text{O}_7 =$



Known only in solution (Mente, A 248 260)

Aluminum nitrilotrimetaphosphate

Insol in H_2O , conc HCl , or $\text{HNO}_3 + \text{Aq}$
 Slowly sol in boiling conc H_2SO_4 Sol in warm $\text{NaOH} + \text{Aq}$ or $\text{Na}_2\text{CO}_3 + \text{Aq}$ without decomp Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Mente)

Barium —, BaNP_3O_7

Insol in dil or conc acids Decomp by boiling NaOH or $\text{Na}_2\text{CO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Mente)

Cadmium nitrilotrimetaphosphate

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, or boili $(\text{NH}_4)_2\text{CO}_3$, or $\text{NaOH} + \text{Aq}$ (Mente)

Calcium —, $\text{CaNP}_3\text{O}_7 + \text{H}_2\text{O}$

Sol in conc $\text{HCl} + \text{Aq}$ by long boiling, ar more easily in fuming $\text{HNO}_3 + \text{Aq}$ Insol NH_4OH or $\text{NaOH} + \text{Aq}$ (Mente)

Chromium —

Slowly sol in dil acids Easily sol ammonia Sol in cold $\text{NaOH} + \text{Aq}$ (Mente)

Cobalt —, $\text{CoNP}_3\text{O}_7 + \text{H}_2\text{O}$

Insol in H_2O Sl sol in dil acids Easi sol in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by NaOH $\text{Na}_2\text{CO}_3 + \text{Aq}$ (Mente)

Copper —

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by $\text{NaO} + \text{Aq}$ (Mente)

Ferric —, $\text{Fe}_2(\text{NP}_3\text{O}_7)_3$

Insol in conc acids Easily sol in $\text{NH}_4\text{O} + \text{Aq}$ or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Decomp b NaOH or $\text{Na}_2\text{CO}_3 + \text{Aq}$ (Mente)

Lead —

Insol in dil acids Sol in fuming HNC Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{NaOH} + \text{A}$ (Mente)

Magnesium —, $\text{MgNP}_3\text{O}_7 + \text{H}_2\text{O}$

Slowly sol in $\text{HCl} + \text{Aq}$ Sol in H_2SO_4 , fuming HNO_3 with addition of Br_2 Insol in NH_4OH or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Mente)

Manganous —, $\text{MnNP}_3\text{O}_7 + \text{H}_2\text{O}$

Insol in dil acids Very sl sol in NaOH Aq Insol in Na_2CO_3 or $(\text{NH}_4)_2\text{CO}_3 + \text{A}$ Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Mente)

Mercurous —, $\text{Hg}_2\text{NP}_3\text{O}_7$

Insol in dil acids, NH_4OH , NaOH , $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Easily sol in fumi HNO_3 (Mente)

Nickel —, $\text{NiNP}_3\text{O}_7 + \text{H}_2\text{O}$

Insol in dil acids, NH_4OH , or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Mente)

Zinc —, $\text{ZnNP}_3\text{O}_7 + 2\text{H}_2\text{O}$

Easily sol in NH_4OH , NaOH , $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Mente)

Nitrirosulphonic acid, $\text{N}(\text{SO}_3\text{H})_3$

Not known in free state (Raschig, A 24 161)

Potassium nitrirosulphonate, $\text{N}(\text{SO}_3\text{K})_3 + 2\text{H}_2\text{O}$

Soluble in H_2O (Raschig, A 241 161)
 Is identical with "potassium ammonitrisulphonate" of Claus

Insol in cold H_2O (Claus), sol in 50 pts H_2O at 23° (Fremy), in H_2O at scarcely 40° without change Decomp by boiling (Claus)

Potassium sodium nitrosulphonate,
 $N(SO_3K)_2(SO_3Na)$

Nearly insol in cold H_2O (Raschig, A 241 161)

Sodium nitrosulphonate, $N(SO_3Na)_3$

Not isolated on account of its extreme solubility in H_2O (Raschig, A 241 161)

Nitrosulphophosphoric acid,
 $NP(SH)_2$

Decomp by H_2O (Stock, B 1906, 39 2001)

Ammonium nitrosulphophosphate,
 $NP(SNH_4)_2$

Easily sol in H_2O Not decomp by boiling with alkali Decomp by acid (Stock)

Easily sol in liquid NH_3 (Stock, B 1903, 36 315)

Ammonium hydrogen nitrosulphophosphate, $SHP(SNH_4)N$

Not decomp by boiling with alkali Decomp by acids (Stock, B 1906, 39 1999)

Barium nitrosulphophosphate, $BaNPS_2 + H_2O$

Sol in H_2O with decomp Decomp by hot H_2O Not decomp by warming with alkali Decomp by acid (Stock)

Lead nitrosulphophosphate, NPS_2Pb

Sol in liquid NH_3 Solution decomp rapidly with separation of PbS (Stock)

Sodium nitrosulphophosphate, $NPSN_2$

Not decomp by boiling with alkali Decomp by acid (Stock)

Nitrosulphuric acid

Ammonium nitrosulphate, $N(SO_3NH_4)_3 + 2H_2O$

Rather sl sol in H_2O , but much more sol than K salt (Divers and Haga, Chem Soc 1901, 79 1094)

Sodium nitrosulphate, $N(SO_3Na)_3 + 5H_2O$

Very sol in H_2O (Divers and Haga, Chem Soc 1901, 79 1097)

Nitrosulphurous acid

Ammonium nitrosulphite, $NH(SO_2NH_4)_2$

Somewhat deliquescent Very sol in H_2O Slowly decomp in solution Decomp by boiling with HCl (Divers, Proc Chem Soc 1901, 17 163)

Nitrocobaltic chloride

Sol in 200 pts cold H_2O (Jorgensen, Z anorg 5 172)

Nitroplatindiamine nitrate,
 $(NO_2)_2Pt(NH_5NO_2)_2$

Sol in cold H_2O with decomp, violently decomp on warming (Hadow, Chem Soc (2) 4 345)

Nitropurpureocobaltic comps

See Xanthocobaltic comps

Nitropurpureorhodium comps

See Xanthorhodium comps

Nitrocarbamic acid

Potassium nitrocarbamate, NO_2NK COOK

Decomp by H_2O (Thiele, B 1894, 27 1909)

Nitro cobalt, Co_2NO_2

Decomp by H_2O (Sabatier and Senderens, C R 115 236)

Nitro copper, $CuNO_2$

Violently decomp by H_2O (Sabatier and Senderens, C R 116 756)

Nitroferri cyanhydric acid

See Nitroprussic acid

Nitrogen, N_2

Nearly insol in all known solvents
1 vol recently boiled H_2O absorbs 0.0147 vol N at 15.5° (Henry 1803)
1 vol recently boiled H_2O absorbs 0.02 vol N (Dalton)
1 vol recently boiled H_2O absorbs 0.016 vol N at ord temp (Dalton)

1 vol H_2O at t° and 760 mm absorbs V vols N gas reduced to 0° and 760 mm

t°	V	t	V	t	V
0	0.02035	7	0.01713	14	0.01500
1	0.01981	8	0.01675	15	0.01475
2	0.01932	9	0.01640	16	0.01458
3	0.01884	10	0.01607	17	0.01441
4	0.01838	11	0.01577	18	0.01426
5	0.01794	12	0.01549	19	0.01413
6	0.01752	13	0.01523	20	0.01403

(Bunsen)

Coefficient of absorption = $0.020346 - 0.00053887t + 0.000011156t^2$ (Bunsen)

1 l H₂O absorbs ccm N from atmospheric air
at 760 mm pressure and t°

t°	ccm N	t°	ccm N
0	19 29	15	13 95
5	17 09	20	12 80
10	15 36	25	11 81

(Dittmar, Challenger Exped Report, vol 1)

t°	ccm N	t°	ccm N
0	19 14	15	13 73
5	16 93	20	12 63
10	15 14	25	11 80

(Hamberg, 1885)

Absorption of N by H₂O at t° and 760 mm
 β = coefficient of absorption

t°	β	t°	β	t°	β
0	0 02388	18	0 01696	36	0 01252
1	2337	19	1667	37	1233
2	2288	20	1639	38	1215
3	2241	21	1611	39	1198
4	2196	22	1584	40	1182
5	2153	23	1557	41	1166
6	2111	24	1530	42	1151
7	2070	25	1504	43	1137
8	2031	26	1478	44	1124
9	1993	27	1453	45	1111
10	1956	28	1428	46	1099
11	1920	29	1404	47	1088
12	1885	30	1380	48	1078
13	1851	31	1357	49	1069
14	1818	32	1334	50	1061
15	1786	33	1312	60	1000
16	1755	34	1291	100	1000
17	1725	35	1271		

(Bohr and Bock, W Ann 44 318)

Absorption of N by H₂O at t° and 760 mm
 β = coefficient of absorption, β_1 = "Solubility" (see under Oxygen)

t	β	β_1
0	0 02348	0 02334
1	2291	2276
2	2236	2220
3	2182	2166
4	2130	2113
5	2081	2063
6	2032	2013
7	1986	1966
8	1941	1920
9	1898	1877
10	1857	1834
11	1819	1795
12	1782	1758
13	1747	1722
14	1714	1687

Absorption of N by H₂O at t° — *Continue*

t°	β	β_1
15	0 1682	0 1654
16	1651	1622
17	1622	1591
18	1594	1562
19	1567	1534
20	1542	1507
21	1519	1482
22	1496	1457
23	1473	1433
24	1452	1410
25	1432	1387
26	1411	1365
27	1392	1344
28	1374	1323
29	1356	1303
30	1340	1284
31	1321	1263
32	1304	1243
33	1287	1224
34	1270	1204
35	1254	1185
36	1239	1167
37	1224	1149
38	1210	1131
39	1196	1114
40	1183	1097
41	1171	1082
42	1160	1067
43	1149	1052
44	1139	1037
45	1129	1023
46	1120	1009
47	1111	0995
48	1102	0982
49	1094	0968
50	1087	0955
52	1072	0929
54	1058	0902
56	1045	0876
58	1033	0849
60	1022	0822
62	1011	0794
64	1001	0765
66	0992	0736
68	0983	0707
70	0976	0676
72	0970	0645
74	0965	0614
76	0961	0581
78	0959	0546
80	0957	0510
82	0956	0472
84	0955	0432
86	0954	0388
88	0953	0343
90	0952	0294
92	0951	0242
94	0950	0187
96	0949	0128
98	0948	0066
100	0947	0000

(Winkler, B 24 3606)

Coefficient of absorption for $\text{H}_2\text{O}=0.01432$ at 25° , 0.01621 at 20° , 0.01789 at 15° , 0.02003 at 10° , 0.02173 at 5° (Braun, Z phys Ch 1900, 33 730)

Solubility in H_2O at various pressures

V = volume of the absorbing liquid

P = Hg-pressure in metres

λ = coefficient of solubility

V	t°	P	λ
33 134 ccm	19 4	0 8910	0 01617
		1 0453	0 01616
		1 2488	0 01611
		1 4764	0 01608
		1 8111	0 01602
		2 3961	0 01597
		2 9074	0 01585
		3 3411	0 01579
		4 1382	0 01561
		4 5958	0 01554
		5 1103	0 01546
		5 8349	0 01528
		6 2767	0 01515
32 152 ccm	24 9	7 1059	0 01499
		7 5815	0 01487
		8 1074	0 01473
		0 8977	0 01498
		1 0129	0 01493
		1 1887	0 01491
		1 5573	0 01487
		1 9846	0 01482
		2 5171	0 01478
		2 8781	0 01463
		3 2956	0 01455
		4 0947	0 01440
		4 5581	0 01434
		5 0529	0 01426
		5 5935	0 01413
		6 1956	0 01408
		7 0333	0 01382
		7 5596	0 01377
		74 1846	0 01369

(Cassuto, Phys Zeit 1904, 5 236)

Coefficient of absorption for $\text{H}_2\text{O}=0.01565$ at 20.18° (Hufner, Z phys Ch 1907, 57 615)

Absorption of N_2 by distilled H_2O at t°
 a = ccm of N_2 absorbed by 1 l of H_2O at t° and 760 mm

t°	a	t°	a	t°	a
0	23 00	17	16 29	34	12 93
1	22 50	18	16 03	35	12 79
2	22 02	19	15 78	36	12 65
3	21 55	20	15 54	37	12 52
4	21 09	21	15 29	38	12 39
5	20 64	22	15 06	39	12 27
6	20 20	23	14 84	40	12 15
7	19 77	24	14 63	41	12 04
8	19 35	25	14 43	42	11 92
9	18 94	26	14 23	43	11 80
10	18 54	27	14 04	44	11 68
11	18 16	28	13 87	45	11 57
12	17 80	29	13 71	46	11 46
13	17 46	30	13 55	47	11 35
14	17 14	31	13 39	48	11 24
15	16 84	32	13 23	49	11 13
16	16 56	33	13 08	50	11 02

(Fox, Trans Faraday Soc 1909, 5 73)

Solubility in H_2O at $25^\circ=0.1561$ (Drucker and Moles, Z phys Ch 1910, 75 418)

Solubility of N_2 in H_2O at $25^\circ=0.0231$ (Calculated according to special formula, for which see original article) (Findlay and Craghton, Chem Soc 1911, 99 1315)

Coefficient of absorption for $\text{H}_2\text{O}=0.01689$ at 15° , 0.01670 at 16.2° , 0.01622 at 17.2° (Muller, Z phys Ch 1912, 81 493)

1 l sea water (sp gr 1.027) absorbs ccm N from atmosphere at t° and 760 mm pressure—

t	According to Tornoe	According to Dittmar	According to Hamberg
0	14 40	15 60	14 85
5	13 25	13 86	13 32
10	12 10	12 47	12 06
15	10 95	11 34	11 04
20		10 41	10 25
25		9 62	9 62

No of ccm of N_2 (containing 1.185% argon) absorbed by a l of sea-water from a free dry atmosphere of 760 mm pressure at given temperatures

Cl per 1000	0	4	8	12	16	20	24	28
0								
4						2		
8						1		
12					1	2		
16								9 80
20								9 44

(Fox, Trans Faraday Soc 1909, 5 77)

Absorption of N_2 by $H_2SO_4 + Aq$ at t° α = coefficient of absorption

Normality of the acid	t°	α
0	20 9	0 0156
4 9	20 9	0 0091
8 9	20 9	0 0072
10 7	21 2	0 0066
20 3	21 1	0 0049
24 8	21 5	0 0048
29 6	20 8	0 0051
34 3	20 9	0 0100
35 8	21 1	0 0129

(Bohr, Z phys Ch 1910, 71 49)

Absorption of N_2 by $BaCl_2 + Aq$ α_{t° = coefficient of absorption at t°

Per cent of $BaCl_2$ in the solution	α_{25°	α_{20°	α_{15°	α_{10°	α_5°
13 830	0 00783	0 00923	0 01036	0 01166	0 01270
11 927	0 00855	0 00976	0 01139	0 01249	0 01368
6 903	0 01044	0 01184	0 01317	0 01474	0 01598
6 738	0 01036	0 01182	0 01340	0 01494	0 01628
3 870	0 01137	0 01323	0 01480	0 01660	0 01802
3 325	0 01190	0 01346	0 01502	0 01681	0 01826

(Braun, Z phys Ch 1900, 33 733)

Absorption of N_2 by $NaCl + Aq$ α_{t° = coefficient of absorption at t°

Per cent of $NaCl$ in the solution	α_{25°	α_{20°	α_{15°	α_{10°	α_5°
11 732	0 00470	0 00657	0 00810	0 00930	0 01016
10 945	0 00565	0 00703	0 00824	0 00912	0 01052
8 135	0 00749	0 00872	0 01014	0 01131	0 01266
8 033	0 00729	0 00871	0 00995	0 01121	0 01248
6 595	0 00802	0 00972	0 01120	0 01252	0 01380
6 400	0 00826	0 00975	0 01134	0 01259	0 01375
4 196	0 00990	0 01151	0 01294	0 01451	0 01579
3 880	0 01005	0 01168	0 01316	0 01475	0 01615
2 120	0 01131	0 01311	0 01469	0 01638	0 01795
2 100	0 01133	0 01314	0 01467	0 01656	0 01805
0 686	0 01295	0 01477	0 01640	0 01833	0 01994
0 671	0 01304	0 01484	0 01642	0 01845	0 02000

(Braun, l c)

At -191.5° liquid oxygen dissolves 458 times its vol or 50.7 per cent of its weight of gaseous nitrogen (Erdmann, B 1904, 37 1191)

At 18° and 760 mm 100 vols H_2O or alcohol of 0.84 sp gr absorb 4.2 vols N gas (de Saussure 1814)

1 vol alcohol at t° and 760 mm dissolves $\frac{1}{V}$ vols N gas reduced to 0° and 760 mm

t°	V	t°	V
0	0 12634	13	0 12192
1	0 12593	14	0 12166
2	0 12553	15	0 12142
3	0 12514	16	0 12119
4	0 12476	17	0 12097
5	0 12440	18	0 12076
6	0 12405	19	0 12056
7	0 12371	20	0 12030
8	0 12338	21	0 12021
9	0 12306	22	0 12005
10	0 12276	23	0 11990
11	0 12247	24	0 11976
12	0 12219		

(Bunsen's Gasometry)

1 vol alcohol absorbs 0.126338-0.000418t -
0.000060t² vols N gas (Carius, A 94 13)

Solubility in alcohol at 25°

Vol H_2O	Vol % alcohol	Solubility
100	0	0 01634
80	20	0 01536
67	33	0 01719
0	100	0 1432

(Just, Z phys Ch 1901, 37 361)

1 vol ether absorbs 0.15 vol N (Dobereiner) 1
caoutchouc absorbs 5 vols N in 5 weeks (Himly)

Solubility of N_2 in ether = 0.2580 at t° ,
0.2561 at 10° (Christoff, Z phys Ch 19 79 459)

Solubility in organic solvents

Solvent	Solubility at $25^\circ C$	Solubility at $20^\circ C$	$\frac{ds}{dt}$
Glycerine	Not measurable		
Water	0 01634	0 01705	-0.000 2
Aniline	0 03074	0 02992	+0.000 4
Carbon bisulphide	0 05860	0 05290	+0.001
Nitrobenzene	0 06255	0 06082	+0.000 6
Benzene	0 1159	0 114	+0.000
Glacial acetic acid	0 1190	0 1172	+0.000
Xylene	0 1217	0 1185	+0.000
Amyl alcohol	0 1225	0 1208	+0.000
Toluene	0 1235	0 1186	+0.000
Chloroform	0 1348	0 1282	+0.001
Methyl alcohol	0 1415	0 1348	+0.001
Ethyl alcohol (99.8%)	0 1432	0 1400	+0.000
Acetone	0 1460	0 1383	+0.001
Amyl acetate	0 1542	0 1512	+0.000
Ethyl acetate	0 1727	0 1678	+0.000
Isobutyl acetate	0 1734	0 1701	+0.000

(Just, Z phys Ch 1901, 37 361)

Coefficient of absorption for petroleum
0.117 at 20° , 0.135, at 10° (Gniewasz a 1
Walfisz, Z phys Ch 1 70)

Absorption of N_2 by propionic acid + Aq
 αt° = coefficient of absorption at t°

Per cent of propionic acid in the solution	$\alpha 25^\circ$	$\alpha 20^\circ$	$\alpha 15^\circ$	$\alpha 10^\circ$	$\alpha 5^\circ$
11 220					
11 023					
9 537					
9 155	0 01329	0 01469	0 01630	0 01845	0 02026
6 066					
5 891					
4 081	0 01365	0 01541	0 01688	0 01919	0 02095
3 816	0 01371	0 01547	0 01674	0 01915	0 02087

(Braun, Z phys Ch 1900, **33** 732)

Solubility of N_2 in isobutyric acid + Aq at t°

P = Corrected pressure at end of experiment in mm Hg at 0°

S = Solubility of N_2

Solvent	t°	P	S
Pure isobutyric acid	25 05	262 6 388 3 566 1 662 4 783 5 832 2	0 1609(?) 0 1640 0 1647 0 1656 0 1656 0 1656
37 5% solution of isobutyric acid + Aq	23 02	246 2 492 2 563 6 836 3 867 3	0 0393 0 0393 0 0393 0 0400 0 0401
Vapor pressure = 21 6 mm			
"	29 02	231 468 4 480 7 536 656 720	0 0373 0 0384 0 0383 0 0385 0 0384 0 0386
Vapor pressure = 30 6 mm			

(Drucker and Moles, Z phys Ch 1910, **75** 434)

Absorption of N_2 by chloralhydrate + Aq

t° = temp of the solution

P = % chloralhydrate in the solution

βt° = coefficient of absorption at t°

$\beta 15^\circ$ = coefficient of absorption at 15°

t°	P	βt°	$\beta 15^\circ$
15 6	15 8	0 01574	0 01580
15 4	28 2	0 01418	0 01422
16 4	37 25	0 01288	0 01300
16 9	47 0	0 01260	0 01275
17 0	56 52	0 01230	0 01245
15 3	71 5	0 01415	0 01420
14 8	78 8	0 01447	0 01495

(Muller, Z phys Ch 1912, **81** 499)

Absorption of N_2 by organic substances + Aq
at 15°

P = % of the organic substance in the solvent

$\beta 15^\circ$ = coefficient of absorption at 15°

S 15° = Solubility at 15°

Organic substance used	P	$\beta 15^\circ$	S 15°
Chloralhydrate	0 0 0 6 9 14 0 15 0 23 6 26 1 37 6 48 9 49 3 61 3 70 9 71 2 78 3 79 1	0 01725 0 01675 0 01706 0 0164 0 0154 0 0152 0 0134 0 0141 0 0123 0 0115 0 0118 0 0114 0 0131 0 0130 0 0152 0 0156	0 01796 0 0173 0 0162 0 0160 0 0141 0 0149 0 0130 0 0121 0 0124 0 0120 0 0138 0 0137 0 0160 0 0165
Glycerine	0 0 15 7 15 7 29 9 46 6 57 6 67 1 72 8 74 7 77 0 85 1 87 3 88 5 99 25	0 01707 0 01708 0 01425 0 01376 0 01087 0 00840 0 00698 0 00635 0 00552 0 00597 0 00527 0 00482 0 00192 0 00536 0 00521	

(Hammel, Z phys Ch 1915, **90** 121)

Absorption of N_2 by glycerine + Aq

t° = temp of the solution

P = % glycerine in the solution

βt° = coefficient of absorption at t°

$\beta 15^\circ$ = coefficient of absorption at 15°

t°	P	βt°	$\beta 15^\circ$
16 1	25 0	0 01240	0 01266
15 6	42 2	0 00966	0 00976
14 7	51 5	0 00759	0 00759
14 9	58 0	0 00703	0 0070
15 9	80 25	0 00520	0 00520
16 2	90 0	0 00570	0 00570
18 0	95 0	0 00578	0 00716

(Muller, Z phys Ch 1912, **81** 496)

Solubility of N_2 in glycerine + Aq at 25°
 G = % by wt of glycerine in the solvent
 S = solubility of N_2
 P = corrected pressure at end of experiment
 in mm Hg at 0°

G	P	S
16	598 4	0 0103
"	915 5	0 0103
29 7	556 5	0 0067
"	846 5	0 0068
48 9	617 7	0 0052
"	859 8	0 0051
74 5	588 5	0 0025
84 1	637 3	0 0024
"	757 0	0 0024

(Drucker and Moles, Z phys Ch 1910, 75 418)

Absorption of N_2 by sucrose + Aq

t° = temp of the solution

P = % sucrose in the solution

β_{t° = coefficient of absorption at t°

β_{15° = coefficient of absorption at 15°

t°	P	β_{t°	β_{15°
16 2		0 01670	0 01700
17 2		0 01622	0 01688
16 8	11 38	0 01432	0 01480
16 9	20 00	0 01233	0 01280
17	29 93	0 01025	0 01053
17 8	30 12	0 01033	0 01090
18	47 89	0 00742	0 00735
17 7	48 57	0 00658	0 00700

(Muller, Z phys Ch 1912, 81 493)

Absorption of N_2 by organic substances + Aq
 at t°

V = absorbed volume reduced to 0° and
 760 mm

α = coefficient of absorption

Solution	Vol of solution ccm	t	V ccm	α
N-dextrose	409 94	20 18	4 55	0 01215
$\frac{1}{2}$ N-dextrose	409 94	20 21	5 14	0 01380
$\frac{3}{4}$ N-dextrose	409 94	20 2	5 51	0 01480
N-levulose	409 94	20 25	4 27	0 01221
N-arabinose	409 94	20 21	4 40	0 01203
N-erythritol	409 94	20 25	4 87	0 01321
N-alanine	409 94	20 19	4 445	0 01213
N-glycocoll	409 94	20 16	4 47	0 01212
N-urea	409 94	20 18	5 37	0 01477
N-acetamide	409 94	20 22	5 385	0 01475

(Hufner, Z phys Ch 1907, 57 618-621)

Nitrogen bromide, NBr_3

Decomp under H_2O

Nitrogen bromophosphide, PBr_2N

Insol in H_2O Sol in ether, less sol in C
 or $CHCl_3$ (Besson, C R 114 1479)

Nitrogen bromosulphide

See Nitrogen sulphobromide

Nitrogen chloride, NCl_3

Very unstable Explodes when heated
 93° or by contact with other substance
 Insol in H_2O , but is decomp thereby (in 4
 hours by cold H_2O) Sol in CS_2 , PCl_3 , a
 S_2Cl_2 (H Davy, Phil Trans 1813, 1. 24)
 Sol in C_6H_6 , CS_2 , $CHCl_3$, CCl_4 (Hentsch
 B 1897, 30 1434)

Nitrogen chlorophosphide, $N_3P_3Cl_6$

Insol in H_2O , but slowly decomp there
 Insol in hot H_2SO_4 , HCl , or HNO_3 +
 Decomp by hot fuming HNO_3 Sol in
 alcohol, very sol in ether, but these solut
 gradually decompose Sol in CS_2 , CHC
 C_6H_6 , and oil of turpentine
 Sol in $POCl_3$ (Gladstone, Chem Soc
 138)

Nitrogen chlorosulphide

See Nitrogen sulphochloride

Nitrogen fluoride

Very explosive (Warren, C N 55 289)

Nitrogen moniodamine, NH_2I

Very rapidly decomp by H_2O into N_2H
 (Raschig, A 230 212)

Nitrogen diiodamine, NHI_2

Properties as triioddiamine

Nitrogen triioddiamine, NH_3, NI_3

Decomp by H_2O (Raschig, A 230 21)
 Insol in absolute alcohol Sol with
 comp in HCl + Aq (Bunsen)

Nitrogen iodide, N_3I

See Triaziodide

Nitrogen iodide, NI_3

Insol in H_2O , but slowly decomp there
 Sol in HCl + Aq Sol in KCN + Aq (N
 lon, J pr 17 1)
 Sol in $Na_2S_2O_3$ + Aq (Guyard, C R 7
 526)
 Sol in $KSCN$ + Aq (Raschig, A 230 2)

Nitrogen iodide ammonia, $NI_3, 3NH_3, I$
 $2NH_3$, and NI_3, NH_3

(Hugot, C R 1900, 130 507)

$NI_3, 12NH_3$ Ppt, insol in ether (R ff,
 B 1900, 33 3028)

Nitrogen monoxide, N₂O

- (a) *Liquid* Miscible with alcohol or ether
 (b) *Gas*

1 vol H₂O absorbs 0.78–0.86 vol N₂O at ordinary temp (Henry) 0.80 vol at ordinary temp (Dalton)
 0.76 vol at ordinary temp (de Saussure) 0.708 vol at 18 (Plesch) 0.54 vol (Davy)

1 vol H₂O at t° and 760 mm absorbs V vols N₂O, reduced to 0° and 760 mm

t°	V	t°	V
0	1 3052	13	0 8304
1	1 2605	14	0 8034
2	1 2172	15	0 7778
3	1 1752	16	0 7535
4	1 1346	17	0 7306
5	1 0954	18	0 7090
6	1 0575	19	0 6888
7	1 0210	20	0 6700
8	0 9858	21	0 6525
9	0 9520	22	0 6364
10	0 9196	23	0 6216
11	0 8885	24	0 6082
12	0 8588		

(Bunsen's Gasometry)

1 vol H₂O absorbs 1.30521–0.0453620t + 0.00068430t² vols N₂O at t° and 760 mm (Bunsen)

Coefficient of absorption by H₂O = 0.01883 at 15° (Steiner, Z phys Ch 1895, 18 14)

Coefficient of absorption by H₂O = 0.600 at 23.5°, 0.773 at 15.5°, 0.951 at 8.1° (Gordon, Z phys Ch 1895, 18 4)

Absorption of N₂O by H₂O at t°

t	Coefficient of absorption
25	0 5752
20	0 6654
15	0 7896
10	0 9479
5	1 1403

(Roth, Z phys Ch 1897, 24 123)

Solubility in H₂O at 25° = 0.5942, at 20° = 0.6756, at 15° = 0.7784, at 10° = 0.9101, at 5° = 1.067 (For formula for "solubility," see under oxygen) (Geffcken, Z phys Ch 1904, 49 278)

Solubility of N₂O in H₂O = 0.592 at 25° and 758–136° mm pressure (Findlay and Creighton, Chem Soc 1910, 97 538)

100 vols H₂SO₄ (sp gr = 1.84) absorb 75.7 vols N₂O, 100 vols H₂SO₄ + Aq (sp gr = 1.80) absorb 66.0 vols N₂O, 100 vols H₂SO₄ + Aq (sp gr = 1.705) absorb 39.1 vols N₂O, 100 vols H₂SO₄ + Aq (sp gr = 1.45) absorb 41.6 vols N₂O, 100 vols H₂SO₄ + Aq (sp gr = 1.25) absorb 33.0 vols N₂O

CaCl₂ + Aq, and NaCl + Aq absorb considerable amounts of N₂O (Lunge, B 14 2188)

Absorption by acids + Aq

M = content in gram-equivalents per liter
 S = solubility (see under Oxygen)

Absorption of N₂O by HNO₃ + Aq

M	S 25	S 15°
0 610	0 5969	0 7770
0 614	0 5980	0 7766
1 253	0 6045	0 7767
1 254	0 6061	0 7767
2 405	0 6156	0 7735
2 435	0 6149	0 7737

(Geffcken, Z phys Ch 1904, 49 278)

Absorption of N₂O by HCl + Aq

M	S 25°	S 15°
0 549	0 5775	0 7550
0 550	0 5759	0 7528
1 089	0 5670	0 7360
1 093	0 5657	0 7347
2 300	0 5546	0 7103
2 340	0 5564	0 7122

(Geffcken)

Absorption of N₂O by $\frac{\text{H}_2\text{SO}_4}{2}$ + Aq

M	S 25	S 15
0 523	0 5648	0 7328
0 526	0 5657	0 7340
1 050	0 5426	0 6997
1 054	0 5419	0 6984
2 042	0 5083	0 6440
2 047	0 5087	0 6428
2 971	0 4819	0 6024
2 963	0 4820	0 6030
3 897	0 4569	0 5648
3 973	0 4577	0 5640

(Geffcken)

Absorption of N₂O by H₃PO₄ + Aq at t°

t	% of H ₃ PO ₄				
	3.38%	4.72%	8.84%	9.89%	13.30%
5	1 057	1 0365	0 9883	0 9635	0 9171
10	0 8827	0 8665	0 8296	0 8101	0 7711
15	0 7388	0 7253	0 6977	0 6826	0 6505
20	0 6253	0 6147	0 5926	0 5810	0 5555
25	0 5427	0 5329	0 5143	0 5054	0 4860

(Roth, Z phys Ch 1897, 24 134)

100 vols conc FeSO₄ + Aq absorb 19.5 vols N₂O

Solubility of N₂O in a solution containing 47.7 g Fe(OH)₃ per litre at 25° = 0.5799, 47.9 g Fe(OH)₃ per litre at 25° = 0.5787 (Geffcken, Z phys Ch 1904, 49 299)

100 vols KOH+Aq (sp gr =1.12) absorb 18.7 vols N_2O , 100 vols KOH+Aq sat with pyrogallol absorb 18.1 vols N_2O , 100 vols NaOH+Aq (sp gr =1.1) (7% NaOH) absorb 23.1 vols N_2O , 100 vols NaOH+Aq sat with pyrogallol absorb 28.0 vols N_2O

Absorption of N_2O by KOH+Aq

M = content in gram-equivalents per litre

S = solubility (see under oxygen)

M	S 25°	S 15°
0.541	0.5087	0.6591
0.542	0.5093	0.6595
1.074	0.4252	0.5427
1.082	0.4221	0.5392

(Geffeken, Z phys Ch 1904, 49 278)

Coefficient of solubility of N_2O in salts+Aq at t°

Salt	Concentration of salt		Coeff of absorption at			
	G per 100 g solution	G mol per l	5°	10°	15°	20°
CaCl ₂	5.790 9.860 13.991	0.547 0.964 1.416	0.819 0.608 0.510	0.697 0.586 0.441	0.591 0.509 0.380	0.500 0.435 0.328
LiCl	1.350 3.850 11.482	0.319 0.928 2.883	0.986 0.878 0.606	0.831 0.743 0.512	0.700 0.629 0.437	0.599 0.536 0.382
Li ₂ SO ₄	2.370 5.460 8.560	0.219 0.521 0.836	0.934 0.795 0.646	0.792 0.665 0.555	0.670 0.557 0.477	0.569 0.474 0.415
MgSO ₄	5.900 7.660 10.780	0.521 0.687 0.997	0.766 0.708 0.569	0.664 0.586 0.491	0.561 0.486 0.417	0.471 0.414 0.346
KCl	4.900 7.641 14.582 22.083	0.676 1.037 2.187 3.414	0.879 0.799 0.654 0.544	0.751 0.693 0.574 0.459	0.643 0.591 0.500 0.390	0.555 0.494 0.430 0.339
K ₂ SO ₄	2.620 4.780	0.154 0.285	0.986 0.918	0.831 0.763	0.701 0.637	0.605 0.542
NaCl	6.201 8.881 12.782	1.107 1.614 2.391	0.800 0.713 0.634	0.682 0.603 0.532	0.585 0.510 0.449	0.509 0.434 0.386
Na ₂ SO ₄	5.760 8.530 12.440	0.427 0.646 0.974	0.808 0.692 0.559	0.677 0.574 0.486	0.584 0.482 0.417	0.495 0.416 0.354
SrCl ₂	3.310 5.730 13.240	0.215 0.380 0.939	0.928 0.848 0.644	0.788 0.709 0.547	0.671 0.610 0.463	0.578 0.556 0.390

(Gordon, Z phys. Ch 1895, 18 5)

Absorption of N_2O by salts+Aq at 15°
M = number of molecules of salt per litre.
 α = coefficient of absorption

Salt	M	α
KCl	3.554 2.909 1.755 1.051 0.526	0.0892 0.1012 0.1279 0.1489 0.1667
KNO ₃	2.430 1.820 1.541 0.879 0.482	0.1180 0.1311 0.1391 0.1559 0.1683
K ₂ CO ₃	4.352 2.939 2.156 1.376 0.690 0.341 0.209	0.0160 0.0285 0.0462 0.0761 0.1183 0.1501 0.1628
NaCl	4.815 2.801 2.049 0.825	0.0595 0.0925 0.1130 0.1548
NaNO ₂	5.711 3.980 2.656 1.413 0.679	0.0578 0.0810 0.1052 0.1370 0.1603
Na ₂ CO ₃	1.218 0.819 0.438 0.207	0.0839 0.1082 0.1385 0.1639
Na ₂ SO ₄	1.364 0.638 0.335	0.0775 0.1254 0.1519
LiCl	3.734 1.800 0.835	0.0990 0.1370 0.1619
MgSO ₄	2.501 1.631 0.936 0.433	0.0499 0.0797 0.1159 0.1501
ZnSO ₄	2.180 1.277 0.899 0.397	0.0605 0.0961 0.1175 0.1525
CaCl ₂	2.962 2.556 1.827 1.122 0.578 0.321	0.0519 0.0619 0.0839 0.1138 0.1450 0.1619

(Steiner, Z phys Ch 1895, 18 14-5)

Coefficient of absorption of N_2O by $NaCl + Aq$ at t°

t°	Percent of $NaCl$			
	0 990	1 808	3 886	5 865
5	1 0609	1 0032	0 9131	0 8428
10	0 8812	0 8383	0 7699	0 7090
15	0 7339	0 7026	0 6495	0 5976
20	0 6191	0 5962	0 5520	0 5088
25	0 5363	0 5190	0 4775	0 4424

(Roth, Z phys Ch 1897, 24 139)

Absorption of N_2O by salts + Aq at 20°

C = concentration of the solution in terms of normal

α = coefficient of absorption

Absorption of N_2O by $KNO_3 + Aq$ at 20°

P	C	α
0		0 6270
1 063	0 1061	0 6173
2 720	0 2764	0 6002
5 389	0 5630	0 5713
10 577	1 1683	0 5196

Absorption of N_2O by $NaNO_3 + Aq$ at 20°

P	C	α
0		0 6270
1 124	0 1336	0 6089
2 531	0 3052	0 5876
5 077	0 6286	0 5465
8 701	1 1200	0 4926

(Knopp, Z phys Ch 1904, 48 107)

Absorption of N_2O by salts + Aq

M = content in gram-equivalents per litre

S = solubility

Salt	M	S 25°	S 1°
NH_4Cl	0 598	0 5532	0 7203
	0 600	0 5504	0 7185
	1 158	0 5223	0 6800
	1 166	0 5200	0 6775
KI	0 550	0 5367	0 6950
	0 557	0 5344	0 6916
	0 886	0 5025	0 6466
	0 913	0 5012	0 6442
	0 514	0 5428	0 7074
	0 545	0 5406	0 7036
LiCl	0 558	0 5276	0 6884
	0 561	0 5278	0 6877
	1 057	0 4760	0 6163
	1 059	0 4773	0 6146

Absorption of N_2O by salts + Aq —
Continued

Salt	M	S 25°	S 15°
KBr	0 546	0 5306	0 6877
	0 550	0 5318	0 6892
	0 937	0 4908	0 6352
	0 959	0 4899	0 6334
RbCl	0 439	0 5399	0 7050
	0 444	0 5386	0 7053
	0 977	0 4873	0 6306
	0 993	0 4846	0 6276
	0 558	0 5218	0 6782
	0 559	0 5217	0 6787
	1 070	0 4673	0 6046
	1 102	0 4639	0 6020

(Geffcken, Z phys Ch 1904, 49 278)

Solubility of N_2O in a solution containing
39.6 g As_2S_3 per litre at $25^\circ = 0.5819$, 42.4 g
 As_2S_3 per litre at $25^\circ = 0.5833$ (Geffcken)

1 vol alcohol at t° and 760 mm absorbs V
vols N_2O gas reduced to 0° and 760 mm

t°	V	t	V
0	4 1780	13	3 3734
1	4 1088	14	3 3200
2	4 0409	15	3 2678
3	3 9741	16	3 2169
4	3 9085	17	3 1672
5	3 8442	18	3 1187
6	3 7811	19	3 0714
7	3 7192	20	3 0253
8	3 6585	21	2 9805
9	3 5990	22	2 9368
10	3 5408	23	2 8944
11	3 4838	24	2 8532
12	3 4279		

(Bunsen's Gasometry)

Coefficient of absorption = $4.17805 - 0.0698160t + 0.0006090t^2$ (Carius)

At 18 and 760 mm 100 vols H_2O absorb 76 vols
 N_2O 100 vols alcohol of 0.840 sp gr absorb 153 vols
100 vols rectified naphtha of 0.784 sp gr absorb 254 vols
100 vols oil of lavender of 0.880 sp gr absorb 275 vols
100 vols olive oil of 0.915 sp gr absorb 150 vols
100 vols sat $KCl + Aq$ (2% KCl) of 1.212 sp gr absorb 29 vols (de Saussure 1814)
1 vol oil of turpentine absorbs 2.5-2.7 vols N_2O (de Saussure)

Absorption of N_2O by glycerine + Aq at t°

t	% by weight of glycerine			
	3 460%	6 720%	12 12%	16 244%
25	0 5558	0 5415	0 5268	0 5083
20	0 6468	0 6303	0 6050	0 5851
15	0 7672	0 7454	0 7098	0 6857
10	0 9172	0 8871	0 8411	0 8102
5	1 0967	1 0552	0 9990	0 9586

(Roth, Z phys Ch 1897, 24 128)

Absorption of N_2O by urea+Aq at t°

t°	% by weight of urea				
	3 312%	4 974%	6 366%	7 296%	9 966%
25	0 5686	0 5669	0 5588	0 7502	0 5689
20	0 6533	0 6558	0 6539	0 6553	0 6508
15	0 7708	0 7732	0 7605	0 7722	0 7614
10	0 9209	0 9201	0 9086	0 9208	0 9007
5	1 1040	1 0964	1 0880	1 1012	1 0685

(Roth, Z phys Ch 1897, 24 124)

Absorption of N_2O by sugar+Aq at 15°

Number of molecules of $C_{12}H_{22}O_{11}$ per litre	Coefficient of absorption
1 699	0 0892
0 993	0 1284
0 520	0 1561

(Steiner, Z phys Ch 1895, 18 15)

Absorption of N_2O by organic substances + Aq

C = concentration of the solution in terms of normal

 α = coefficient of absorptionAbsorption of N_2O by chloral hydrate+Aq at 20°

P	C	α
0		0 6270
2 947	0 184	0 6182
6 848	0 445	0 6128
13 48	0 942	0 5960
16 15	1 165	0 5891
19 60	1 474	0 5793
24 02	1 911	0 5675

(Knopp, Z phys Ch 1904, 48 106)

Absorption of N_2O by propionic acid+Aq at 20°

P	C	α
0		0 6270
1 492	0 2045	0 6323
5 702	0 816	0 6369
13 680	2 140	0 6504
15 011	2 385	0 6534
25 589	4 645	0 7219

(Knopp, Z phys Ch 1904, 48 107)

Absorption of N_2O by oxalic acid+Aq at t°

t°	Coeff of abs in $H_2C_2O_4$ +Aq of given % strength	
	8 122%	3 699%
25	0 5786	0 5643
20	0 6694	0 6538
15	0 7940	0 7745
10	0 9526	0 9264
5	1 1450	1 1094

(Roth, Z phys Ch 1897, 24 130)

Coefficient of absorption for petroleum = 2.11 at 20° , 2.49 at 10° (Gniewasz and Walfisz, Z phys Ch 1 70)

The solubility of N_2O in various colloidal solutions has been determined by Findlay and Creighton (Chem Soc 1910, 97 538), for which see original article

Nitrogen dioxide, NO

1 vol H_2O absorbs 0.1 vol NO gas at ordinary temp (Davy) 1 vol absorbs 0.05 vol (Henry) 1 vol absorb 1/27 vol (Dalton)

Absorption of NO by H_2O at 760 mm pressure β = Coefficient of absorption β' = "Solubility"

t°	β	β'	t°	β	β'
0	0 07381	0 07337	55	0 03040	0 0257
5	6461	6406	60	2954	237
10	5709	5640	65	2877	216
15	5147	5061	70	2810	194
20	4706	4599	75	2751	170
25	4323	4189	80	2700	143
30	4004	3838	85	2665	114
35	3734	3529	90	2648	081
40	3507	3254	95	2638	043
45	3311	3000	100	2628	000
50	3152	2771			

(Winkler, B 1901, 34 1414)

205.69 cc H_2O absorb 9.6798 cc NO at 20 and 760 mm (Hufner, Z phys Ch 190, 59 420)

Sol in conc HNO_3 +Aq

100 vols HNO_3 +Aq of 1.3 sp gr agitate with NO gas take up 20 vols NO. If acid twice as strong or one-half as strong, the quantity NO is proportional to the amount of HNO_3 . Very dil HNO_3 +Aq absorb scarcely more NO than pure H_2O (Dalton)

100 pts HNO_3 +Aq of 1.4 sp gr absorb 90 pts N (Dalton) sol in Br and very sl sol in conc H_2SO_4 (Berthelot)

1 cc conc H_2SO_4 of 1.84 sp gr absorb 0.035 cc NO, of 1.50 sp gr, 0.017 cc NO (Lunge, B 18 1391)

Absorption of NO by $\text{H}_2\text{SO}_4 + \text{Aq}$ at 18° and 760 mm

α = Coefficient of solubility

H_2SO_4	α	H_2SO_4	α
98%	not constant	70%	0 0118
90%	0 0193	60%	0 0118
80%	0 0117	50%	0 0120

(Tower, Z anorg 1906, 50 387)

Very sol in aqueous solutions of ferrous salts, especially the sulphate (Priestley)

1 vol $\text{FeSO}_4 + \text{Aq}$ of 1 081 sp gr, containing 1 grain FeSO_4 to 6 grains H_2O , absorbs 6 vols NO (Dalton)

Absorption by ferrous salts + Aq is proportional to the amount of Fe present, irrespective of the acid or concentration of the solution. Between 0° and 10° , about 2 mols NO are absorbed for each atom of Fe, between 10° and 15° , 1 mol NO for 2 atoms of Fe, and at 25° , only 1 mol NO for $2\frac{1}{2}$ to 3 atoms of Fe. The amount of NO absorbed also varies with the pressure. The sp gr of the ferrous salt solution is greater after the absorption of NO than before. The solutions are decomposed by heat, and at 100° all NO is given off (Gay, A ch (6) 5 145)

Absorption of NO by $\text{FeSO}_4 + \text{Aq}$ at 25°

A = vol H_2O (in litres) containing 1 mol FeSO_4

V = vol NO (in litres) absorbed

A	V	A	V
1 2	1 47	7 2	5 52
1 8	2 01	12 0	6 46
2 4	2 55	18 6	8 01
4 82	4 40	36 0	10 40

(Kohlschutter, B 1907, 40 877)

Absorption of NO by $\text{FeSO}_4 + \text{Aq}$ at t°

205 69 cc $\text{FeSO}_4 + \text{Aq}$ contain 0 0221 g Fe

Coefficient of absorption = 0 06067 at $20 09^\circ$

t°	Pressure mm	NO absorbed ccm
20 1	704 9	14 42
20 1	683 5	14 10
20 1	668 6	13 80
20 2	651 9	13 58
20 05	632 9	13 15
20 0	613 7	12 98

Absorption of NO by $\text{FeSO}_4 + \text{Aq}$ at t° —
Continued

205 69 cc of $\text{FeSO}_4 + \text{Aq}$ contain 0 0296 g Fe

Coefficient of absorption = 0 06505

t°	Pressure mm	NO absorbed ccm
20 05	677 5	14 30
20 05	655 3	14 07
20 04	639 1	13 81
20 00	620 2	13 39
20 15	600 5	13 20
20 14	581 2	12 92

205 69 cc of $\text{FeSO}_4 + \text{Aq}$ contain 0 0409 g Fe

Coefficient of absorption = 0 06684

t°	Pressure mm	NO absorbed ccm
20 04	667 6	16 79
20 02	650 6	16 65
20 00	613 1	15 71
20 00	594 6	15 41
20 10	577 1	15 32

205 69 cc of $\text{FeSO}_4 + \text{Aq}$ contain 0 0513 g Fe

Coefficient of absorption = 0 07981

t°	Pressure mm	NO absorbed ccm
20 10	644 8	18 82
20 10	623 8	18 47
20 08	606 4	18 02
20 10	589 7	17 56
20 10	571 1	17 19
20 10	553 1	16 95

205 69 cc of $\text{FeSO}_4 + \text{Aq}$ contain 0 0663 g Fe

Coefficient of absorption = 0 08059

t°	Pressure mm	NO absorbed ccm
20 10	697 3	21 91
20 10	678 9	21 60
20 10	660 4	21 18
20 08	638 2	20 71
20 04	620 7	20 28
20 00	602 5	19 87

205 69 cc of $\text{FeSO}_4 + \text{Aq}$ contain 0 099 g Fe

Coefficient of absorption = 0 11661

t°	Pressure mm	NO absorbed ccm
20 10	649 9	34 26
20 15	631 1	33 82
20 20	618 4	33 26
20 00	603 3	32 76
19 85	588 6	32 34
19 85	574 2	31 95

(Hufner, Z phys Ch 1907, 59 419)

Absorption of NO by $\text{NiSO}_4 + \text{Aq}$ at t°
 205 69 cc $\text{NiSO}_4 + \text{Aq}$ contain 0 0506 g Ni
 Coefficient of absorption = 0 08311

t°	Pressure mm	NO absorbed ccm
20 2	654 7	23 00
20 2	629 8	22 54
20 2	609 5	22 03
20 15	591 7	21 65
20 14	573 4	21 18

(Hufner, *l c*)

Absorption of NO by $\text{CoSO}_4 + \text{Aq}$ at t°
 205 69 cc $\text{CoSO}_4 + \text{Aq}$ contain 0 0598 g Co
 Coefficient of absorption = 0 09146

t°	Pressure mm	NO absorbed ccm
20 15	678 3	23 47
20 16	653 5	23 01
20 20	636 6	22 55
20 30	615 9	21 99
20 40	600 0	21 56

(Hufner, *l c*)

Absorption of NO by $\text{MnCl}_2 \cdot 4\text{H}_2\text{O} + \text{Aq}$ at t°
 205 69 cc $\text{MnCl}_2 \cdot 4\text{H}_2\text{O} + \text{Aq}$ contain 0 0697 g Mn
 Coefficient of absorption = 0 06111

t°	Pressure mm	NO absorbed ccm
20 0	711 96	14 25
20 05	686 5	13 99
20 2	657 4	13 49
20 3	638 9	13 05
20 45	621 0	12 81

(Hufner, *l c*)

Coefficient of absorption for $\text{FeSO}_4 + \text{Aq}$ of concentration used by Hufner (*Z phys Ch* 1907, 59 417) = 0 180 at 20° Hufner's results are incorrect because he assumed that the absorption-coefficient of NO always had the same value, whereas it does not NO is reduced by $\text{FeSO}_4 + \text{Aq}$ (Usher, *Z phys Ch* 1908, 62 624)

Coefficient of absorption for $\text{CoSO}_4 + \text{Aq}$ sat at 20° = 0 0288 (Usher, *Z phys Ch* 1908, 62 624)

Coefficient of absorption for $\text{NiSO}_4 + \text{Aq}$ of the concentration used by Hufner (*cf Z phys Ch* 1907, 59 422) = 0 048 at 20°

Coefficient of absorption for $\text{NiSO}_4 + \text{Aq}$ sat at 20° = 0 0245 (Usher, *l c*)

Coefficient of absorption for $\text{MnCl}_2 + \text{Aq}$ sat at 20° = 0 0082 (Usher, *Z phys Ch* 1908, 62 624)

Absorption of NO by $\text{FeCl}_2 + \text{Aq}$ at 22°
 A = vol H_2O (in litres) containing 1 mol FeCl_2
 V = vol NO (in litres) absorbed

A	V
2 5	3 30
5 18	4 83
10 35	6 56
20 7	8 32
51 8	11 89

(Kohlschutter, B 1907, 40 878)

Absorption by $\text{HCl} + \text{FeCl}_2 + \text{Aq}$
 10 37 l 30% HCl containing 1 mol FeCl_2 in solution absorb 15 64 l NO
 10 37 l 10% HCl containing 1 mol FeCl_2 in solution absorb 6 17 l NO

(Kohlschutter, *l c*)

Absorption by salts + $\text{FeCl}_2 + \text{Aq}$
 10 37 l sat $\text{NaCl} + \text{Aq}$ containing 1 mol FeCl_2 in solution absorb 6 549 l NO
 10 37 l sat $\text{NH}_4\text{Cl} + \text{Aq}$ containing 1 mol FeCl_2 in solution absorb 6 549 l NO

(Kohlschutter, *l c*)

Solubility of NO in $\text{Fe}(\text{NO}_3)_2 + \text{Aq}$ at 23°
 A = vol H_2O (in litres) containing 1 mol $\text{Fe}(\text{NO}_3)_2$
 V = vol NO (in litres) absorbed

A	V
3 25	2 77
6 50	4 16
13 00	5 54
26 00	6 61

(Kohlschutter, *l c*)

Absorption of NO by $\text{CuCl}_2 + \text{Aq}$
 A = vol H_2O (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V
0 231	0 120
0 277	0 098
0 371	0 052

(Kohlschutter, *l c*)

Absorption of NO by $\text{CuCl}_2 + \text{conc HCl}$
 A = vol conc HCl (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V	A	V
0 389	0 801	7 499	3 931
0 410	0 933	12 500	3 606
0 840	2 838	18 750	3 153
1 230	3 426	28 650	1 976
2 462	3 989		

(Kohlschutter, *l c*)

Absorption of NO by CuCl_2 + acetic acid

A = vol acetic acid (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V
252	51 77
504	39 67
1269	81 60

(Kohlschutter, *l c*)Absorption of NO by CuCl_2 + 98% formic acid

A = vol 98% formic acid (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V
27 9	12 76
56 0	13 17
140 0	14 34
280 0	18 68
1400 0	27 29

(Kohlschutter, *l c*)Absorption of NO by CuCl_2 + acetone

A = vol acetone (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V	A	V
4 667	14 04	291 60	40 99
29 16	24 01	583 20	67 22
58 33	24 60	1166 40	81 96

(Kohlschutter, *l c*)Absorption of NO by CuCl_2 + methyl alcohol

A = vol methyl alcohol (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V	A	V
1 60	3 30	20 50	6 15
8 22	5 60	82 25	4 90

(Kohlschutter, *l c*)Absorption of NO by CuCl_2 + ethyl alcohol

A = vol ethyl alcohol (in litres) containing 1 mol CuCl_2
 V = vol NO (in litres) absorbed

A	V	A	V
1 50	8 70	38 41	18 15
3 84	12 38	76 83	18 05
12 80	15 43	192 10	15 92

(Kohlschutter, *l c*)Absorption of NO by CuBr_2 + Aq

A = vol H_2O (in litres) containing 1 mol CuBr_2
 V = vol NO (in litres) absorbed

A	V
0 37	0 515
0 62	0 120
0 925	0 000

(Kohlschutter, *l c*)Absorption of NO by CuBr_2 + ethyl alcohol

A = vol alcohol (in litres) containing 1 mol CuBr_2
 V = vol NO (in litres) absorbed

A	V	A	V
2 625	16 02	131 20	22 23
5 25	19 26	262 50	23 46
13 12	20 51	656 10	30 46
43 74	21 13		

(Kohlschutter, *l c*)

Sol in stannous and chromous salts + Aq (Pelgot)

Not absorbed by $\text{Fe}_2(\text{SO}_4)_3$ + Aq (Dalton)
 1 vol absolute alcohol absorbs 0.31606 - 0.003487t + 0.000049t² vols NO between 0° and 25° (Bunsen)

1 vol alcohol at t° and 760 mm absorbs V vols NO gas reduced to 0° and 760 mm

t°	V	t°	V
0	0 31606	13	0 27901
1	0 31262	14	0 27685
2	0 30928	15	0 27478
3	0 30604	16	0 27281
4	0 30290	17	0 27094
5	0 29985	18	0 26917
6	0 29690	19	0 26750
7	0 29405	20	0 26592
8	0 29130	21	0 26444
9	0 28865	22	0 26306
10	0 28609	23	0 26178
11	0 28363	24	0 26060
12	0 28127		

(Bunsen's Gasom (try))

Abundantly absorbed by CS_2 (Friedburg, C N 48 97)

Nitrogen trioxide, N_2O_3

Sol in H_2O at 0° If large amt of H_2O is present, the solution is quite stable at ordinary temp (Fremy, C R 79 61)

Sol in HNO_3 + AqSol in conc H_2SO_4 to form HNOSO_4

Sol in ether

Nitrogen trioxide stannic chloride, N_2O_3 , $SnCl_4$

Decomp by H_2O (Weber, Pogg 118 471)

Nitrogen tetroxide, NO_2 or N_2O_4

Sol in H_2O at 0° with decomp Miscible with very conc HNO_3 Absorbed abundantly by CS_2 , $CHCl_3$, and C_6H_5Cl (Friedburg, C N 47 52)

Sol in $C_6H_5NO_2$

Sl sol in $H_2S + Aq$

Sol in H_2SO_4 or conc $HNO_3 + Aq$

H_3PO_4 absorbs some liquid NO_2 (Frankland, Chem Soc 1901, 79 1362)

Nitrogen pentoxide, N_2O_5

Very deliquescent Combines with H_2O to form HNO_3 with evolution of heat

Nitrogen hexoxide, NO_3

Decomposes upon air or with H_2O (Hautefeuille and Chappins, C R 92 80, 134, 94 1111, 1306)

Nitrogen oxybromide

See Nitrosyl and Nitroxyl bromide

Nitrogen oxychloride

See Nitrosyl and Nitroxyl chloride

Nitrogen oxyfluoride

See Nitrosyl fluoride and Nitroxyl fluoride

Nitrogen phosphochloride, $P_3N_3Cl_6$

See Nitrogen chlorophosphide

Nitrogen selenide, NSe

Very explosive Insol in H_2O Sol in $HNO_3 + Aq$, and $NaClO + Aq$ (Espenschued, A 113 101)

Insol in H_2O , ether, absolute alcohol, very sl sol in CS_2 , C_6H_6 , and glacial acetic acid Decomp by $HCl + Aq$ or $KOH + Aq$ (Verneuil, Bull Soc (2) 38 548)

Nitrogen sulphide, N_4S_4

Insol in H_2O Decomp by hot H_2O Sl sol in alcohol, ether, wood alcohol, oil of turpentine Easily sol in CS_2 Slowly decomp by $HCl + Aq$ or $KOH + Aq$, rapidly by $HNO_3 + Aq$ 15 g dissolve in 1 kilo of CS_2 (Fordos and Géls, C R 31 702)

Sol in $CHCl_3$ (Demarçay, C R 91 854)

Sol in warm glacial acetic acid with decomp on boiling (Ruff and Geisel, B 1904, 37 1591)

Nitrogen pentasulphide, N_2S_5

Sol in ether and most organic solvents, insol in H_2O , fairly stable in ethereal solution, but decomp by light (Muthmann, Z anorg 1897, 13 206)

Nitrogen sulphobromide, N_3S_4Br

Decomp by boiling H_2O and by dil alkali, also by boiling with alcohol (Muthman, B 1897, 30 630)

$N_4S_4Br_4$ Decomp by moist air (Clev, B 1896, 29 340-341)

$N_4S_4Br_8$ Decomp by moist air Very unstable (Clever)

$N_4S_4Br_2$ Insol most solvents, unstable (Clever)

Nitrogen sulphochloride, $N_4S_4Cl_4$

Unstable on air Sol in warm $CHCl_3$, crystallizes out on cooling (Demarçay, C R 91 854, 1066)

Demarçay calls this comp thiazyl chloride Sol in hot dry benzene, and in CCl_4 , decomp by moist air (Andreocci, Z anorg 1897, 14 249)

$N_4S_4Cl_2$ Partly sol in H_2O (Demarçay, C R 92 726)

Demarçay calls this compound dithiotetrazyl dichloride

$N_2S_2Cl_2 = N_2S_2, SCl_2$ Decomp on a (Fordos and Géls)

Demarçay (C R 92 726) calls this compound thiothiazyl dichloride

$N_2S_2Cl_2$ Sol in H_2O with subsequent decomp More sol than S in CS_2 (Soubeiran, A ch 67 71)

Is a mixture of S_2Cl_2 and N_4S_4 (Fordos and Géls, C R 31 702)

N_2S_2Cl Sol in warm, insol in cold $CHCl_3$ (Demarçay, C R 92 726)

"Thiothiazyl chloride" (Demarçay)

N_2S_2Cl Sol in H_2O Insol in most solvents Sl sol in $CHCl_3$ Easily sol in thionyl chloride (Demarçay, C R 91 854, 1066)

Demarçay calls the compound thiothiazyl chloride $= (NS)_3 \equiv S-Cl$

$N_4S_4Cl_2 = 2N_2S_2, SCl_2$ Decomp on a (Michaelis)

$N_6S_7Cl_2 = 3N_2S_2, SCl_2$ Not decomp on air Decomp by H_2O containing ammonium

Nitrogen sulphiodide, N_3S_4I

Readily decomp by H_2O (Muthmann and Setter, B 1897, 30 627)

Nitrohydroxylaminic acid, $H_2N'O_3$

Known only in solution (Angeli Garzanti 1897, 27 (2) 357)

Barium nitrohydroxylamine, $Ba_2N_4O_3 + H_2O$

Ppt More stable in the air than the sodium salt Not decomp by prolonged boiling with H_2O (Angeli, Gazzetta chim 1896, 26 17-25)

Cadmium nitrohydroxylamine, $CdN_2O_3 + H_2O$

As Ba salt (Angelico and Fanara, Gazzetta chim 1901, 31 (2) 21)

Calcium nitrohydroxylamine, $\text{CaN O}_3 + \frac{1}{2}\text{H}_2\text{O}$
(Angeli, Gazz ch it 1900, 30 (1) 593)

Calcium nitrohydroxylamine, $\text{CaN}_2\text{O}_3 + 3\frac{1}{2}\text{H}_2\text{O}$
(Angelico and Fanara, Gazz ch it 1901, 31 (2) 15)

Lead nitrohydroxylamine, PbN_2O_3
(Angeli, Gazz ch it 1900, 30 (1) 593)

Potassium nitrohydroxylamine, $\text{K}_2\text{N}_2\text{O}_3$
Like Na salt More hygroscopic (Angeli, Gazz ch it 1897, 27 (2) 357)
Sol in H_2O (Angeli, Gazz ch it 1900, 30 (1) 593)

Silver nitrohydroxylamine, $\text{Ag}_2\text{N}_2\text{O}_3$
Ppt (Angeli, C C 1901, I 1192)

Sodium nitrohydroxylamine, $\text{Na}_2\text{N}_2\text{O}_3$
Very sol in H_2O Pptd by alcohol
Aqueous solution is readily decomp by boiling (Angeli, Gazz ch it 1896, 26 (2) 17)

Strontium nitrohydroxylamine, $\text{SrN}_2\text{O}_3 + \text{H}_2\text{O}$
(Angeli, Gazz ch it 1900, 30 (1) 593)
 $+1\frac{1}{2}\text{H}_2\text{O}$ (Angelico and Fanara, Gazz ch it 1901, 31 (2) 15)

Nitroiodic acid, $\text{I}_2\text{O}_4(\text{NO})_2$
See Nitrosoiodic acid

Nitronitrous acid

Platinum potassium nitronitrite, $\text{K}_2\text{Pt}(\text{NO})_2\text{N}_2\text{O}_4$
Decomp by heat (Miolati, C C 1896, II 1088)

Nitroplatinous acid
See Platonitrous acid

Nitroprussic acid, $\text{H}_2\text{Irc}_6\text{N}_6\text{O} + \text{H}_2\text{O} = \text{H}_2\text{Irc}(\text{CN})_5\text{NO} + \text{H}_2\text{O}$
Deliquescent Easily sol in H_2O , alcohol, or ether (Playfair, A 74 317)

Nitroprussides

The alkali and alkali earth nitroprussides are sol in H_2O , and the solutions are not pptd by alcohol The others are mostly insol in H_2O

Ammonium nitroprusside, $(\text{NH}_4)_2\text{Fe}(\text{CN})_5\text{NO}$

Deliquescent Very sol in H_2O , not pptd therefrom by alcohol (Playfair)

Barium nitroprusside, $\text{BaFe}(\text{CN})_5\text{NO} + 4\text{H}_2\text{O}$
Verv sol in H_2O
 $+6\text{H}_2\text{O}$

Cadmium nitroprusside, $\text{CdFe}(\text{CN})_5\text{NO}$
Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ Insol in dil or conc $\text{HNO}_3 + \text{Aq}$ even when boiling Not attacked by NH_4OH or $\text{KOH} + \text{Aq}$ (Norton, Am Ch J 10 222)

Calcium nitroprusside, $\text{CaFe}(\text{CN})_5\text{NO} + 4\text{H}_2\text{O}$
Very sol in H_2O (Playfair)

Cobalt nitroprusside, $\text{CoFe}(\text{CN})_5\text{NO}$
Ppt (Norton, Am Ch J 10 222)
 $+4\text{H}_2\text{O}$

Copper nitroprusside, $\text{CuFe}(\text{CN})_5\text{NO} + 2\text{H}_2\text{O}$
Insol in H_2O or alcohol

Ferrous nitroprusside, $\text{FeFe}(\text{CN})_5\text{NO} + x\text{H}_2\text{O}(?)$
Insol in H_2O

Mercurous nitroprusside, $\text{Hg}_2\text{Fe}(\text{CN})_5\text{NO}$
Insol in H_2O Unstable (Norton, Am Ch J 10 222)

Nickel nitroprusside, $\text{NiFe}(\text{CN})_5\text{NO}$
As the Co salt (Norton)

Potassium nitroprusside, $\text{K}_2\text{Fe}(\text{CN})_5\text{NO} + 2\text{H}_2\text{O}$
Sl deliquescent Sol in 1 pt H_2O at 16°
 $\text{K}_2\text{Fe}(\text{CN})_5\text{NO}$, 2KOH Very sol in H_2O

Silver nitroprusside, $\text{Ag}_2\text{Fe}(\text{CN})_5\text{NO}$
Insol in H_2O , alcohol, or $\text{HNO}_3 + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Sodium nitroprusside, $\text{Na}_2\text{Fe}(\text{CN})_5\text{NO} + 2\text{H}_2\text{O}$
Sol in $2\frac{1}{2}$ pts H_2O at 16° , and in less hot H_2O

Zinc nitroprusside, $\text{ZnFe}(\text{CN})_5\text{NO}$
Very sl sol in cold, more in hot H_2O

Nitrosulphonic acid

Cupric nitrosulphonate, $\text{NO} \begin{smallmatrix} \text{O} \\ \diagup \text{SO}_3 \diagdown \end{smallmatrix} \text{Cu}$
Decomp by H_2O (Raschig, B 1907, 40 4583)

Nitrosobromoruthenic acid

Silver nitrosobromoruthenate ammonia, $\text{Ag}_2\text{Ru}(\text{NO})\text{Br}_3, \text{NH}_3$
Decomp by H_2O Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ Very sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Brizard, Bull Soc 1895, (3) 13 1093)

Nitrosobromosmic acid

Potassium nitrosobromosmate, $K_2Os(NO)Br_8$
Stable in aqueous solution (Wintrebert,
A ch 1903, (7) 28 132)

Nitrosochloroplatinic acid

Potassium nitrosochloroplatinate,
 $K_2PtCl_5(NO)$
Sol in H_2O (Vèzes, C R 110 757)

Nitrosochlororuthenic acid

Ammonium nitrosochlororuthenate,
 $(NH_4)_2Ru(NO)Cl_5$
Sol in H_2O (Joly, C R 107 991)
5 pts are sol in 100 pts H_2O at 25°
22 " " " " " " " " 60°
(Howe, J Am Chem Soc 1894, 16 390)

Cæsium nitrosochlororuthenate,
 $Cs_2Ru(NO)Cl_5$
0 20 pt is sol in 100 pts H_2O at 25°
0 56 " " " " " " " " 100°
(Howe)
+2 H_2O Very sol in H_2O 105 8 pts are
sol in 100 pts H_2O (Howe)

Potassium nitrosochlororuthenate,
 $K_2Ru(NO)Cl_5$
Sol in H_2O (Joly)
12 pts are sol in 100 pts H_2O at 25°
80 " " " " " " " " 60°
(Howe)

Rubidium nitrosochlororuthenate,
 $Rb_2Ru(NO)Cl_5$
Sol in boiling H_2O without decomp
0 57 pt is sol in 100 pts H_2O at 25°
2 13 " " " " " " " " 60°
(Howe)

Silver nitrosochlororuthenate ammonia,
 $Ag_2Ru(NO)Cl_5, NH_3$
Decomp by H_2O SI sol in $NH_4OH + Ag$
Very sol in $Na_2S_2O_3 + Ag$ (Brizard, Bull
Soc 1895, (3) 13 1092)

Nitrosoiodic acid, $I_2O_4(NO)_2$ (?)
Decomp with H_2O , alcohol, ether, or acetic
ether Slowly sol in H_2SO_4 (Kammerer, J
pr 83 65)

Nitrososulphonic acid

Potassium dinitrososulphonate, $N_2O OK$
 SO_3K
Sol in H_2O Very unstable (Hantzsch,
B 1894, 27 3268)

Potassium nitrosodisulphonate, $ON(SO_3K)_2$
Sol in H_2O Very explosive (Hantzsch,
B 1895, 28 996 and 2744)

Potassium nitrosotrisulphonate, $ON(SO_3K)_3$
+ H_2O
Sol in H_2O (Hantzsch, B 1895, 28 2750)

Sodium nitrosotrisulphonate, $NO_2(SO_3)_3Na$
Decomp by H_2O (Traube, B 1913, 4
2521)

Nitrososulphuric acid,
 $H_2N_2SO_5 = H_2SO_5(NO)_2$
Not known in free state

Ammonium dinitrososulphate,
 $(NH_4)_2(NO)_2SO_3$
Sol in H_2O Insol in hot alcohol (F
louze, A 15 240)

Barium —, $Ba(NO)_2SO_3$
Sol in H_2O (Divers and Haga, Chem Soc
47 364)

Barium potassium —, $BaK_2(SN_2O_5)_2$
Sol in much H_2O to form a clear liquid
but the solution gradually deposits $BaSO_4$
(Hantzsch, B 1894, 27 3271)

Cupric nitrosodisulphate, $Cu(NO)(SO_3)_2$
(Sabatier, Bull Soc 1897, (3) 17 787)

Lead dinitrososulphate
Insol in H_2O (Divers and Haga, Chem
Soc 47 364)

Potassium —, $K_2(NO)_2SO_3$
Decomp by H_2O at ordinary temp Insol
in alcohol (Pelouze, A ch 60 160)
Sol in about 8 pts H_2O at 14 5° Less sol
in presence of KOH (Divers and Haga
Chem Soc 1895, 67 455)

Sodium —, $Na_2(NO)_2SO_3$
More sol than K salt (Pelouze)
SI sol in H_2O , very unstable moist or dr
decomp by H_2O (Divers, C N 1895, 7
266)

Nitrososulphurous acid

Ruthenium sodium nitrososulphite,
 $O[Ru(SO_3)_2(NO)Na_2] + 2H_2O$
SI sol in cold H_2O (Miolati, Gazz c
it 1900, 30 511)

Nitrosulphide of iron

See *Ferroletranitrososulphonic acid*

Binitrosulphide of iron

Roussin's comp is ammonium ferrohept
nitrososulphonate, which see

Nitrosulphonic acid, $\text{HNSO}_3 = \begin{smallmatrix} \text{HO} \\ \text{NO}_2 \end{smallmatrix} \text{SO}_2$

(*Lead chamber crystals*) Rapidly sol in H_2O with decomp When brought into large amount of H_2O , no gas is evolved (Freymy, C R 70 61)

Sol in H_2SO_4 without decomp Sol in cold $\text{H}_2\text{SO}_4 + \text{Aq}$ of sp gr 1.7–1.55 (Weber, J pr 100 37)

Sl sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ of 1.6 sp gr (Dana) More difficultly sol in dil than conc $\text{H}_2\text{SO}_4 + \text{Aq}$ (Muller)

Potassium nitrosulphonate, $\text{KOSO}_2\text{NO}_2(?)$

Decomp by H_2O (Schultz-Sellack, B 4 113)

Nitrosulphonic anhydride (?), $\text{N}_2\text{O}_3, 2\text{SO}_3 = \text{S}_2\text{O}_5(\text{NO}_2)_2$

Rapidly sol in H_2O with decomp Abundantly sol in cold H_2SO_4 (Rose, Pogg 47 605)

Insol in cold, slowly sol in warm H_2SO_4 (Prevostaye, A ch 73 362)

Nitrosulphonic chloride, $\text{NO}_4\text{SO}_2\text{Cl} = \text{NO}_2\text{SO}_2\text{Cl} (?)$

Decomp by H_2O Sol in fuming H_2SO_4 without decomp Decomp by conc H_2SO_4 (Weber, Pogg 123 333)

Dinitrosulphuric acid

See *Dinitrososulphuric acid*

Nitrosyl bromide, NOBr

Decomp with cold H_2O (Landolt, A 116 177)

Nitrosyl tribromide, NOBr_3

Decomp by H_2O or cold alcohol Miscible with ether (Landolt, A 116 177) Mixture of NOBr and Br_2 (Frohlich, A 224 270)

Nitrosyl platonic bromide, $2\text{NOBr}, \text{PtBr}_4$

Deliquescent Decomp by H_2O (Topsoe, J B 1868 274)

Nitrosyl chloride, NOCl

Decomp by H_2O Absorbed by fuming H_2SO_4 without decomp

Nitrosyl boron chloride, $\text{NOCl}, \text{BCl}_3$

See *Boron nitrosyl chloride*

Nitrosyl platonic chloride, $2\text{NOCl}, \text{PtCl}_4$

Very deliquescent, and sol in H_2O with evolution of NO (Rogers and Boye, Phil Mag J 17 397)

Nitrosyl thallium chloride, $2\text{NOCl}, \text{TlCl}, \text{TlCl}_3$

Very deliquescent, and sol in H_2O with decomp (Sudborough, Chem Soc 59 657)

Nitrosyl stannic chloride, $2\text{NOCl}, \text{SnCl}_4$

Decomp by H_2O , chloroform, or benzene, not by carbon disulphide (Jorgensen)

Nitrosyl titanium chloride, $2\text{NOCl}, \text{TiCl}_4$

Decomp by H_2O (Weber, Pogg 118 476)

Nitrosyl zinc chloride, $\text{NOCl}, \text{ZnCl}_2$

Very deliquescent, and sol in H_2O with evolution of NO (Sudborough, Chem Soc 59 656)

Nitrosyl chloride sulphur trioxide, NOCl, SO_3

Decomp by H_2O Sol in conc H_2SO_4 with evolution of HCl (Weber, Pogg 123 233)

Nitrosyl fluoride, NOF

Sol in H_2O Solution decomp on standing with formation of NO and HNO_3 (Ruff and Stauber, Z anorg 1905, 47 190)

Nitrosyl sulphate, acid, $\text{H}(\text{NO})\text{SO}_4$

See *Nitrosulphonic acid*.

Nitrosyl sulphate, anhydro, $(\text{NO})_2\text{S O}_7$

See *Nitrosulphonic anhydride*

Nitrosyl selenic acid, $\text{SeO}_2(\text{ONO})_2$

Decomp by H_2O (Lenher and Mathews, J Am Chem Soc 1906, 28 516)

Nitrosyl sulphuric acid, $\text{H}(\text{NO})\text{SO}_4$

See *Nitrosulphonic acid*

Nitrous acid, HNO_2

Known only in aqueous solution

See *Nitrogen trioxide*

Nitrites

Normal nitrites, except AgNO_2 , are sol in H_2O and alcohol, but, as a rule, they are less sol than the corresponding nitrates

Ammonium nitrite, NH_4NO_2

Very deliquescent, and sol in H_2O H_2O solution decomp at 50° (Berzelius) Very dil solution can be evaporated on water bath without decomp (Bohlig, A 125 25) Solution containing $\frac{1}{100,000}$ pt NH_4NO_2 can be evaporated to $\frac{1}{2}$ its vol without decomp Solution containing $\frac{1}{500}$ pt gives a distillate containing 8.6% of NH_4NO_2 , while residue contains 82% of original quantity, 9.4% being lost (Schöyen)

Very deliquescent, sol in H_2O , slowly but easily sol in alcohol, insol in ether (Sörensen, Z anorg 1894, 7 38)

Ammonium barium cupric nitrite,

$(\text{NH}_4)_2\text{BaCu}(\text{NO}_2)_6$
Ppt, decomp readily (Przibylla, Z anorg 1897, 15 424)

Ammonium bismuth silver nitrite,

$(\text{NH}_4)_2\text{BiAg}(\text{NO}_2)_6$
Moderately sol in H_2O Rapidly hydrolyzed by H_2O (Ball and Abram, Chem Soc 1913, 103 2120)

Ammonium bismuth sodium nitrite,

$2\text{NH}_4\text{NO}_2, \text{Bi}(\text{NO}_2)_3, \text{NaNO}_2$
Easily decomp (Ball, Chem Soc 1905, 87 761)

Ammonium cadmium nitrite ammonia, basic,

$2\text{NH}_4\text{NO}_2, \text{Cd}(\text{NO}_2)_2, \text{Cd}(\text{OH})_2, 2\text{NH}_3$
Decomp by H_2O (Morin, C R 100 1497)

Ammonium calcium cupric nitrite,

$(\text{NH}_4)_2\text{CaCu}(\text{NO}_2)_6$
Ppt, decomp easily Sol in H_2O Sl sol in alcohol (Przibylla, Z anorg 1897, 15 423)

Ammonium cobaltic nitrite, $3(\text{NH}_4)_2\text{O}, \text{Co}_2\text{O}_3,$

$6\text{N}_2\text{O}_5 + 1\frac{1}{2}\text{H}_2\text{O}$
Sl sol in H_2O , decomp in aq solution on heating (Rosenheim, Z anorg 1898, 17 45)
 $+3\text{H}_2\text{O}$
Somewhat sol in cold H_2O , decomp by boiling Decomp by conc H_2SO_4 , not by acetic or dil mineral acids (Erdmann, J pr 97 405)

Ammonium cupric lead nitrite,

$\text{CuPb}(\text{NH}_4)_2(\text{NO}_2)_6$
Stable at ordinary temp, sol in HNO_3 with decomp
2 575 pts are sol in 100 pts H_2O at 20° , or 2 51% salt in sat solution at 20° (Przibylla, Z anorg 1897, 15 420)

Ammonium cupric strontium nitrite,

$(\text{NH}_4)_2\text{CuSr}(\text{NO}_2)_6$
Ppt, sol in H_2O with decomp (Przibylla, l c)

Ammonium iridium nitrite

See Iridonitrite, ammonium

Ammonium lead nickel nitrite,

$(\text{NH}_4)_2\text{PbNi}(\text{NO}_2)_6(?)$
Ppt (Przibylla, Z anorg 1897, 15 433)

Ammonium osmium nitrite

See Osmunitrite, ammonium

Ammonium osmyl oxynitrite

See Osmyloxynitrite, ammonium

Ammonium platinum nitrite

See Platonitrite, ammonium

Ammonium rhodium nitrite

See Rhodonitrite, ammonium

Ammonium ruthenium hydrogen nitri,

$\text{Ru}_2\text{H}_2(\text{NO}_2)_4, 3\text{NH}_4\text{NO}_2 + 3\text{H}_2\text{O}$
See Ruthennitrite, ammonium hydrogen

Barium nitrite, $\text{Ba}(\text{NO}_2)_2 + \text{H}_2\text{O}$

Permanent Very sol in H_2O

Solubility in H_2O at t°

t°	G in 100 cc $\text{Ba}(\text{NO}_2)_2$	Sp gr
0	58	1 40
20	63	1 45
25	71	1 50
30	82	1 52
35	97	1 61

(Vogel, Z anorg 1903, 35 389)

100 pts H_2O dissolve at			
0°	10°	20°	30°
63 5	69 5	79 5	93 pts. $\text{Ba}(\text{NO}_2)_2 + \text{H}$
40°	50°	60°	70°
113	136	170	202 pts $\text{Ba}(\text{NO}_2)_2 + \text{H}$
80°	90°	100°	110°
254	331	461	765 pts $\text{Ba}(\text{NO}_2)_2 + \text{H}$

The sat solution at 17° contains 46% $\text{Ba}(\text{NO}_2)_2$, and has sp gr $17^\circ/0^\circ = 1 48$ (Oswald, A ch 1914, (9) 1 62)

100 g H_2O at $13 5^\circ$ dissolve 64 g $\text{Ba}(\text{NO}_2)_2$ + 10 2 g AgNO_2 with excess of AgNO_2 , and 75 6 g $\text{Ba}(\text{NO}_2)_2$ + 9 5 g AgNO_2 , with excess of AgNO_2 (Oswald)

Sol in 64 pts 94% alcohol, nearly insol in absolute alcohol (Lang, Pogg 118 28)

Solubility in alcohol + Aq at t°

t°	Solvent	100 cc of the sat solution contain $\text{Ba}(\text{NO}_2)_2 + \text{H}_2\text{O}$
19 5	10% alcohol	49 30
21 0	20% "	29 30
20 5	30% "	18 41
20 5	40% "	13 33
20 5	50% "	9 11
20 0	60% "	4 54
19 0	70% "	2 66
19 5	80% "	0 98
20 0	90% "	0 00
20 0	absolute alcohol	0 00

(Vogel, Z anorg 1903, 35 390)

Insol in acetone (Naumann B 1904, 4329)

Insol in ethyl acetate (Naumann, 1910, 43 314)

Barium caesium nitrite, $\text{CsBa}_2(\text{NO}_2)_6$

Sol in H_2O (Jamieson, Am Ch J 1907, 38 616)

$\text{Cs}_2\text{Ba}(\text{NO}_2)_4 + \text{H}_2\text{O}$ Very sol in H_2O (Jamieson, Am Ch J 1907, 38 616)

Barium caesium silver nitrite, $\text{Cs}_3\text{AgBa}(\text{NO}_2)_6 + 2\text{H}_2\text{O}$

Decomp by cold H_2O (Jamieson, Am Ch J 1907, 38 616)

Barium cobaltic nitrite, $2\text{BaO}, \text{Co}_2\text{O}_3, 4\text{N}_2\text{O}_5 + 10\text{H}_2\text{O}$

Sol in moderately warm H_2O without decomp but not recryst therefrom (Rosenheim, Z anorg 1898, 17 51-54)

$3\text{BaO}, \text{Co}_2\text{O}_3, 6\text{N}_2\text{O}_5 + \text{H}_2\text{O}$ Ppt, very unstable Nearly insol in H_2O (Rosenheim, Z anorg 1898, 17 47)

Barium cobaltous potassium nitrite, $\text{Ba}(\text{NO}_2)_2, \text{Co}(\text{NO}_2)_2, 2\text{KNO}_2$

Decomp by H_2O (Erdmann, J pr 97 385)

Barium cupric nitrite, $\text{Ba}[\text{Cu}(\text{OH})(\text{NO}_2)_2]_2$

Ppt Insol in H_2O Decomp by H_2O Insol in alcohol, but slowly decomp by it (Kurtenacker, Z anorg 1913, 82 208)

Barium cupric potassium nitrite, $\text{BaCuK}_2(\text{NO}_2)_6$

Stable when dry, easily decomp when moist, sol in H_2O with decomp

45 86 pts are sol in 100 pts H_2O at 20° , or 31 45% salt is contained in sat solution at 20° (Przibylla, Z anorg 1897, 15 424)

Barium cupric thallium nitrite, $\text{BaCuTl}_2(\text{NO}_2)_6$

Sl sol in H_2O (Przibylla, Z anorg 1898, 18 461)

Barium iridium nitrite

See Iridonitrite, barium

Barium mercuric nitrite, $2\text{Ba}(\text{NO}_2)_2, 3\text{Hg}(\text{NO})_2 + 5\text{H}_2\text{O}$

Very sol in H_2O and easily decomp (Rây, Chem Soc 1910, 97 327)

Barium nickel nitrite, $2\text{Ba}(\text{NO}_2)_2, \text{Ni}(\text{NO}_2)_2$

Somewhat more easily sol in H_2O than nickel potassium nitrite (Lang)

Barium nickel potassium nitrite, $\text{Ba}(\text{NO}_2)_2, \text{Ni}(\text{NO}_2)_2, 2\text{KNO}_2$

Sl sol in cold, easily in hot H_2O without apparent decomp (Lang)

Barium nickel thallium nitrite, $\text{NiBaTl}_2(\text{NO}_2)_6$

Ppt (Przibylla, Z anorg 1898, 18 462)

Barium osmium nitrite

See Osminitrite, barium

Barium osmyl oxynitrite

See Osmyloxynitrite, barium

Barium potassium nitrite, $\text{Ba}(\text{NO}_2)_2, 2\text{KNO}_2 + \text{H}_2\text{O}$

Easily sol in H_2O , insol in alcohol (Lang, Pogg, 118 293)

Barium rhodium nitrite, $3\text{Ba}(\text{NO}_2)_2, \text{Rh}_2(\text{NO}_2)_6$

See Rhodonitrite, barium

Barium silver nitrite, $\text{Ba}(\text{NO}_2)_2, 2\text{AgNO}_2 + \text{H}_2\text{O}$

Resembles the potassium salt (Fischer) Less stable than the Na salt (Oswald)

Bismuth nitrite, basic, $(\text{BiO})\text{NO}_2 + \frac{1}{2}\text{H}_2\text{O}$

Sol in HCl (Vanino, J pr 1906, (2) 74 150)

Bismuth caesium silver nitrite, $\text{Cs}_2\text{BiAg}(\text{NO}_2)_6$

Very sl sol in H_2O Slowly decomp by H_2O (Ball and Abram, Chem Soc 1913, 103 2122)

Bismuth potassium nitrite, $\text{Bi}(\text{NO}_2)_3, 3\text{KNO}_2 + \text{H}_2\text{O}$

Decomp by H_2O (Ball, Chem Soc 1905, 87 762)

Bismuth potassium silver nitrite, $\text{K}_2\text{BiAg}(\text{NO}_2)_6$

Less sol in H_2O than NH_4 salt (Ball and Abram, Chem Soc 1913, 103 2121)

Bismuth rubidium silver nitrite, $\text{Rb}_2\text{BiAg}(\text{NO}_2)_6$

Sl sol in H_2O with slow hydrolysis (Ball and Abram)

Bismuth silver thallos nitrite, $\text{BiAgTl}_2(\text{NO}_2)_6$

Insol in H_2O , but decomp thereby (Ball and Abram)

Cadmium nitrite, basic, $2\text{CdO}, \text{N}_2\text{O}_5$

Insol in H_2O (Hampe, A 125 335)

Cadmium nitrite, $\text{Cd}(\text{NO}_2)_2 + \text{H}_2\text{O}$

Deliquescent Sol in H_2O (Lang, J B 1862 99)

Cadmium potassium nitrite, $\text{Cd}(\text{NO}_2)_2, \text{KNO}_2$

Easily sol in H_2O Very difficultly sol in absolute alcohol, and only sl sol in 90% alcohol (Hampe, A 125 334)

$\text{Cd}(\text{NO}_2)_2, 2\text{KNO}_2$ Easily sol in H_2O Insol in alcohol (Lang, J B 1862 99)

$\text{Cd}(\text{NO}_2)_2, 4\text{KNO}_2$ More sol in H_2O than the above salt (Lang)

Cæsium nitrite, CsNO₂

Very hygroscopic Very sol in H₂O
(Ball, Chem Soc 1913, 103 2130)

Cæsium calcium nitrite, Cs₂Ca(NO₂)₄+H₂O
Ppt (Jamieson, Am Ch J 1907, 38 617)**Cæsium cobaltic nitrite, Cs₃Co(NO₂)₆+H₂O**
Sol in 20,100 pts H₂O at 17° (Rosenbladt, B 19 2531)**Cæsium lead nitrite, CsPb(NO₂)₃+H₂O**
Sol in cold H₂O without decomp When solution is heated, some basic lead salt separates (Jamieson, Am Ch J 1907, 38 618)**Cæsium lead silver nitrite, Cs₃AgPb(NO₂)₆+2H₂O**
Ppt (Jamieson)**Cæsium silver nitrite, CsAg(NO₂)₂**
Decomp by H₂O (Jamieson)**Cæsium silver strontium nitrite, Cs₂AgSr(NO₂)₆+2H₂O**
Partially decomp by H₂O (Jamieson)**Cæsium strontium nitrite, CsSr(NO₂)₃+H₂O**
Ppt Sol in H₂O (Jamieson)**Calcium nitrite, Ca(NO₂)₂+H₂O**
Very deliquescent Insol in dil alcohol (Fischer, Pogg 74 115)
100 ccm of the sat solution contain 111.6 g Ca(NO₂)₂+H₂O at 20.5° (Vogel, Z anorg 1903, 35 395)Solubility in H₂O at t°

t°	%Ca(NO ₂) ₂	Solid phase
0	38.3	Ca(NO ₂) ₂ , 4H ₂ O
18.5	43	
42	51.8	"
44	53.5	" +Ca(NO ₂) ₂ , H ₂ O
54	55.2	Ca(NO ₂) ₂ , H ₂ O
64	58.4	"
70	60.3	"
73	61.5	"
91	71.2	"

(Oswald, A ch 1914, (9) 1 32)

Sat solution of Ca(NO₂)₂+AgNO₂ contains 92.4 g Ca(NO₂)₂ and 11.2 g AgNO₂ per 100 g H₂O at 14° (Oswald)

Solubility in alcohol
100 ccm of sat solution in 90% alcohol contain 39.0 g Ca(NO₂)₂+H₂O at 20°

100 ccm of sat solution in absolute alcohol contain 1.1 g Ca(NO₂)₂+H₂O at 20° (Vogel)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

+4H₂O The sat solution at 16° contains 42.3% Ca(NO₂)₂ and has sp gr at 16°/0 1.4205 (Oswald, A ch 1914, (9) 1 66)

Calcium cobaltous potassium nitrite, Ca(NO₂)₂, Co(NO₂)₂, 2KNO₂
Decomp by H₂O (Erdmann)**Calcium cupric potassium nitrite, CaCuK₂(NO₂)₆**

Ppt, insol in alcohol, sol in H₂O with decomp

14.97 pts are sol in 100 pts H₂O at 20° or 13.02 per cent of salt is contained in sat solution (Przibylla, Z anorg 1897, 15 42)

Calcium mercuric nitrite, Ca(NO₂)₂, Hg(NO₂)₂+5H₂O
Very sol in H₂O (Rây, Chem Soc 19), 97 327)**Calcium nickel potassium nitrite, Ca(NO₂)₂, Ni(NO₂)₂, 2KNO₂**

Very sl sol in cold, easily in hot H₂O Insol in alcohol Sl sol in dil HC₂H₃O₂ + Aq (Erdmann)

Calcium osmium nitrite
See Osmium nitrite, calcium**Calcium potassium nitrite, CaK(NO₂)₂+3H₂O**

Sol in H₂O (Topsoe, W A B 73, 2 11)
Deliquescent (Lang)

Cobaltous nitrite
Known only in solution**Cobaltic lead nitrite, 3PbO, CoO₃, 6N₂O+12H₂O**

Insol in H₂O (Rosenheim, Z anorg 18 3, 17 48)

Cobaltic lead potassium nitrite, 3K₂O, 3PbO, 2Co₂O₃, 10N₂O₃+4H₂O

Sol by boiling in much H₂O Sol in dil acids with evolution of N₂O₃ (Stromeyer A 96 228)

Cobaltous potassium nitrite, 2Co(NO₂)₂+2KNO₂+H₂O

Ppt (Sadtlir)
Co(NO₂)₂, 2KNO₂+H₂O Ppt (Sadtlir)
3Co(NO₂)₂, 6KNO₂+H₂O Insol in cold, sol in hot H₂O Sl sol in KC₂H₃O₂+Aq (Erdmann, J pr 97 397)

Insol in ethyl acetate (Naumann, B 1904, 37 3602)

Cobaltic potassium nitrite (cobalt yellow), Co₂(NO₂)₆, 6KNO₂+3H₂O

Very sl sol in cold H₂O Insol in alcohol and ether Sol in traces in CS₂ (St E e,

- C R 35 552**) Insol in boiling conc K_2SO_4 , KCl , KNO_3 , or $KC_2H_3O_2 + Aq$
Sol in 1120 pts H_2O at 17° (Rosenblatt, B 1886, 19 2535)
Decomp when heated in aq solution (Rosenheim, Z anorg 1898, 17 42)
More sol in NH_4Cl or $NaCl + Aq$ than in H_2O (Stromeyer)
Sl decomp by $KOH + Aq$, except when very conc, easily decomp by $NaOH$ or $Ba(OH)_2 + Aq$
Very sl sol in $KC_2H_3O_2 + Aq$, or $KNO_3 + Aq$ (Fresenius) Sol in $HCl + Aq$
Sol in $HC_2H_3O_2$, or $H_2C_2O_4 + Aq$ (Stromeyer)
Small quantity of $HC_2H_3O_2 + Aq$ does not dissolve (Fresenius)
- Cobaltic potassium silver nitrite**, $KCoAg_2(NO_2)_6$, and $K_2CoAg(NO_2)_6$
Very sl sol in H_2O Less sol than Na comp (Burgess and Karum, J Am Chem Soc 1912, 34 653)
- Cobaltous potassium strontium nitrite**, $Co(NO_2)_2$, $2KNO_2$, $Sr(NO_2)_2$
Decomp by H_2O (Erdmann, J pr 97 385)
- Cobaltic rubidium nitrite**, $Rb_3Co(NO_2)_6 + H_2O$
Sol in 19,800 pts H_2O (Rosenblatt, B 19 2531)
- Cobaltic silver nitrite**, $CoAg_3(NO_2)_6$
Fairly sol in H_2O (Cunningham and Perkin, Chem Soc 1909, 95 1568)
 $2Ag_2O$, Co_2O_3 , $3N_2O_5 + 3H_2O$ Sl sol in H_2O , decomp by boiling H_2O (Rosenheim, Z anorg 1898, 17 56)
- Cobaltic silver hydroxynitrite**, $Co_2Ag_3(OH)_3(NO_2)_6$
Sl sol in H_2O (Suzuki, Chem Soc 1910, 97 729)
- Cobaltic silver nitrite ammonia**, Co_2O_3 , Ag_2O , $4N_2O_5$, $4NH_3$
See Cobalt ammonium comps
- Cobaltic sodium nitrite**, $2Na_2O$, Co_2O_3 , $4N_2O_5$
Sol in H_2O and alcohol (Rosenheim, Z anorg 1898, 17 50)
 $+ H_2O$ Ppt (Sadtler, Sil Am J (2) 49 196)
 $3Na_2O$, Co_2O_3 , $6N_2O_5 + xH_2O$ Sol in H_2O , decomp on heating, insol in alcohol (Rosenheim, Z anorg 1898, 17 43)
- Cobaltic strontium nitrite**, $2SrO$, Co_2O_3 , $4N_2O_5 + 11H_2O$
Ppt (Rosenheim, Z anorg 1898, 17 54)
- Cobaltic thallium nitrite**, $Co_2(NO_2)_6$, $6TlNO_2$
Sol in 23,810 pts H_2O at 17° (Rosenblatt, B 19 2531)
- Cobaltic zinc nitrite**, $2ZnO$, Co_2O_3 , $3N_2O_5 + 11H_2O$
Sol in dil acetic acid (Rosenheim, Z anorg 1898, 17 56)
- Cobalt nitrite nitrate**, $2CoO$, Co_2O_3 , $3N_2O_5$, $Co(NO_2)_2 + 14H_2O$
Ppt (Rosenheim, Z anorg 1898, 17. 58)
- Cupric nitrite, basic**, $2CuO$, N_2O_5
(Hampe, A 125 345)
 $Cu(NO_2)_2$, $3Cu(OH)_2$ Very sl sol in H_2O or alcohol Easily sol in dil acids or ammonia (van der Meulen, B 12 758)
- Cupric nitrite**
Known only in solution
- Cupric lead potassium nitrite**, $CuPbK_2(NO_2)_6$
(van Lessen, R t c 10 13)
3 056 pts are sol in 100 pts H_2O at 20° , or 2 51% salt is contained in sat solution at 20° p 429 (Przybylla, Z anorg 1897, 15 429)
- Cupric potassium strontium nitrite**, $CuSrK_2(NO_2)_6$
Sol in H_2O with decomp 10 82 pts are sol in 100 pts H_2O at 20° , or 9 77 per cent salt is contained in sat solution at 20° (Przybylla, Z anorg 1897, 15 425)
- Cupric rubidium nitrite**, $Rb_3Cu(NO_2)_6$
Easily sol in H_2O Sol in alcohol (Kurténacker, Z anorg 1913, 82 206)
- Cupric nitrite ammonia**, $Cu(NO_2)_2$, $2NH_3 + 2H_2O$
Sol in little H_2O with absorption of much heat Decomp by much H_2O (Peligot, C R 53 209)
 $3CuO$, N_2O_5 , $2NH_3 + H_2O$ As above (Peligot)
- Iridium hydrogen nitrite**, $Ir_2H_6(NO_2)_{12}$
See Iridonitrous acid
- Iridium nitrite with MNO_2**
See Iridonitrite, M
- Iron (ferrous) lead potassium nitrite**, $FePbK_2(NO_2)_6$
Ppt, insol in cold H_2O , stable at ordinary temp (Przybylla, Z anorg 1897, 15 439)
- Iron (ferrous) lead thallos nitrite**, $FePbTl_2(NO_2)_6$
Ppt (Przybylla, Z anorg 1898, 18 463)

Lead nitrite, basic, $4\text{PbO}, \text{N}_2\text{O}_3 + \text{H}_2\text{O} = \text{Pb}(\text{OH})\text{NO}_2, \text{PbO}$

Sol in 143 pts H_2O at 23° , and 33 pts at 100° (Chevreul)

Sol in 1250 pts cold H_2O , and 34.5 pts at 100° (Peligot)

Sol in cold HNO_3 or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$
Composition is $3\text{PbO}, \text{N}_2\text{O}_3 + \text{H}_2\text{O}$ (Meissner, J B 1876 194)

Composition is as above (v Lorenz, W A B 84, 2 1133)

$3\text{PbO}, \text{N}_2\text{O}_3 = \text{Pb}(\text{NO}_2)_2, 2\text{PbO}$ Sol in H_2O (Bromeis, A 72 38, v Lorenz)

$2\text{PbO}, \text{N}_2\text{O}_3 + \text{H}_2\text{O}$ Sl sol in H_2O (Bromeis)

$+3\text{H}_2\text{O}$ (Meissner)
 $4\text{PbO}, 3\text{N}_2\text{O}_3 + 2\text{H}_2\text{O}$ Sol in H_2O (Meissner, J B 1876 195)

Lead nitrite, $\text{Pb}(\text{NO}_2)_2 + \text{H}_2\text{O}$

Easily sol in H_2O (Peligot, A ch 77 87)

Lead nickel potassium nitrite, $\text{Pb}(\text{NO}_2)_2, \text{KNO}_2, \text{Ni}(\text{NO}_2)_2$

Insol in H_2O (Baubigny, A ch (6) 17 111)

Ppt (Przybylla, Z anorg 1897, 15 432)

Lead nickel thalious nitrite, $\text{NiPbTl}_2(\text{NO}_2)_6$

Ppt (Przybylla, Z anorg 1898, 18 462)

Lead potassium nitrite, $4\text{Pb}(\text{NO}_2)_2, 6\text{KNO}_2 + 3\text{H}_2\text{O}$

Easily sol in H_2O and in absolute alcohol (Hampe, A 125 334)

$\text{Pb}(\text{NO}_2)_2, 2\text{KNO}_2 + \text{H}_2\text{O}$ Easily sol in H_2O Insol in alcohol (Lang, J B 1862 102)

Lead potassium silver nitrite, $\text{K}_3\text{AgPb}(\text{NO}_2)_6 + 2\text{H}_2\text{O}$

Ppt (Jamieson, Am Ch J 1907, 38 619)

Lead nitrite nitrate

See Nitrate nitrite, lead

Lithium nitrite, $\text{LiNO}_2 + \frac{1}{2}\text{H}_2\text{O}$

Deliquescent Easily sol in alcohol and H_2O (Vogel, Z anorg 1903, 35 403)

Sat solution of $\text{LiNO}_2 + \frac{1}{2}\text{H}_2\text{O}$ in H_2O contains at

65° 81.5° 91° 96° 92.5°
63.8 68.7 72.4 91.8 94.3% LiNO_2

(Oswald)

$+ \text{H}_2\text{O}$ Very sol in H_2O , readily forming supersat solutions Very sol in abs alcohol (Ball, Chem Soc 1913, 103 2133)

100 pts H_2O dissolve at

0° 10° 20°
125 156 189 pts $\text{LiNO}_2 + \text{H}_2\text{O}$

30° 40° 50°
242 316 459 pts $\text{LiNO}_2 + \text{H}_2\text{O}$

$\text{LiNO}_2, \text{H}_2\text{O} + \text{Aq}$ sat at 19° contains 48.9% LiNO_2 and has sp gr = 1.3186 (Oswald, J ch 1914, (9) 1 61)

100 g H_2O dissolve 78.5 g $\text{LiNO}_2 + 10.5 \text{ AgNO}_2$ at 14° (Oswald)

Lithium mercuric nitrite, $\text{LiNO}_2, \text{Hg}(\text{NO}_2)_2 + \text{H}_2\text{O}$

(Ray, Chem Soc 1907, 91 2033)

$4\text{LiNO}_2, \text{Hg}(\text{NO}_2)_2 + 4\text{H}_2\text{O}$ Extreme deliquescent (Ray)

Magnesium nitrite, $\text{Mg}(\text{NO}_2)_2 + 2\text{H}_2\text{O}$

Deliquescent, and sol in H_2O Solution decomp by boiling Easily sol in absolute alcohol (Hampe, A 125 334)

Insol in absolute alcohol (Fischer)
 $+3\text{H}_2\text{O}$ Sol in H_2O and absolute alcohol

Very deliquescent (Vogel, Z anorg 1903, 35 397)

Magnesium osmium nitrite

See Osminitrite, magnesium

Magnesium potassium nitrite

Deliquescent, and easily sol in H_2O Insol in alcohol (Lang)

Magnesium silver nitrite

Sol in H_2O with decomp (Spiegel, Ch 1895, 19 1423)

Manganous nitrite

Deliquescent, and sol in H_2O (Mitschlich) Not obtained in a solid state, as solution decomp on evaporation (Lang, J B 1862 102)

Mercurous nitrite, $\text{Hg}_2(\text{NO}_2)_2$

Sol in H_2O with partial decomp to Hg and $\text{Hg}(\text{NO}_2)_2$ (Ray, A 1901, 316 252)

Sol in cold conc HNO_3 Very slowly in cold dil HNO_3 (Ray, Chem Soc 1897, 71 339)

Decomp by boiling H_2O and by cold H_2SO_4 (Ray, Z anorg 1896, 12 366)

$+ \text{H}_2\text{O}$ Slowly decomp by H_2O (Ray, Chem Soc 1897, 71 340)

Mercuric nitrite, basic, $\text{Hg}(\text{NO}_2)_2, 2\text{HgO} + \text{H}_2\text{O}$

Ppt (Lang)

$12\text{HgO}, 5\text{N}_2\text{O}_3 + 24\text{H}_2\text{O}$ (Ray, Chem Soc 1897, 71 341)

Mercuric nitrite, $\text{Hg}(\text{NO}_2)_2$

Deliquescent Partly sol in boiling H_2O , but the greater part is decomp into $\text{Hg} + \text{HNO}_2$ (Ray, Proc Chem Soc 1904, 20 341)

Mercuromercuric nitrite, basic

α $9\text{Hg}_2\text{O}, 4\text{HgO}, 5\text{N}_2\text{O}_3 + 8\text{H}_2\text{O}$

β $\text{Hg}_2\text{O}, 2\text{HgO}, \text{N}_2\text{O}_3 + 2\text{H}_2\text{O}$

(Ray, Chem Soc 1897, 71 341)

Mercuric potassium nitrite, $\text{Hg}(\text{NO}_2)_2$, 2KNO_2

Easily sol in H_2O Insol in alcohol (Lang, 1860)

$\text{KHg}(\text{NO}_2)_3$ Obtained from $\text{K}_3\text{Hg}(\text{NO}_2)_6$, $\text{H}_2\text{O} + \text{Aq}$ containing a small excess of KNO_2 Decomp by H_2O (Rosenheim, Z anorg 1901, 28 173)

$\text{K}_3\text{Hg}(\text{NO}_2)_6 + \text{H}_2\text{O}$ Sol in H_2O Formula of Lang is incorrect (Rosenheim, Z anorg 1901, 28 172)

Mercuric sodium nitrite, $\text{Na}_2\text{Hg}(\text{NO}_2)_4$

Very hygroscopic Decomp by hot H_2O (Rosenheim, Z anorg 1901, 28 173)

$+2\text{H}_2\text{O}$ Deliquescent (Rây, Chem Soc 1907, 91 2032)

$2\text{Hg}(\text{NO}_2)_2$, 3NaNO_2 Decomp by H_2O (Rây, Chem Soc 1907, 91 2032)

Mercuric strontium nitrite, $3\text{Hg}(\text{NO}_2)_2$, $2\text{Sr}(\text{NO}_2)_2 + 5\text{H}_2\text{O}$

Very sol in H_2O (Rây, Chem Soc 1910, 97 327)

Mercuric nitrite hydrazine, $\text{Hg}(\text{NO}_2)_2$, N_2H_4

Ppt Decomp by H_2O (Hofmann and Marburg, A 1899, 305 215)

Nickel nitrite, basic, 2NiO , N_2O_3

Ppt (Hampe, A 125 343)

Nickel nitrite, $\text{Ni}(\text{NO}_2)_2$

Sol in H_2O and alcohol (Lang, J B 1862 100)

Nickel potassium nitrite, $\text{Ni}(\text{NO}_2)_2$, 4KNO_2

Moderately sol in H_2O (Fischer, Pogg 74 115) Extremely sol in H_2O (Hampe, A 125 346) Insol in absolute alcohol

Nickel potassium strontium nitrite, $\text{Ni}(\text{NO}_2)_2$, 2KNO_2 , $\text{Sr}(\text{NO}_2)_2$

Sl sol in cold, easily sol in hot H_2O

Nickel nitrite ammonia, $\text{Ni}(\text{NO}_2)_2$, 4NH_3

Sol in cold H_2O Decomp on standing or by heating Insol in alcohol Can be recrystallized by dissolving in $\text{NH}_4\text{OH} + \text{Aq}$, and adding much absolute alcohol (Erdmann, J pr 97 395)

$\text{Ni}(\text{NO}_2)_2$, 5NH_3 Decomp in the air giving $\text{Ni}(\text{NO}_2)_2$, 4NH_3 (Ephraim, B 1913, 46 3110)

Osmium nitrite, $\text{Os}(\text{NO}_2)_3$

Ppt (Wintrebert, C R 1905, 140 587)

Osmium nitrite with MNO

See Osmnitrite, M

Osmyl nitrite with MNO_2

See Osmynitrite, M

Osmyl oxynitrite with MNO_2

See Osmyloxynitrite, M

Osmyl nitrite ammonia, $\text{OsO}_2(\text{NO}_2)_2$, 4NH_3

(Wintrebert, A ch 1903, (7) 28 56)

Palladious nitrite with MNO_2

See Palladonitrite, M

Platinous hydrogen nitrite, $\text{H}_2\text{Pt}(\text{NO}_2)_4$

See Platonitrous acid

Platinous nitrite with MNO_2

See Platonitrite, M

Potassium nitrite, KNO_2

Deliquescent Sol in H_2O

Pure KNO_2 is not deliquescent (Oswald, A ch 1914, (9) 1 32)

Sol in about $1/3$ its wt of H_2O (Divers, Chem Soc 1899, 75 86)

100 pts H_2O dissolve at

0°	10°	20°	30°	40°
281	291	302	313	325 pts KNO_2

50°	60°	70°	80°	90°
337 5	351	365	380	396 pts KNO_2

100°	110°	120°	130°
413	432	451	473 pts KNO_2

Bpt of sat $\text{KNO} + \text{Aq}$ is 132° at 759.5 mm pressure

(Oswald, A ch 1914, (9) 1 58)

Sp gr of $\text{KNO}_2 + \text{Aq}$ at 17.5° containing

10	20	30	40% KNO_2
1 049	1 126	1 208	1 295

50	60	70	74.5% KNO_2
1 377	1 491	1 599	1 646

(Oswald)

100 g H_2O at 13.5° dissolve 18 g $\text{KNO}_2 + 2.36$ g AgNO_2 , at 25° , 23.1 g $\text{KNO}_2 + 5.3$ g AgNO_2 with excess of AgNO_2

100 g H_2O at 13.5° dissolve 276 g $\text{KNO}_2 + 26.3$ g AgNO_2 , at 25° , 279 g $\text{KNO}_2 + 39.3$ g AgNO_2 with excess of KNO_2 (Oswald)

See also under AgNO_2

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Deliquesces in 90% alcohol, insol in cold 94% alcohol More sol in H_2O than KNO_3 , but less sol in alcohol (Fischer)

Ppt from its conc aq solution by the addition of methyl alcohol Addition of ethyl alcohol to a conc aq solution of KNO_2 causes separation into two layers, of which the lower aq solution contains 71.9% KNO_2 while the upper alcoholic layer contains 6.9% KNO_2 (Donath, Ch Z 1911, 35 773)

Very sl sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)
 Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602)

Potassium rhodium nitrite, 6KNO_2 ,
 $\text{Rh}_2(\text{NO}_2)_6$

See Rhodonitrite, potassium

Potassium ruthenium nitrite

See Ruthenonitrite, potassium

Potassium silver nitrite, KNO_2 , $\text{AgNO}_2 + \frac{1}{2}\text{H}_2\text{O}$

Completely sol in a little H_2O , but decomp by more H_2O Sol in $\text{KNO}_2 + \text{Aq}$ without decomp Insol in alcohol (Lang)

Potassium strontium nitrite, 2KNO_2 ,
 $\text{Sr}(\text{NO}_2)_2$

Sol in H_2O , insol in alcohol (Lang, Pogg 118 293)

Potassium zinc nitrite, 2KNO_2 , $\text{Zn}(\text{NO}_2)_2 + \text{H}_2\text{O}$

Deliquescent Easily sol in H_2O (Lang, J B 1862 101)

$\text{K}_2\text{Zn}(\text{NO}_2)_6 + 3\text{H}_2\text{O}$ Very hygroscopic
 Decomp by H_2O (Rosenheim, Z anorg 1901, 28 174)

Rhodium nitrite with MNO_2

See Rhodonitrite, M

Rubidium nitrite, RbNO_2

Deliquescent, very sol in H_2O , sl sol in hot alcohol, almost insol in acetone (Ball, Chem Soc 1913, 103 2131)

Ruthenium nitrite with MNO_2

See Ruthenonitrite, M

Silver nitrite, AgNO_2

Sol in 120 pts cold H_2O (Mitscherlich), in 300 pts (Fischer), and more abundantly in hot H_2O

1 l H_2O dissolves 3 1823 g or 0 02067 g mols at 18° (Naumann and Rucker, B 1905, 38 2294)

1 litre H_2O dissolves at—

0°	0 0113 mol AgNO_2
8°	0 0159 " "
14°	0 0189 " "
16°	0 0203 " "
18°	0 0216 " "
25°	0 0260 " "
33°	0 0370 " "

(Pick and Abegg, Z anorg 1906, 51 3)

1 l H_2O dissolves 3 609 g AgNO_2 at 21°
 (Oswald, A ch 1914, (9) 1 33)

Solubility in H_2O at t°

t°	% AgNO_2
1	0 1589
15	0 2752
25	0 4125
35	0 6016
51	1 0240
60	1 3625

(Creighton and Ward, J Am Chem Soc 1915, 37 2335)

Solubility in $\text{AgNO}_3 + \text{Aq}$ at 18°

Mols AgNO_3 per l of the solution	Mols AgNO_2 dissolved per l
0	0 0207
0 0026	0 0198
0 0052	0 0190
0 0103	0 0169
0 0207	0 0144
0 0413	0 0117
0 0827	0 0096

(Abegg and Pick, B 1905, 38 2573)

1 l 0.2-N $\text{NaNO}_2 + \text{Aq}$ dissolves 4.91 g AgNO_2 at 25° (Ley and Schaefer, B 1906, 39 1263)

1 l sat $\text{KNO}_3 + \text{Aq}$ dissolves 26% AgNO_2 at 13.5° (Oswald, A ch 1914, (9) 1 3)

Solubility in salts + Aq at 25°

Salt	Conc of the salt mols per l	% AgNO_2
		0 4135
AgNO_3	0 00258 0 00588 0 01177 0 02355 0 04710	0 3991 0 3735 0 3432 0 294 0 2495
KNO_2	0 00258 0 00588 0 01177 0 02355 0 04710	0 3974 0 3820 0 3560 0 3110 0 2761

(Creighton and Ward, J Am Chem Soc 1915, 37 2336)

See also under KNO_2

$\text{AgNO}_2 + \text{NaNO}_2$

1 l 0.02 N- $\text{NaNO}_2 + \text{Aq}$ dissolves 3.15 g AgNO_2 at 25° 0.2-N NaNO_2 , 3.016 g AgNO_2 (Ley and Schaefer, B 1906, 39 1263)

100 g H_2O sat with AgNO_2 and $\text{Sr}(\text{NO}_2)_2$ contain 10.9 g AgNO_2 and 78.3 g $\text{Sr}(\text{NO}_2)_2$ at 14° (Oswald)

Very sol in liq^d NH_3 (Frankhn, Am Ch J 1893, 20 829)

Insol in alcohol

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

100 pts acetonitrile dissolve 23 pts at ord temp, 40 pts at 81° (Scholl and Steinkopf, B 1906, 39 4393)

Sl sol in methyl acetate (Bezold, Dissert 1906)

Insol in ethyl acetate (Hamers, Dissert 1906, Naumann, B 1910, 43 314)

Silver sodium nitrite, AgNO_2 , NaNO_2

Completely sol in a little H_2O , but decomp by more H_2O (Fischer)

$+\frac{1}{2}\text{H}_2\text{O}$ (Oswald, A ch 1914, (9) 1 75)

Silver nitrite ammonia, AgNO_2 , NH_3

Sl sol in H_2O , less sol in alcohol, nearly insol in ether (Reychler, B 16 2425)

AgNO_2 , 2NH_3 (Reychler)

AgNO_2 , 3NH_3 Deliquescent Sol in H_2O (Reychler)

Sodium nitrite, NaNO_2

Not deliquescent Very sol in H_2O

More sol in H_2O than NaNO_3 , but less in alcohol

6 pts H_2O dissolve 5 pts NaNO_2 at 15° (Divers, Chem Soc 1899, 75 86)

100 g H_2O dissolve 83.25 g NaNO_2 at 15° (Niementowski and Roszkowski, J phys Ch 1897, 22 146)

100 pts H_2O dissolve at

0° 10° 20° 30° 40°
73 78 94 91.5 98.5 pts NaNO_2 ,

50° 60° 70° 80°
107 116 125.5 136 pts NaNO_2 ,

90° 100° 110° 120°
147 160.5 178 198.5 pts NaNO_2

B-pt of sat $\text{NaNO}_2 + \text{Aq} = 128^\circ$ at 761.5 mm pressure Sat solution at 20° has a sp gr = 1.3585 (Oswald, A ch 1914, (9) 1 59)

Solubility in $\text{NaNO}_3 + \text{Aq}$ at t°

t°	100 pts H_2O dissolve	
	NaNO_2	NaNO_3
0	73	0
	68.5	19
	67.1	36.3
	64.9	41.7*
	50.3	46.8
	30.2	55.4
	0	74.2

Solubility in $\text{NaNO}_3 + \text{Aq}$ at t° — *Continued*

t°	100 pts H_2O dissolve	
	NaNO_2	NaNO_3
21	84.75	0
	81.1	9.6
	79.7	23.5
	73.8	50.8
	73.1	54.5*
	64.2	56.7
	46.8	62.8
	21.6	74.7
	0	89.3
52	108.8	0
	107.9	6.7
	104.3	20.6
	101.8	34.5
	99.5	43.2
	98.0	62.6*
	97.8	82.0
	65.2	88.0
	44.2	92.9
	27.2	101.4
	14.7	109
	0	118
65	120.7	0
	111.5	34.8
	108.5	62.8
	107.8	90.6*
	78.3	96
	49.5	104.1
	28.4	113.4
	14.7	121.4
	0	131
81	137.1	0
	125.7	38.8
	122.7	69.8
	122.6	101.0*
	79.1	111.5
	50.0	121.0
	27.2	131.7
	0	150
92	149.7	0
	141.2	23.6
	134.6	57.6
	132.3	107.8*
	60.2	130.6
	30.3	145.0
	0	163.5
103	166	0
	153.3	33.2
	148.8	58.8
	142.4	116.0*
	100.0	126.8
	60.1	142.9
	0	181.2

* Both salts in solid phase

(Oswald, A ch 1914, (9) 1 71)

Solubility in H_2O is decreased by presence of Na_2SO_4 . 100 pts H_2O dissolve 11.8 pts $Na_2SO_4 + 53.9$ pts $NaNO_2$ (Oswald)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Neither dissolved nor attacked by liquid NO_2 (Frankland, Chem Soc 1901, 79 1361)

Sol in warm 90% alcohol (Hampe, A 125 336)

100 pts absolute methyl alcohol dissolve 4.43 pts at 19.5° , 100 pts absolute ethyl alcohol dissolve 0.31 pt at 19.5° (de Bruyn, Z phys Ch 10 783)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Strontium nitrite, $Sr(NO_2)_2$

Very sol in H_2O , and very sl sol in boiling alcohol (Lang, Pogg 118 287)

Easily sol in 90% alcohol (Hampe, A 125 340)

+ H_2O Hygroscopic. 100 ccm of the sat solution contain 62.83 g $Sr(NO_2)_2 + H_2O$ at 19.5° (Vogel, Z anorg 1903, 35 393)

100 pts H_2O dissolve at

0°	10°	20°	30°
58.9	67.6	75.5	84

pts $Sr(NO_2)_2 + H_2O$,

40°	50°	60°	70°
94	105	116	130

pts $Sr(NO_2)_2 + H_2O$,

80°	90°	100°
145	162	182

pts $Sr(NO_2)_2 + H_2O$

Bpt of sat solution is 112.5° at 763 mm pressure. The sat solution at 19° contains 39.3% $Sr(NO_2)_2$ and has sp gr at $19^\circ/0^\circ = 1.4461$ (Oswald, A ch 1914, (9) 1 64)

Solubility in alcohol. 100 ccm of the solution in 90% alcohol contain 0.42 g $Sr(NO_2)_2 + H_2O$ at 20° . 100 ccm of the solution in absolute alcohol contain 0.04 g $Sr(NO_2)_2 + H_2O$ at 20° (Vogel, Z anorg 1903, 35 393)

Thallous nitrite, $TlNO_2$

Sol in H_2O . Ppt from solution in H_2O by absolute alcohol (Vogel, Z anorg 1903, 35 404)

Very sol in H_2O , insol in alcohol (Ball, Chem Soc 1913, 103 2131)

Zinc nitrite, basic, $2ZnO, N_2O_3$

(Hampe, A 125 334)

Zinc nitrite, $Zn(NO_2)_2 + 3H_2O$

Deliquescent. Sol in H_2O and alcohol (Lang, J B 1862 99)

Nitrous oxide, N_2O

See Nitrogen monoxide

Nitroxyl bromide, NO_2Br

Decomp spontaneously or with F_2 (Hasenbach, J pr (2) 4 1)

Does not exist (Frolich, A 224 270)

Nitroxyl chloride, NO_2Cl

Decomp by H_2O without evolution of as
Probably does not exist (Geuther, A 5 98)

Nitroxyl fluoride, NO_2F

Absorbed by H_2O with formation of H_2O_2 and HF . Decomp by H_2O , alcohol, and ether (Moissan and Lebeau, C R 1 15, 140 1624)

Nitroxypyrosulphuric acid,

$(HO)_2S_2O_5(NO_2)_2, H_2O$

Very deliquescent. Sol in H_2O with lecomp (Weber, Pogg 142 602)

Nitryl chloride, NO_2Cl

See Nitroxyl chloride

Octamine cobaltic compounds

The formulæ of the following octamine cobaltic compounds should be reduced nearly half, and they should be classed with the tetramine cobaltic compounds (Jorge en Z anorg 2 279)

Octamine cobaltic carbonate,

$Co_2(NH_3)_8(CO_3)_8 + 3H_2O$

Easily sol in H_2O (Vortmann and las berg, B 22 2654)

See Carbonatotetramine carbonate

$Co_2(NH_3)_8O_8(CO_3)_4 + 3H_2O$. Rather difficultly sol in H_2O

— — — chloride (?), $Co(NH_3)_8(OH)_2$ 14 + $2H_2O$

Ppt

$Co_2(NH_3)_8(OH)_2Cl_4$, $2HgCl_2$
 $Co_2(NH_3)_8(OH)_2Cl_4$, $PtCl_4 + H_2O$ (Vortmann and Blasberg, B 22 2654)

— — — mercuric chloride, $Co_2(NH_3)_8Cl_4$
 $3HgCl_2 + H_2O$

$Co_2(NH_3)_8Cl_6$, $HgCl_2$. Difficultly sol in cold H_2O , decomp on warming (Vortmann)

— — — chlorosulphite, $Co_2(NH_3)_8(SO_3)_2Cl_4 + 4H_2O$

Sol in H_2O (Vortmann and Magdeburg B 22 2635)

— — — chromate,

$Co_2(NH_3)_8(CrO_4)_8(H_2O)_2 + 2H_2O$

Sol in H_2O or acetic acid
+ $8H_2O$. Sol in warm H_2O or acetic acid
 $Co_2(NH_3)_8(CrO_4)_8(Cr_2O_7)(H_2O)_2 + H_2O$ is easily sol in H_2O , from which it is precipitated by dil $HNO_3 + Aq$ (Vortmann, B 15 95)

Octamine cobaltic nitrate, $\text{Co}_2(\text{NH}_3)_8(\text{NO}_3)_8 + 2\text{H}_2\text{O}$

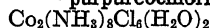
Sol in H_2O , precipitated by conc HNO_3 + Aq (Vortmann)

— — — **nitratocarbonate**,
 $\text{Co}_2(\text{NH}_3)_8(\text{NO}_3)_2(\text{CO}_3)_2 + \text{H}_2\text{O}$

Less sol than other octamine carbonates (Vortmann and Blasberg, B 22 2650)

See Carbonatotetramine cobaltic nitrate

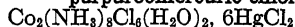
— — — **purpureochloride**,



Easily sol in H_2O , partly precipitated from aqueous solution by conc HCl + Aq (Vortmann, B 10 1451)

= Chlorotetramine cobaltic chloride, $\text{ClCo}(\text{NH}_3)_4(\text{OH}_2)\text{Cl}_2$, wick see (Jorgensen, J pr (2) 42 211)

— — — **purpureomercuric chloride**,



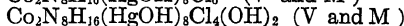
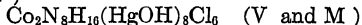
Sl sol in cold, easily in hot H_2O (Vortmann)

= Chlorotetramine cobaltic mercuric chloride (Jorgensen, J pr (2) 42 211)

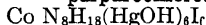
— — — **purpureomercuric hydroxychloride**,



Ppt (Vortmann and Morgulis, B 22 2647)



— — — **purpureomercuriodide, basic**,



(Vortmann and Borsbach, B 23 2805)

— — — **purpureochloroplatinate**

Very sl sol in H_2O (Vortmann)

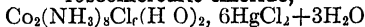
= Chlorotetramine cobaltic chloroplatinate, $\text{ClCo}(\text{NH}_3)_4(\text{OH}_2)\text{PtCl}_6 + 2\text{H}_2\text{O}$ (Jorgensen, J pr (2) 42 215)

— — — **roseochloride**, $\text{Co}_2(\text{NH}_3)_8\text{Cl}_6(\text{H}_2\text{O})_2 + 2\text{H}_2\text{O}$, or $4\text{H}_2\text{O}$

Sol in H_2O (Vortmann, B 15 1891)

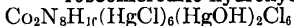
See Roseotetramine cobaltic chloride

— — — **roseomercuric chloride**,

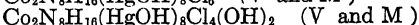
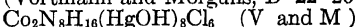


Ppt (Vortmann)

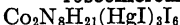
— — — **roseomercuric hydroxychloride**,



(Vortmann and Morgulis, B 22 2647)



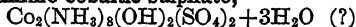
— — — **roseomercuric iodide**,



Ppt Sol in HCl or HNO_3 (Vortmann and Borsbach, B 23 2806)

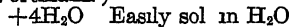
$\text{Co}_2\text{N}_8\text{H}_{20}(\text{HgI})_4\text{I}_6$ Ppt (V and B)
 $\text{Co}_2\text{N}_8\text{H}_{20}(\text{HgI})_4\text{I}_4(\text{OH})_2$ Ppt (V and B)

Octamine cobaltic sulphate,



Insol in H_2O or dil H_2SO_4 + Aq Sol in moderately conc HCl + Aq (Vortmann and Blasberg, B 22 2653)

$\text{Co}_2(\text{NH}_3)_8(\text{SO}_4)_3 + 6\text{H}_2\text{O}$ Sol in H_2O (Vortmann)



See Roseotetramine cobaltic sulphate

— — — **sulphatocarbonate**,

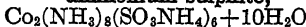


Sol in H_2O (Vortmann, B 10 1458)

See Carbonatotetramine cobaltic sulphate

$\text{Co}_2(\text{NH}_3)_8(\text{SO}_4)_2\text{CO}_3 + 4\text{H}_2\text{O}$ Sol in H_2O . (Vortmann and Blasberg, B 22 2650)

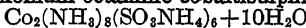
— — — **ammonium sulphite**,



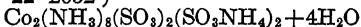
See Octamine cobaltisulphite, ammonium

Octamine cobaltisulphurous acid

Ammonium octamine cobaltisulphite,



Sol in H_2O (Vortmann and Magdeburg, B 22 2632)



Ammonium barium — — —

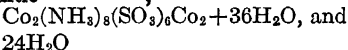


Ppt (V and M)

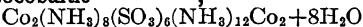
Barium — — —, $\text{Co}_2(\text{NH}_3)_8(\text{SO}_3)_6\text{Ba}_2 + 7\text{H}_2\text{O}$

Ppt (V and M)

Cobaltic — — —,

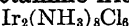


Luteocobaltic — — —,



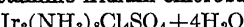
Ppt (V and M)

Octamine iridium chloride,



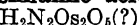
Very sol in H_2O (Palmaer, B 22 16)

Octamine iridium chlorosulphate,



(Palmaer)

Osmiamic acid, $\text{H}_2\text{N}_2\text{Os}_2\text{O}_6$, or



Known only in aqueous solution, which is unstable

Ammonium osmiumate

Easily sol in H_2O or alcohol (Fritzsche and Struve, J pr 41 97)

Barium osmiumate, $Ba_2N_2Os_2O_5$

Moderately sol in H_2O

Lead osmiumate

Ppt Sol in acids without decomp

Lead osmiumate chloride

Ppt

Mercurous osmiumate

Ppt

Mercuric osmiumate

Ppt

Potassium osmiumate, $K_2N_2Os_2O_5$, or $K_2N_2Os_2O_6$

Sl sol in cold, much more easily in hot H_2O Sl sol in alcohol Insol in ether

Silver osmiumate, $Ag_2N_2Os_2O_5$

Extremely sl sol in H_2O or cold HNO_3 + Aq Sol in NH_4OH + Aq

Sodium osmiumate

Easily sol in H_2O or alcohol

Zinc osmiumate, $ZnN_2Os_2O_5$

Decomp by H_2O Nearly insol in NH_4OH + Aq

Osmic acid, H_2OsO_4

Stable in H_2O containing alcohol Sol in HNO_3 or HCl + Aq Not attacked by H_2SO_4 + Aq (Moraht and Wischin, Z anorg 3 153)

100 g H_2O dissolve 5.88 g H_2OsO_4 at 15° (Squire and Cains, Pharm J 1905, 74 720) Attacked by liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Barium osmate, $BaOsO_4 + H_2O$

Insol in H_2O (Claus, Pogg 65 205)

Calcium osmate, $CaOsO_4$

Insol in H_2O (Fremy, J pr 33 411)

Lead osmate

Insol in H_2O (Fremy)

Potassium osmate, $K_2OsO_4 + 2H_2O$

Sl sol in cold, much more sol in hot H_2O , but is decomp thereby Sl sol in KNO_3 + Aq Insol in dil or conc alcohol and ether (Fremy, A ch (3) 12 516)

Insol in conc saline solutions (Gibbs, Am J Sci (2) 31 70)

Sodium osmate, Na_2OsO_4

Sol in H_2O , insol in alcohol and eth (Fremy, l c)

Perosmic acid

See Perosmic acid

Osminitrous acid**Ammonium osminitrite, $(NH_4)_2Os(NO_2)_5 + 2H_2O$**

Sol in H_2O Decomp when solution is warmed (Wintrebert, C R 1905, 140 56)

Barium osminitrite, $BaOs(NO_2)_5$

+ H_2O , + $4H_2O$ (Wintrebert)

Calcium osminitrite, $CaOs(NO_2)_5 + 4H_2O$

(Wintrebert)

Magnesium osminitrite, $MgOs(NO_2)_5 + 4H_2O$

(Wintrebert)

Potassium osminitrite, $K_2Os(NO_2)_5$

Verv hygroscopic Very sol in H_2O Decomp by HCl , HBr and HI (Wintrebert, A ch 1903, (7) 28 135)

Silver osminitrite, $Ag_2Os(NO_2)_5 + 2H_2O$

Sl sol in H_2O with partial decomp (Wintrebert, C R 1905, 140 586)

Sodium osminitrite, $Na_2Os(NO_2)_5 + 2H_2O$

Sol in H_2O (Wintrebert)

Strontium osminitrite, $SrOs(NO_2)_5 + 2H_2O$

(Wintrebert)

Zinc osminitrite, $ZnOs(NO_2)_5 + \frac{1}{2}H_2O$

(Wintrebert)

Osmyloxynitrous acid**Ammonium osmyloxynitrite,**

$(NH_4)_2OsO_3(NO_2)_2$

Decomp by boiling conc HCl and by K_2CO_3 + Aq (Wintrebert, A ch 1903, (7) 28 10)

Barium osmyloxynitrite, $BaOsO_3(NO_2)_2 + 4H_2O$

(Wintrebert)

Potassium osmyloxynitrite, $K_2OsO_3(NO_2)_2 + 3H_2O$

Sl sol in cold H_2O Aqueous solution decomp slowly Sol with decomp in dil K_2CO_3 + Aq (Wintrebert)

Silver osmyloxynitrite, $Ag_2OsO_3(NO_2)_2 + H_2O$

(Wintrebert)

Strontium osmyloxynitrite, $\text{SrOsO}_5(\text{NO}_2)_2 + 3\text{H}_2\text{O}$ (Wintrebert)

Osmynitrous acid

Potassium osmylnitrite, $\text{K}_2\text{OsO}_5(\text{NO}_2)_4$

Decomp by H_2O and by excess of $\text{KOH} + \text{Aq}$ (Weinland, A ch 1903, (7) 28 54)

Osmisulphurous acid

Potassium osmisulphite, $[\text{Os}(\text{H}_2\text{O})(\text{SO}_3)_3]\text{K}_6 + 4\text{H}_2\text{O}$

Ppt (Rosenheim, Z anorg 1899, 21 144)

Potassium hydrogen osmisulphite, $[\text{Os}_2(\text{H}_2\text{O})(\text{SO}_3)_{11}]\text{K}_{11}\text{H}_3 + 5\text{H}_2\text{O}$

Sol in H_2O without decomp (Rosenheim)
 $[\text{Os}(\text{SO}_3)_6]\text{K}_6\text{H}_2 + 2\text{H}_2\text{O}$ Sol in H_2O without decomp (Rosenheim)

Sodium osmisulphite, $[\text{Os}(\text{SO}_3)_6]\text{Na}_6 + 8\text{H}_2\text{O}$

Only sl sol in H_2O

$[\text{Os}(\text{H}_2\text{O})(\text{SO}_3)_3]\text{Na}_6 + 4\text{H}_2\text{O}$ Ppt
 $[\text{OsO}(\text{SO}_3)_4]\text{Na}_6 + 3\text{H}_2\text{O}$ Ppt (Rosenheim)

Osmium, Os

When finely divided and not ignited to a very high temperature, Os is sol in $\text{HNO}_3 + \text{Aq}$ or aqua regia. When ignited it is not attacked by any acid.

Insol in liquid NH_3 (Gore, Am ch J 1898, 20 828)

Osmium ammonium comps

See—

Oxyosmiumamine comps, $\text{OsO}(\text{NH}_3)_2\text{X}$

Oxyosmiumdiamine comps, $\text{OsO}_2(\text{NH}_3)_4\text{X}_2$

Osmium bromide with MBR

See Bromosmate, M

Osmium dichloride, OsCl_2

Deliquescent. Sol in little, but decomp by more H_2O , with pptn of Os. Sol in conc alkali chlorides + Aq with combination and partial decomp (Berzelius)

Sol in alcohol and ether
 Insol in H_2O Insol in HCl and H_2SO_4
 Sl sol in HNO_3 and aqua regia. Slowly sol in strong alkali. Insol in liquid Cl_2 . Insol in alcohol and formaldehyde (Ruff, Z anorg 1910, 65 455)

Osmium trichloride, OsCl_3

Hydroscoptic. Sol in conc H_2SO_4 , HCl and conc HNO_3 . Sol in alkali and in NH_4OH . Insol in liquid Cl_2 . Easily sol in alcohol. Sl sol in ether (Ruff, Z anorg 1910, 65 453)

$+3\text{H}_2\text{O}$ Sol in H_2O (Moraht and Wischin, Z anorg 3 153)

Osmium tetrachloride, OsCl_4

Sol in a little H_2O , but decomp by further addition of that solvent. Sol in conc $\text{HCl} + \text{Aq}$

Osmium trichloride with MCl

See Chlorosmate, M

Osmium tetrachloride with MCl

See Chlorosmate, M

Osmium sodium chloride, $\text{Na}_2\text{OsCl}_6 + 2\text{H}_2\text{O}$

Very sol in H_2O and in alcohol (Rosenheim, Z anorg 1899, 21 133)

Osmium tetrafluoride, OsF_4

Sol in H_2O (Ruff, B 1913, 46 948)

Osmium hexafluoride, OsF_6

Decomp by H_2O and conc H_2SO_4 . Sol in $\text{NaOH} + \text{Aq}$ (Ruff, B 1913, 46 945)

Osmium octofluoride, OsF_8

Sol in H_2O , but is somewhat hydrolyzed. Sol in conc H_2SO_4 with decomp. Sol in $\text{NaOH} + \text{Aq}$ (Ruff, B 1913, 46 944)

Osmium monohydroxide, $\text{OsO}, x\text{H}_2\text{O}$

Insol in H_2O . Sl sol in $\text{KOH} + \text{Aq}$. Slowly but completely sol in acids (Berzelius)

Osmium dihydroxide, $\text{OsO}_2, \text{H}_2\text{O}$

Sol in $\text{HCl} + \text{Aq}$ while still moist. Insol in H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ + $2\text{H}_2\text{O}$. Sol in HCl , HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ while still moist (Claus and Jacoby)

Osmium sesquihydroxide, $\text{Os}_2\text{O}_5\text{H}_6$

Sol in acids, and partly sol in $\text{KOH} + \text{Aq}$ (Claus and Jacoby)

Osmium iodide, OsI_4

Extremely deliquescent. Sol in H_2O of alcohol, but solution is unstable (Moraht and Wischin, Z anorg 3 153)

Osmium potassium nitrosochloride,

$\text{K}_2\text{Os}(\text{NO})\text{Cl}_5$

Stable in aqueous solution. Only sl attacked by hot HNO_3 (Wintrebert, A ch 1903, (7) 28 132)

Osmium monoxide, OsO

Insol in H_2O or acids (Claus and Jacoby)

Osmium dioxide, OsO_2

Insol in H_2O or acids

Osmium sesquioxide, Os_2O_5

Insol in acids (Claus and Jacoby)

Osmium trioxide, "Osmic acid," OsO_3

See **Osmic acid**

Osmium tetroxide, "Perosmic acid," OsO_4

Slowly but abundantly sol in H_2O Sol in alcohol and ether with gradual decomposition
Sol in $\text{NH}_4\text{OH} + \text{Aq}$, the solution undergoing decomposition on heating

Osmium oxide ammonia, $\text{OsO}_3 \cdot 2\text{NH}_3 + \text{H}_2\text{O}$

See **Oxyosmiumamine hydroxide**

Osmium oxysulphide, $\text{Os}_3\text{S}_7\text{O}_5 + 2\text{H}_2\text{O}$

Unstable

$\text{OsSO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (v Meyer, J pr (2) 16 77)

$\text{Os}_2\text{O}_3\text{S}_2 + \text{H}_2\text{O}$ Decomp and dissolved by HNO_3 , HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Moraht and Wischin, Z anorg 3 153)

Osmium sulphide, Os_2S_3 (?)

(Berzelius)

Min *Laurite* Insol in all acids, even in aqua regia

Osmium disulphide, OsS_2

Sl sol in H_2O , not more sol in alkali hydrates or carbonates + Aq Insol in alkalies after drying (Fremy, A ch (3) 12 521)

Osmium tetrasulphide, $\text{OsS}_4 + x\text{H}_2\text{O}$

Insol in alkali sulphides, carbonates, or hydroxides + Aq Sol in cold dil $\text{HNO}_3 + \text{Aq}$ (Claus)

Osmocyanhydric acid, $\text{H}_4\text{Os}(\text{CN})_6$

Easily sol in H_2O and alcohol Insol in ether (Martius, A 117 361)

Barium osmocyanide, $\text{Ba}_2\text{Os}(\text{CN})_6 + 6\text{H}_2\text{O}$

Easily sol in H_2O and dil alcohol (M)

Barium potassium osmocyanide,

$\text{BaK}_2\text{Os}(\text{CN})_6 + 3\text{H}_2\text{O}$

Efflorescent Sl sol in cold, easily in hot H_2O

Ferric osmocyanide, $\text{Fe}_4[\text{Os}(\text{CN})_6]_3 + x\text{H}_2\text{O}$

Insol in H_2O

Potassium osmocyanide, $\text{K}_4\text{Os}(\text{CN})_6 + 3\text{H}_2\text{O}$

Moderately sol in boiling, less in cold H_2O
Insol in alcohol and ether

Osmosyl ammonium comps

See **Oxyosmium amine comps**

Osmyl potassium bromide, $\text{K}_2\text{OsO}_2\text{Br}_4 + 2\text{H}_2\text{O}$

Same properties as the chloride (Wintrebert, A ch 1903, (7) 28 94)

Osmyl potassium chloride, $\text{K}_2\text{OsO}_2\text{Cl}_4$

Very sol in H_2O Solution is stable only in the presence of a small amt of HCl comp by hot conc HCl

$+ 2\text{H}_2\text{O}$ As the anhydrous salt (Winbert, A ch 1903, (7) 28 86)

Osmyl ditetramine comps

See **Oxyosmium diamine comps**

Oxamidodisulphonic acid

See **Hydroxylamine monosulphonic acid**

Oximidosulphonic acid

See **Hydroxylamine disulphonic acid**

Oxyamidodisulphonic acid

See **Hydroxylamine sulphonic acid**

Oxyammonium salts

See **Hydroxylamine salts**

Oxycobaltamines, acid comps

(Maquenne, C R 96 344)

Are anhydrooxycobaltamine comps, with see (Vortmann, M ch 6 404)

Oxycobaltamine chloride,

$\text{Co}_2(\text{NH}_3)_{10}\text{O} \begin{smallmatrix} \text{OH} \\ \text{(OH)} \end{smallmatrix} \text{Cl}_4$

(Vortmann, M ch 6 404)

$\text{Co}_2(\text{NH}_3)_{10}\text{O}_2\text{Cl}_4$, $\text{HCl} + 3\text{H}_2\text{O}$ Is anhydrooxycobaltamine chloride, which see

— **chloronitrate hydrochloride,**

$\text{Co}_2(\text{NH}_3)_{10}(\text{OH})(\text{O OH})(\text{NO}_2)_2\text{Cl}_2$, $4\text{HCl} + 3\text{H}_2\text{O}$

Is anhydrooxycobaltamine chloronitrate, which see

— **chlorosulphate,**

$\text{Co}_2(\text{NH}_3)_{10} \begin{pmatrix} \text{OH} \\ \text{O(OH)} \end{pmatrix} (\text{SO}_4)\text{Cl}_2$, 4HCl

Easily decomp

— **iodide,** $\text{Co}_2(\text{NH}_3)_{10} \begin{pmatrix} \text{OH} \\ \text{O(OH)} \end{pmatrix} \text{I}_4$

Sl sol in H_2O Decomp by much H_2O (Vortmann)

— **nitrate,** $\text{Co}_2(\text{NH}_3)_{10}(\text{OH})(\text{O OH})(\text{NO}_3)_4$, $+ \text{H}_2\text{O}$

Decomp by H_2O

$\text{Co}_2(\text{NH}_3)_{10}(\text{OH})(\text{O OH})(\text{NO}_3)_4$, HNO_3
 $2\text{H}_2\text{O}$ Decomp by H_2O

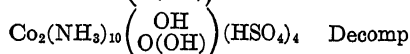
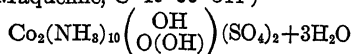
— **nitratodisulphate,**

$\text{Co}_2(\text{NH}_3)_{10}(\text{OH})(\text{O OH})(\text{SO}_4)(\text{NO}_3)_2$, 4HNO_3

Decomp at once by H_2O

Oxycobaltamine sulphate,

Verv sl sol in H_2O with decomp, more easily sol in acidified H_2O Sol in acids (Maquenne, C R 96 344)



violently by H_2O

Oxygen, O_2

100 vols H_2O absorb 4.6 vols O gas at ord temp (Otto Graham)

Sol in 27 pts H_2O at ord temp (Pelouze and Fremy)

100 vols H_2O dissolve 0.925 vol O (Gay Lussac)

1 vol H_2O at t° and 760 mm absorbs V vols O gas, reduced to 0° and 760 mm

t°	V	t°	V	t°	V
0	0 04114	7	0 03465	14	0 03034
1	0 04007	8	0 03389	15	0 02989
2	0 03907	9	0 03317	16	0 02949
3	0 03810	10	0 03250	17	0 02914
4	0 03717	11	0 03189	18	0 02884
5	0 03628	12	0 03133	19	0 02858
6	0 03544	13	0 03082	20	0 02838

(Bunsen's Gasometry)

Coefficient of absorption of O by H_2O = 0.04115 - 0.0010899t + 0.000022563t² (Bunsen and Paul, A 93 21)

Coefficient of absorption of O in H_2O at 64° = 0.041408, at 126° = 0.036011 (Timofejew, Z pays Ch 6 148)

Absorption of O by H_2O β_1 = "solubility," i.e., the amount of gas (reduced to 0° and 760 mm) which is absorbed by 1 vol of the liquid when the barometer indicates 760 mm pressure, β = coefficient of absorption, i.e., amount absorbed by the liquid when the pressure of the gas itself without the tension of the liquid amounts to 760 mm, $\beta_1 = \beta \frac{760-f}{760}$, when f = vapour tension of solvent at t°

t°	β	β_1
0	0 04890	0 04860
1	4759	4728
2	4633	4601
3	4512	4479
4	4397	4362
5	4286	4250
6	4181	4142
7	4080	4040
8	3983	3941
9	3891	3847
10	3802	3756
11	3718	3670
12	3637	3587
13	3560	3507

Absorption of O by H_2O — Continued

t°	β	β_1
14	0 3486	0 3431
15	3415	3358
16	3347	3288
17	3283	3220
18	3220	3155
19	3161	3093
20	3102	3031
21	3044	2970
22	2988	2911
23	2934	2853
24	2881	2797
25	2831	2743
26	2783	2691
27	2736	2641
28	2691	2592
29	2649	2545
30	2608	2500
31	2572	2459
32	2537	2419
33	2503	2380
34	2471	2342
35	2440	2306
36	2410	2270
37	2382	2236
38	2355	2203
39	2330	2171
40	2306	2140
41	2280	2107
42	2256	2075
43	2232	2043
44	2209	2012
45	2187	1981
46	2166	1952
47	2145	1922
48	2126	1894
49	2108	1865
50	2090	1837
52	2057	1782
54	2026	1728
56	1998	1674
58	1971	1619
60	1946	1565
62	1921	1508
64	1897	1450
66	1874	1392
68	1853	1332
70	1833	1270
72	1815	1208
74	1799	1144
76	1785	1078
78	1772	1010
80	1761	0939
82	1752	0865
84	1743	0788
86	1736	0707
88	1729	0622
90	1723	0532
92	1717	0437
94	1712	0337
96	1708	0231
98	1704	0119
100	7001	0000

(Winkler B 24 3609)

Absorption of O by H₂O at t° and 760 mm β = coefficient of absorption

t°	β	t°	β	t°	β
0	0 04961	23	0 03006	46	0 02163
1	4838	24	2956	47	2139
2	4720	25	2904	48	2115
3	4606	26	2855	49	2092
4	4496	27	2808	50	2070
5	4389	28	2762	51	2049
6	4286	29	2718	52	2029
7	4186	30	2676	53	2009
8	4089	31	2635	54	1990
9	3994	32	2596	55	1972
10	3903	33	2558	56	1955
11	3816	34	2521	57	1938
12	3732	35	2486	58	1922
13	3651	36	2452	59	1907
14	3573	37	2419	60	1893
15	3497	38	2387	65	1832
16	3425	39	2356	70	1787
17	3357	40	2326	75	1752
18	3292	41	2297	80	1726
19	3230	42	2269	85	1707
20	3171	43	2241	90	1693
21	3114	44	2214	95	1684
22	3059	45	2188	100	1679

(Bohr and Bock, W Ann (2) 44 318)

Coefficient of absorption of O by H₂O between 0° and 30° = 0 04890—0 0013413t + 0 0000283t²—0 00000029534t³ (Winkler, l c)Solubility in H₂O at 25° = 0 03080, at 15° = 0 03630 (Geffcken, Z phys Ch 1904, 49 269)Absorption of O₂ by distilled H₂O at t°a = ccm of O₂ absorbed by 1 l of H₂O at t° and 760 mm

t°	a	t°	a	t°	a
0	49 24	17	33 21	34	25 19
1	47 94	18	32 58	35	24 85
2	46 65	19	32 01	36	24 52
3	45 45	20	31 44	37	24 20
4	44 31	21	30 91	38	23 89
5	43 21	22	30 38	39	23 59
6	42 15	23	29 86	40	23 30
7	41 15	24	29 38	41	23 02
8	40 19	25	28 90	42	22 75
9	39 28	26	28 42	43	22 49
10	38 37	27	27 94	44	22 24
11	37 51	28	27 51	45	22 00
12	36 75	29	27 08	46	21 77
13	35 98	30	26 65	47	21 55
14	35 26	31	26 27	48	21 34
15	34 55	32	25 90	49	21 14
16	33 88	33	25 54	50	20 95

(Fox, Trans Faraday Soc 1909, 5 74)

Solubility in H₂O at various pressures

V = volume of the absorbing liquid

P = Hg-pressure in metres

 λ = coefficient of solubility

V	t°	P	λ
33 320 ccm	23°	0 9595	0 0296
		1 0941	0 0296
		1 2883	0 0296
		1 4976	0 0296
		1 7638	0 0296
		2 0838	0 0296
		2 5011	0 0296
		3 0402	0 0296
		3 8675	0 0288
		4 2504	0 0287
32 003 ccm	25 9°	4 6301	0 0288
		5 1360	0 0288
		5 6973	0 0281
		6 1857	0 0276
		6 7343	0 0274
		7 3051	0 0274
		7 7138	0 0274
		8 1406	0 0270
		0 8611	0 0284
		0 9808	0 0284
		1 0833	0 0284
		1 2039	0 0284
		1 4112	0 0284
		1 6602	0 0284
		2 3854	0 028
		2 6482	0 0284
		2 8995	0 0281
		3 2883	0 0280
		3 9133	0 0276
		4 2720	0 0278
		4 6905	0 0274
		5 0559	0 0276
		5 6141	0 0274
		6 0120	0 027
		6 5687	0 0271
		7 1056	0 0268
		7 4729	0 0264
		8 1889	0 0264

(Cassuto, Phys Zeit 1904, 5 236)

Solubility of O in H₂O at 25° = 0 029 (Findlay and Creighton, Bioch J 1911, 294)Coefficient of absorption for H₂O = 0 0336 at 15°, 0 03375 at 15 3°, 0 03330 at 16 2 (Müller, Z phys Ch 1912, 81 494)

Solubility in H_2O at t°

l_{760} = solubility of atmospheric O_2 in H_2O at 760 mm and t°

t°	l_{760}	t°	l_{760}
0	10 26	13	7 51
1	9 99	14	7 36
2	9 73	15	7 21
3	9 48	16	7 07
4	9 25	17	6 93
5	9 02	18	6 80
6	8 80	19	6 67
7	8 59	20	6 55
8	8 39	21	6 43
9	8 20	22	6 32
10	8 02	23	6 21
11	7 84	24	6 10
12	7 67	25	6 00

(Carlson, Zeit angew Ch 1913, 26 714)

Solubility of atmospheric O_2 in mixtures of distilled H_2O with sea water diminishes regularly with the proportion of sea water present (Clowes, J Soc Chem Ind 1904, 23 359)

No of ccm of O_2 absorbed by 1 l of sea water from a free dry atmosphere of 760 mm pressure

Cl per 1000	$t=0^\circ$	4°	8°	12°	16°	20°	24°	28°
0	10 29	9 26	8 40	7 68	7 08	6 57	6 14	5 75
4	9 83	8 85	8 04	7 36	6 80	6 33	5 91	5 53
8	9 36	8 45	7 68	7 04	6 52	6 07	5 67	5 31
12	8 90	8 04	7 33	6 74	6 24	5 82	5 44	5 08
16	8 43	7 64	6 97	6 43	5 96	5 56	5 20	4 86
20	7 97	7 23	6 62	6 11	5 69	5 31	4 95	4 62

(Fox, Trans Faraday Soc 1909, 5 77)

For O absorbed from the air, see also air, atmospheric, p 1

Absorption of O_2 by acids + Aq

M = content in gram-equivalents per litre
S = solubility

 $\text{HNO}_3 + \text{Aq}$

M	S 25°	S 15°
0 492	0 03021	0 03473
0 494	0 03016	0 03490
1 00	0 02954	0 03354
1 008	0 02963	0 03365
1 88	0 02853	0 03175
1 901		0 03166

Absorption of O_2 by acids + Aq — Continued $\text{HCl} + \text{Aq}$

M	S 25°	S 15°
0 578	0 02963	0 03431
0 579	0 02960	0 03410
1 170	0 02817	0 03217
1 176	0 02833	0 03109
1 736	0 02733	0 03069
1 982	0 02674	0 02988

 $\frac{\text{H}_2\text{SO}_4}{2} + \text{Aq}$

M	S 25°	S 15°
0 489	0 02887	0 03366
0 527	0 02875	0 03375
0 977	0 02757	0 03210
1 017	0 02745	0 03217
1 896	0 02545	0 02886
1 829	0 02577	0 02930
2 947	0 02285	0 02584
3 512	0 02198	0 02399
4 951		0 02174
5 293	0 01918	0 02067

(Geffcken, Z phys Ch 1904, 49 269)

Absorption of O by $\text{H}_2\text{SO}_4 + \text{Aq}$ at t°

α = coefficient of absorption

Normality of the acid	t°	α
0	20 9	0 0310
4 9	20 9	0 0195
8 9	20 9	0 0155
10 7	21 2	0 0143
20 3	21 1	0 0119
24 8	21 5	0 0103
29 6	20 8	0 0117
34 3	20 9	0 0201
35 8	21 2	0 0275

(Bohr, Z phys Ch 1910, 71 49)

Absorption of O by $\text{NaOH} + \text{Aq}$

M = content in gram-equivalents per litre
S = solubility

M	S 25°	S 15°
0 559	0 02434	0 02777
0 601	0 02424	0 02784
1 033	0 02020	0 02291
1 059	0 01991	0 02262
2 077	0 01295	0 01479
2 089	0 01272	0 01456

Absorption of O₂ by KOH+Aq

M	S 25°	S 15°
0 577	0 02447	0 02791
0 579	0 02435	0 02791
1 157	0 01920	0 02191
1 170	0 01914	0 02181

(Geffcken, Z phys Ch 1904, **49** 270)

NaCl+Aq with a chlorine content of 1,930 per 100,000 dissolved 82.9% of the amount of O₂ dissolved by distilled H₂O alone (Clowes, J Soc Chem Ind 1904, **23** 359)

Absorption of O₂ by salts+Aq

M=content in gram-equivalents per litre
S=solubility

Absorption of O = by $\frac{K_2SO_4}{2}$ + Aq

M	S 25	S 15°
0 499	0 02528	0 02944
0 508	0 02530	0 02922
0 968		0 02395
0 970	0 02096	0 02377

Absorption of O₂ by NaCl+Aq

M	S 25	S 15
0 530	0 02598	0 03045
0 535	0 02604	0 03052
1 020	0 02226	0 02601
1 034	0 02202	0 02557
1 880		0 01898
1 890	0 01663	0 01904
1 921	0 01654	0 01869

(Geffcken, Z phys Ch 1904, **49** 270)Solubility of O₂ in NaCl+Aq

Data indicate cc O₂ dissolved per l at 760 mm and 0°

t°	NaCl+Aq 1 g mol per l	NaCl+Aq 2 g mol per l	NaCl+Aq sat at 20°
0	6 50	3 14	1 27
5	5 80	2 84	1 22
10	5 25	2 59	1 17
15	4 77	2 41	1 12
20	4 39	2 25	1 07
25	4 06	2 13	1 02
30	3 76	2 01	0 97

(Winkler, Z anorg 1911, **24** 342)Solubility of O₂ in KCN+Aq at 20°

% KCN 1 10 20 30 50
Coeff of abs 0.029 0.018 0.013 0.008 0.003
(McLaurin, J S C I 1893, **63** 737)

1 vol alcohol absorbs 0.28397 vol O at all temperatures between 0° and 24° (Bunsen)

Absorption by alcohol (99.7%) at t°

β = coefficient of absorption,
 β_1 = solubility (See p 635)

t°	β	β_1
0	0 23370	0 22978
1	0 23296	0 22878
2	0 23222	0 22777
3	0 23149	0 22675
4	0 23077	0 22572
5	0 23005	0 22469
6	0 22934	0 22365
7	0 22863	0 22260
8	0 22793	0 22155
9	0 22724	0 22047
10	0 22656	0 21937
11	0 22588	0 21827
12	0 22521	0 21715
13	0 22455	0 21601
14	0 22389	0 21484
15	0 22324	0 21365
16	0 22259	0 21245
17	0 22195	0 21122
18	0 22132	0 20994
19	0 22069	0 20862
20	0 22007	0 20733
21	0 21946	0 20600
22	0 21886	0 20459
23	0 21826	0 20317
24	0 21767	0 20172

(Timofejew, Z phys Ch **6** 151)Solubility of O₂ in alcohol at 20° and 760 mm

Wt % alcohol	Vol % abs O ₂	Wt % alcohol	Vol % abs O ₂
0 0	2 98	33 33	2 67
9 09	2 78	50 0	3 50
16 67	2 63	66 67	4 95
23 08	2 52	80 0	5 66
28 51	2 49		

(Lubarsch, W Ann 1889, (2) **37** 525)Solubility of O₂ in methyl alcohol at t°

t	l	t	l
0	0 31864	25	0 23642
5	0 30506	30	0 21569
10	0 29005	40	0 16990
15	0 27361	50	0 11840
20	0 25574		

(Levi, Gazz ch it 1901, **31** II, 513)

Solubility of O₂ in ether at 0° = 0.4235, a
10° = 0.4215 (Christoff, Z phys Ch 1912
79 459)

Solubility of O₂ in acetone at t°

t°	l	t°	l
0	0 2997	25	0 2127
5	0 2835	30	0 1935
10	0 2667	40	0 1533
15	0 2493	50	0 1057
20	0 2313		

(Levi, Gazz ch it 1901, 31 II, 513)

Absorption of O₂ by chloralhydrate+Aq

t°=temp of the solution

P=% chloralhydrate in the solution

β t°=coefficient of absorption at t°

β 15°=coefficient of absorption at 15°

β 20°=coefficient of absorption at 20°

t°	P	β t°	β 15°
18 3	22 9	0 02759	0 02940
16 9	28 0	0 02690	0 02800
15 4	36 6	0 02590	0 02560
16 6	38 6	0 02402	0 02477
12 8	51 3	0 02439	0 02339
16 2	58 44	0 02350	0 02407
15 9	70 0	0 02659	0 02710
17 2	80 85	0 03200	0 03300
16 9	80 9	0 03140	0 03250

			β 20°
20 0	16 9	0 02795	0 02795
21 0	32 0	0 02443	0 02495
21 0	52 9	0 02375	0 02325
20 4	61 08	0 02390	0 02410
21 8	65 5	0 02500	0 02580
21 0	71 4	0 02680	0 02730
22 2	78 0	0 03090	0 03280

(Muller, / phys Ch 1912, 81 499)

Absorption of O by glycercine+Aq

t°=temp of the solution

P=% glycercine in the solution

β t°=coefficient of absorption at t°

β 15°=coefficient of absorption at 15°

t°	P	β t°	β 15°
12 2	20 5	0 02904	0 02742
12 5	25 0	0 02654	0 02521
14 6	37 3	0 02038	0 02022
13 5	45 0	0 01800	0 01744
12 4	52 0	0 01623	0 01570
12 1	71 5	0 01010	0 00950
13 3	88 5	0 00906	0 00886

(Muller)

Absorption of O₂ by glucose+Aq

t°=temp of the solution

P=% glucose in the solution

β t°=coefficient of absorption at t°

β 20°=coefficient of absorption at 20°

t°	P	β t°	β 20°
21 2	10 84	0 02650	0 02690
21 5	20 7	0 02202	0 02250
19 9	33 8	0 01814	0 01815
20 5	51 9	0 01378	0 01390
21 7	58 84	0 01221	0 01250

(Muller)

Absorption of O₂ by sucrose+Aq

t°=temp of the solution

P=% sucrose in the solution

β t°=coefficient of absorption at t°

β 15°=coefficient of absorption at 15°

t°	P	β t°	β 15°
15 3		0 03375	0 03400
16 2		0 03330	0 03397
16 0	12 1	0 02911	0 02969
15 6	24 38	0 02367	0 02396
16 6	28 44	0 02113	0 02181
15 6	42 96	0 01582	0 01600
16 2	49 25	0 01348	0 01380
17 2	50 0	0 01302	0 01359

(Muller)

Abundantly absorbed by oil of turpentine
Oil of turpentine absorbs its own vol O when exposed two weeks to the air, but does not give it off on boiling (Brandes)

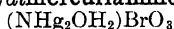
Absorbed by other oils, but this is decomposition rather than absorption, as the oils are oxidized (See Storer's Diet)

100 vols arterial blood dissolve 10-13 vols O (Magnus)

Coefficient of absorption for petroleum = 0 202 at 20°, 0 229 at 10° (Gniewasz and Walfisz, Z phys Ch 1 70)

The author examined the solubility of O and N₂ at low temp in alcohols ethers, acetone, CHCl₃, petroleum, benzene and various organic liquids, at low temp the solubility of the N₂ increases at the same rate as that of the O₂ (Claude, C R 1900, 131 448)

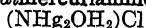
Oxymercuri ammonium bromate,



(Rammelsberg, Pogg 55 82)

— carbonate, (NH₂OH₂)₂CO₃+½H₂O

Insol in H₂O Decomp by HCl+Aq only when conc Not decomp by boiling KOH+Aq Decomp by KI or K₂S+Aq (Hirzel)
+H₂O As above (Hirzel)

Oxydimercuri ammonium chloride,

Is dimercuri ammonium chloride, $\text{NHg}_2\text{Cl} + \text{H}_2\text{O}$, which see

— oxytrimercuriammonium chloride,

Insol in H_2O Easily sol in dil $\text{HCl} + \text{Aq}$ More difficultly sol in very dil H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ Insol in conc H_2SO_4 Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$, or $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$ (Schmieder)

— chromate, $(\text{NHg}_2\text{OH}_2)_2\text{CrO}_4$

Not decomp by $\text{KOH} + \text{Aq}$ (Hirzel, J B 1852 421)

— mercuric chromate, $(\text{NHg}_2\text{OH}_2)_2\text{CrO}_4$, $4\text{HgO}, 3\text{CrO}_3$

Decomp by HNO_3 without going into solution Easily sol in HCl (Hirzel)

Composition is $(\text{NHg}_2\text{OH}_2)_2\text{O}, 2\text{CrO}_3, 3[(\text{NH}_4)_2\text{O}, 2\text{Cr}_2\text{O}_3] = (\text{NHg}_2\text{OH}_2)_2\text{Cr}_2\text{O}_7, 3(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (Hensgen, R t c 5 187)

Probably $(\text{NHg}_2)_2\text{Cr}_2\text{O}_7, 3(\text{NH}_4)_2\text{Cr}_2\text{O}_7 + 2\text{H}_2\text{O}$

— fluoride, acid, $(\text{NHg}_2\text{OH}_2)\text{F}, \text{HF}$

(Finkener, Pogg 110 632)

Probably $\text{NHg}_2\text{F}, \text{HF} + \text{H}_2\text{O}$

— hydroxide, $(\text{NHg OH}_2)\text{OH} = \text{NHg}_2\text{OH} + \text{H O}$

(Millon's base) Sl sol in H_2O , especially if warm Sol in 13,000 pts H_2O at 17° , and 1700 pts at 80° Insol in alcohol or ether (Gerresheim, A 195 373)

+ H_2O Insol in H_2O or alcohol Sol in traces in $\text{NH}_4\text{OH} + \text{Aq}$ Not decomp by cold $\text{KOH} + \text{Aq}$, sl decomp if hot (Millon)

— ammonium iodate, $(\text{NHg}_2\text{OH}_2)\text{IO}_3$, $2\text{NH}_4\text{IO}_3$

Insol in H_2O (Millon, A ch (3) 18 410)

— iodide, $(\text{NHg}_2\text{OH}_2)\text{I}$

Sol in warm $\text{HCl} + \text{Aq}$ Not decomp by boiling $\text{KOH} + \text{Aq}$ Sol in warm $\text{KI} + \text{Aq}$ (Rammelsberg, Pogg 48 170)

Correct formula is $\text{NHg}_2\text{I} + \text{H}_2\text{O}$ (Rammelsberg)

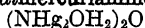
— nitrate, $(\text{NHg}_2\text{OH}_2)\text{NO}_3$

Insol in H_2O , not decomp by boiling $\text{KOH} + \text{Aq}$ Sol in cold $\text{HCl} + \text{Aq}$, from which it is precipitated by H_2O Sl sol without decomp in HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$ Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Souberan)

Is dimercuri ammonium nitrate, NHg_2NO_3 (Pesci, Gazz ch it 20 485)

— ammonium nitrate, $\text{NHg}_2\text{OH}_2\text{NO}_3$, $2\text{NH}_4\text{NO}_3 + \text{H}_2\text{O}$

Decomp by H_2O Kane, A ch 72 242) Is dimercuri ammonium ammonium nitrate, $\text{NHg}_2\text{NO}_3, 2\text{NH}_4\text{NO}_3 + 2\text{H}_2\text{O}$ (Pesci)

Oxydimercuri ammonium oxide,

Insol in H_2O or alcohol, not attacked by boiling conc $\text{KOH} + \text{Aq}$ Sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$, $\text{NH}_4\text{Cl} + \text{Aq}$, $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$, $(\text{NH}_4)_2\text{C}_2\text{O}_4 + \text{Aq}$ (Hirzel, A ch (3) 18 397)

— mercuric phosphate, $\text{Hg}(\text{NHg}_2\text{OH}_2)\text{I}$

Insol in H_2O Slowly sol in hot $\text{HNO}_3 + \text{Aq}$, not decomp by boiling with $\text{KOH} + \text{Aq}$, but by KI or $\text{K}_2\text{S} + \text{Aq}$ Sol in $\text{HCl} + \text{Aq}$ or much hot $(\text{NH}_4)_2\text{HPO}_4 + \text{Aq}$ (Hirzel)

— mercuric sulphite, $(\text{NHg}_2\text{OH}_2)_2\text{SO}_3$, HgSO_3

Insol in H_2O Sol in much $(\text{NH}_4)_2\text{SC} + \text{Aq}$ Sol in $\text{HCl} + \text{Aq}$ with decomposition Insol in boiling $\text{KOH} + \text{Aq}$ (Hirzel)

— sulphate, $(\text{NHg}_2\text{OH}_2)_2\text{SO}_4$

Sol in traces in H_2O Easily sol in $\text{HCl} + \text{HNO}_3 + \text{Aq}$ (Kane)

Insol in $\text{HNO}_3 + \text{Aq}$ (Hirzel)

Slowly sol in boiling conc H_2SO_4 (Hirzel)

Insol in conc, easily sol in dil $\text{H}_2\text{SC} + \text{Aq}$ (Schmieder, J pr 75 147)

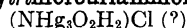
Moderately sol in much $(\text{NH}_4)_2\text{SO}_4$ or boiling $\text{NH}_4\text{Cl} + \text{Aq}$ Not decomp by boiling $\text{KOH} + \text{Aq}$ (Hirzel)

Easily decomp by boiling with dil $\text{KOH} + \text{Aq}$ (Schmieder)

Does not exist (Pesci)

$2\text{NH}_3, 2\text{HgO}, \text{SO}_3$

See Dimercuri ammonium sulphate

Oxytrimercuriammonium chloride,

Insol in H_2O

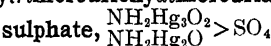
— nitrate, $(\text{NHg}_3\text{O}_2\text{H}_2)\text{NO}_3$

Sol in cold $\text{HCl} + \text{Aq}$, from which it is precipitated by $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ without decomp Not decomp by boiling or warm $\text{KOH} + \text{Aq}$ (Pagano, ch it 485)

Does not exist (Pesci, Gazz ch it 485)

Oxytrimercuriammonium sulphate,

See Trimercuriammonium sulphate

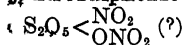
Oxytrimercurioxydimercuri ammonium

Completely sol in $\text{NH}_4\text{Cl} + \text{Aq}$, or $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ Sol in dil or conc $\text{HCl} + \text{Aq}$, and very dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Insol in $\text{HNO}_3 + \text{Aq}$ or conc H_2SO_4 (Schmieder)

Does not exist (Pesci)

Oxytetramercuriammonium mercuric nitrate (?), $2(\text{NH}_4\text{O}_2)\text{NO}_3, \text{HgNO}_3$ (?)

Completely insol in $\text{HNO}_3 + \text{Aq}$ Sol in warm $\text{HCl} + \text{Aq}$ Slowly decomp by boiling $\text{KOH} + \text{Aq}$ Gradually sol in hot conc $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Hirzel)
Does not exist (Pesci, Gazz ch it 20 485)

Oxyantrosulphonic anhydride,

Sol in H_2O with decomp (Weber, Pogg 123, 339)

Oxyosmiumamine hydroxide (Osmosyldiamine hydroxide),

Insol in H_2O Sl sol in acids Sol in $\text{KOH} + \text{Aq}$ When moist, sol in $\text{NH}_4\text{OH} + \text{Aq}$

Oxyosmiumdiamine chloride (Osmyltetramine chloride), $\text{OsO}_2(\text{N}_2\text{H}_6\text{Cl})_2$

Sl sol in cold, more easily in hot H_2O Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Gibbs, Am Ch J 3 233)

— chloroplatinate, $\text{OsO}_2(\text{N}_2\text{H}_6\text{Cl})_2, \text{PtCl}_4$

Sl sol in H_2O (Gibbs)

— hydroxide, $\text{OsO}_2(\text{N}_2\text{H}_6\text{OH})_2$

Known only in solution

— nitrate, $\text{OsO}_2(\text{N}_2\text{H}_6\text{NO}_3)_2$

— sulphate, $\text{OsO}_2(\text{N}_2\text{H}_6)_2\text{SO}_4 + \text{H}_2\text{O}$
(Gibbs, Am Ch J 3 233)

Oxyphosphuretted hydrogen (?), $\text{P}_4\text{H}(\text{OH})$

P_4O of I V C I R I C I, and Goldschmidt has this formula according to Frank (J pr (2) 35 341) Decomp slowly by H_2O or alkalis Forms potassium salt, $\text{P}_4\text{H}(\text{OK})$, sol in H_2O

— hydriodide, $\text{P}_4\text{H}(\text{OH}), \text{HI}$

Decomp at 80°

Sesquioxypylatsulphuric acid, $\text{Pt}_2\text{O}_3, 3\text{SO}_3, 5\text{O}_4\text{H}_2 + 11\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Blondel, A ch 1905, (S) 6 113)

Barium sesquioxypylatsulphate, $\text{Pt}_2\text{O}_3, 3\text{SO}_3, \text{SO}_4\text{Ba} + 8\text{H}_2\text{O}$

Very sol in H_2O (Blondel)

Potassium sesquioxypylatsulphate, $\text{Pt}_2\text{O}_3, 3\text{SO}_3, \text{SO}_4\text{K}_2 + 2\text{H}_2\text{O}$

(Blondel)

Sodium sesquioxypylatsulphate, $\text{Pt}_2\text{O}_3, 3\text{SO}_3, \text{SO}_4\text{Na}_2 + 8\text{H}_2\text{O}$

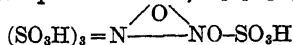
Very sol in H_2O (Blondel)

Oxysulphantimonic acid

See Sulphoxyantimonic acid

Oxysulpharsenic acid

See Sulphoxyarsenic acid

Oxysulphazotic acid, $\text{H}_4\text{S}_4\text{N}_2\text{O}_{14} =$ 

Known only in its salts (Claus, A 158 52, 194)

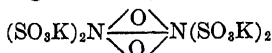
Has formula $(\text{SO}_3\text{H})_2\text{N} \begin{array}{c} \diagup \text{O} \diagdown \\ \text{O} \end{array} \text{N}(\text{SO}_3\text{H})_2$

(Raschig, A 241 161)

Potassium oxysulphazotate, $\text{NO}(\text{SO}_3\text{K})_2$

Insol in alcohol (Fremy, A ch (3) 15 451)

According to Raschig the formula is



Very sol in water, with rapid decomposition (Raschig)

See also Peroxylammesulphonate, potassium

Oxysulphotungstic acid

See Sulphotungstic acid

Oxysulphovanadic acid

See Sulphoxyvanadic acid

Ozone, O_3

Not appreciably sol in H_2O (Schonbein)
Imparts its taste and properties to H_2O (Williamson)

Later, Carius (B 5 520) found that 1000 vols H_2O at 1-2.5° absorb 5.11 vols O_3 (red to 0° and 760 mm) He also still later (A 174 1) found, by conducting the gas for 9-12 hours through H_2O , that 1000 vols H_2O absorb a maximum of 28.160 vols O_3 The ozonized oxygen used contained 3.44 vols O_3 in 100 vols O_2 Since gases are absorbed in proportion to their partial pressure, which is very small for the O_3 , the amount of absorption of water for the gas is very considerable Carius calculated the coefficient of absorption at +1° to be 0.834

Ozone is *not at all* absorbed by H_2O , the H_2O through which ozone had been passed gave no reactions for ozone (Rammelsberg, B 6 603)

Schone (B 6 1224) corroborates Carius, and finds 8.81 vols to 1000 vols H_2O as a maximum amount absorbed

Sol in H_2O (Leeds, B 12 1831)

H₂O takes up $\frac{2}{3}$ of its vol of O₂ at 0° and 760 mm pressure and $\frac{1}{2}$ of its vol at 12°, or about 15 times that of oxygen at the same pressure and temp (Mailfert, C R 1894, 119 951)

Solubility in H₂O at t°

Temp	Wt O ₂ dissolved in 1 l H ₂ O	Wt O ₂ in gaseous mixture above the solution	Coefficient of solubility of O ₂
0	39 4 mgr	61 5 mgr	0 641
6	34 3	61	0 562
11 8	29 9	59 6	0 500
13	28	58 1	0 482
15	25 9	56 8	0 456
19	21	55 2	0 381
27	13 9	51 4	0 270
32	7 7	39 5	0 195
40	4 2	37 6	0 112
47	2 4	31 2	0 077
55	0 6	19 2	0 031
60	0 0	12 3	0 000

(Mailfert, C R 1894, 119 952)

Solubility of ozone in acidulated H₂O

Temp	Coefficient of solubility of ozone	Composition of solution
30°	0 240	} 1 l H ₂ O + 0 7 cc H ₂ SO ₄
33	0 224	
42 7	0 174	
49	0 156	1 l H ₂ O + 0 9 cc "
57	0 096	1 l " + 0 3 cc "

(Mailfert)

0 00002 pt by weight is sol in 1 pt by weight H₂O at ordinary temp and pressure (Ladenburg, B 1898, 31 2510)

The solution of O₃ in H₂O cannot be brought into equilibrium, because when the gas is blown through the liquid, a portion is continually decomposed, although the concentration remains constant (Ingles, Chem Soc 1903, 83 1012)

About 10 mg ozone are sol in 1 l H₂O at +2°, 1 5 mg ozone are sol at +28° (Moufang, C C 1911, II 1674)

Solubility in 0 1-N H₂SO₄

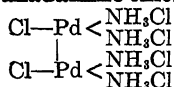
C solution C gas = 0 23 at 20°, 0 44 at 0° (Luther, Z Elektrochem 1905, 11 833)

The absorption coefficient of the gas in 0 1 N H₂SO₄ solution is 0 487 (Rothmund, C C 1912 I, 1261)

Sol in H₂C₂O₄ + Aq (Jeremin, B 11 988)

Completely absorbed by oil of turpentine and oil of cinnamon (Soret, A ch (4) 17 113)

Dipalladamine chloride, Cl₂Pd₂(NH₃)₄Cl =



Sl sol in H₂O (Deville and Debray, C R 86 296)

Palladium, Pd

Not attacked by H₂O Sl attacked by HC + Aq, but Pd sponge or filings are easily dissolved in warm HCl + Aq, with access of air HNO₃ + Aq of 1 2 sp gr dissolves slightly, but it is easily sol in HNO₃ + Aq of 1 35 sp gr (Rose)

Easily sol in aqua regia Sl sol in conc but insol in dil HI + Aq Sol in conc boiling H₂SO₄ Sol in boiling FeCl₃ + Aq Sol in HBr + Aq with a little HNO₃

Insol in liquid NH₃ (Gore, Am Ch 1898, 20 828)

Palladium ammonium compounds

See—

Dipalladamine comps, Cl₂Pd₂(NH₃)₄Cl₄
Palladodamine " Pd(NH₃)₄Cl₂
Palladosamine " Pd(NH₃)₂Cl₂

Palladium dibromide

Not known in pure state

Palladium bromide with MBr

See Bromopalladite, M

Palladium tetrabromide with MBr

See Bromopalladate, M

Palladous phosphorus bromide, Pd₂P₂Br₁₀

Properties as the corresponding chloride (Strecker, B 1909, 42 1776)

Palladium subchloride, Pd₂Cl₂

Deliquescent Decomps by H₂O, NH₃, KI, or NH₄OH + Aq (Kane)

Sol in acetone (Naumann, B 1904, 4328)

Palladium dichloride, PdCl₂

Slowly but completely sol in H₂O

+ 2H₂O Not deliquescent when pure Slowly sol in H₂O Much more sol in H₂O containing HCl

Sol in acetone (Eidmann, C C 1899, I 1014)

Sol in ethyl acetate (Naumann B 19, 37 3601)

Palladium dichloride with MCl

See Chloropalladite, M

Palladium tetrachloride with MCl

See Chloropalladate, M

Palladous phosphorus chloride, PdCl₂, P₂O₅

Decomp by H₂O into deliquescent P(O)₃, PdCl₂ Decomp by alcohol (Fink, C R 115 176)

Decomp by H₂O Sol in CHCl₃ and C₂H₅I Insol in ligroin and CCl₄ (Strecker, B 1 99, 42 1775)

PdCl₂, 2PCL₃ Sol in C₆H₆, and decomp by H₂O (Fink)

Palladous chloride carbon monoxide, PdCl₂, 2CO

Decomp by heat (Fink, C R 1898, 126 648)

2PdCl₂, 3CO Decomp by H₂O Sol in CCl₄ (Fink)**Palladium difluoride, PdF₂**Sl sol in H₂O or HF+Ag Sl sol while moist, in NH₄OH+Ag, insol after drying, in NH₄OH+Ag Insol in boiling NaF or NaHF₂+Ag (Berzelius)**Palladium hydride, Pd₂H (?)****Palladous hydroxide, PdO, xH₂O (?)**Easily sol in acids or excess of alkali hydrates, and carbonates+Ag Sol in hot NH₄Cl+Ag (Rose)Insol in Na₂B₄O₇, and Na₂HPO₄+Ag (Claus)**Palladic hydroxide, PdO₂, xH₂O**Slowly sol in acids Sol in conc HCl+Ag without decomp With dil HCl+Ag, Cl₂ is evolved (Berzelius)**Palladous hydroxide hydroxylamine, Pd(NH₂O)₄(OH)₂**Sl sol in H₂O Sol in dil HCl and in dil H₂SO₄ (Zeisel, A 1907, 351 445)**Palladous iodide, PdI₂**Insol in H₂O Can be detected as a brown coloration in presence of 400,000 pts H₂O (Lassaigne)

Sl sol in HI+Ag Easily sol in KI+Ag (Lassaigne, J ch med 11 57)

Insol in dil HCl+Ag, but slightly sol in saline solutions (Fresenius)

Sl sol in hot conc HNO₃+Ag Sol in H₂SO₄+Ag, Cl₂+Ag, Br₂+Ag, I₂+Ag, and CN+Ag, also in HCN, and MCN+Ag Insol in dil H₂SO₄, HCl, H₃PO₄, HNO₃, or HC₂H₃O₂+Ag, or in the K, Na, or NH₄ salts of those acids Insol in CuCl₂, ZnCl₂, or Pb(C H₃O)₂+Ag Insol in KBr+Ag except in presence of a free mineral acid, but not HC₂H₃O₂ Insol in sugar or starch+Ag, uric acid, alcohol, ether, or oil of lemon Somewhat sol in urine Easily sol in NH₄OH+Ag, even when dil with evolution of heat and decomposition (Kersten, A 87 28)

Insol in alcohol or ether

Sol in methyl acetate (Naumann, B 1909, 42 3790)

Palladous potassium iodide

See Iodopalladite, potassium

Palladium suboxide, Pd₂O

Decomp by acids into palladious salt and Pd (Kane, Phil Trans 1842, 1 276)

Insol in acids, even boiling aqua regia (Willm B 25 220)

Palladous oxide, PdO

Slowly sol in acids by boiling (Wohler, A 174 160)

Palladic oxide, PdO₂

Very sl attacked by acids

Palladopalladic oxide, 4PdO, PdO₂

Not attacked by aqua regia (Schneider, Pogg 141 528)

Palladous oxychloride, 3PdO, PdCl₂+4H₂O(?)

Sol in dil acids (Kane)

Palladous oxychloride ammonia, PdO, PdCl₂, 6NH₃(?)Sol in HCl+Ag
3PdO, PdCl₂, 2NH₃+3H₂O (?) Ppt (Kane)**Palladium selenide, PdSe**Insol in HNO₃ and aqua regia (Rossler, A 180 240)**Palladium subsulphide, Pd₂S**

Not attacked by acids except aqua regia, which attacks slightly (Schneider, Pogg 141 530)

Palladium monosulphide, PdSInsol in H₂O or (NH₄)₂S+Ag Sol in HCl+Ag Pptd in presence of 10,000 pts H₂O (Fellenberg, Pogg 50 65)

Sol in potassium thiocarbonate+Ag (Rosenblatt, Z anal 26 15)

A sol colloidal form was obtained in very dilute solution (Winnsinger, Bull Soc (2) 49 452)

Does not exist (Kritschenko, Z anorg 4 247)

Palladium disulphide, PdS₂HNO₃ dissolves out part of the S Easily sol in aqua regia without separation of S (Schneider)**Palladium sulphide with M S**

See Sulphopalladate, M

Palladoamine bromide, Pd(N₂H₆Br)₂Easily sol in H₂O**— bromopalladite, Pd(N₂H₆Br)₂, PdBr₂**

Properties as the corresponding chloropalladite

— carbonateSol in H₂O**— chloride, Pd(N₂H₆Cl)₂**Easily sol in H₂O

Palladoamine chloropalladite, $\text{Pd}(\text{N}_2\text{H}_5\text{Cl})_2$, PdCl_2

"Vauquehn's red salt" Insol in cold H_2O (Fischer)

Sol in boiling H_2O with decomp Sol in HCl or $\text{HNO}_3 + \text{Aq}$

— **fluoride**

Easily sol in H_2O (Muller)

— **fluosilicate**

Sl sol in cold easily in warm H_2O Insol in alcohol

hydroxide, $\text{Pd}(\text{N}_2\text{H}_5\text{OH})_2$

sl in H_2O

iodide, $\text{Pd}(\text{N}_2\text{H}_5\text{I})_2$

sl in H_2O

nitrate, $\text{Pd}(\text{N}_2\text{H}_5\text{NO}_3)_2$

easily sol in H_2O , HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$
Insol in alcohol

— **palladous nitrite**, $\text{Pd}(\text{N}_2\text{H}_5\text{NO}_2)_2$, $\text{Pd}(\text{NO}_2)_2$

Easily sol in H_2O

— **sulphate**, $\text{Pd}(\text{N}_2\text{H}_5)_2\text{SO}_4 + \text{H}_2\text{O}$

Easily sol in H_2O Insol in alcohol

— **sulphite**, $\text{Pd}(\text{N}_2\text{H}_5)_2\text{SO}_3$

Sl sol in H_2O

Palladochloronitrous acid

Potassium palladochloronitrite, $\text{Pd}(\text{NO}_2)_2\text{Cl}_2\text{K}_2$

Sol in 2 pts hot, and 3 pts cold H_2O (Vezes, C R 115 111)

Palladocyanhydric acid

Ammonium palladocyanide, $(\text{NH}_4)_2\text{Pd}(\text{CN})_4$ (?)

Sol in hot H_2O (Rossler, Z ch 1866 175)

Barium —, $\text{BaPd}(\text{CN})_4 + 4\text{H}_2\text{O}$

Not efflorescent Sol in H_2O

Calcium —, $\text{CaPd}(\text{CN})_4 + 4\text{H}_2\text{O}$

Sol in H_2O

Cupric —, $\text{CuPd}(\text{CN})_4$

Ppt

Lead —, $\text{PbPd}(\text{CN})_4$

Ppt

Magnesium —, $\text{MgPd}(\text{CN})_4$

Very sol in H_2O

Magnesium — platinumocyanide, $\text{MgPd}(\text{C})_4$, $\text{MgPt}(\text{CN})_4 + 14\text{H}_2\text{O}$

Extremely sol in H_2O

Potassium —, $\text{K}_2\text{Pd}(\text{CN})_4 + 3\text{H}_2\text{O}$

Efflorescent Sol in H_2O

+ H_2O Not efflorescent

Silver —, $\text{Ag}_2\text{Pd}(\text{CN})_4$

Ppt

Sodium —, $\text{Na}_2\text{Pd}(\text{CN})_4$

Not efflorescent Sol in H_2O

+ H_2O

Palladoiodonitrous acid

Potassium palladoiodonitrite,

$\text{Pd}(\text{NO}_2)_2\text{I}_2\text{K}_2 + 3\text{H}_2\text{O}$

Effloresces in the air

Decomp by H_2O and dil acids (Ro nheim, Z anorg 1900, 23 28)

Palladonitrous acid

Potassium palladonitrite, $\text{K}_2\text{Pd}(\text{NO}_2)_4$, $2\text{H}_2\text{O}$

Efflorescent, sol in H_2O (Lang, J pr 13 415)

Silver palladonitrite, $\text{Ag}_2\text{Pd}(\text{NO}_2)_4$

Easily sol in hot H_2O (Lang)

Sodium —, $\text{Na}_2\text{Pd}(\text{NO}_2)_4$

(Fischer)

Palladosamine bromide, $\text{Pd}(\text{NH}_3\text{Br})_2$

Insol in cold, sl sol in hot H_2O Easily sol in $\text{HC}_2\text{H}_3\text{O}_2$, H_2SO_3 , KOH , NH_4OH or alkali carbonates + Aq (Muller, A 86 1)

— **carbonate**, $\text{Pd}(\text{NH}_3)_2\text{CO}_3$

Moderately sol in H_2O

— **chloride**, $\text{Pd}(\text{NH}_3\text{Cl})_2$

Insol in H_2O but very gradually decomp by boiling therewith

Sol in warm HCl or $\text{HNO}_3 + \text{Aq}$ Sol in cold $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{KOH} + \text{Aq}$ without evolution of NH_3

+ $2\text{H}_2\text{O}$ Efflorescent Insol in H_2O (Baubigny, A Suppl 4 253)

— **cyanide**, $\text{Pd}(\text{NH}_3\text{CN})_2$

Sol in $\text{NH}_4\text{OH} + \text{Aq}$

— **fluoride**

Known only in solution

— **hydroxide**, $\text{Pd}(\text{NH}_3\text{OH})_2$

Easily sol in H_2O Slowly decomp by boiling with H_2O (Muller, A 86, 341)

Palladosamine iodide, Pd(NH₃I)₂

Insol in H₂O Sol in boiling HNO₃ with evolution of I₂ (Fehling, A 39 106)

— nitrate

Known only in solution, which decomp on evaporation

— nitrite, Pd(NH₃NO₂)₂

Moderately sol in H₂O (Lang)

— palladous nitrite, Pd(NH₃NO₂)₂, Pd(NO₂)₂

Slowly sol in cold, easily in hot H₂O (Lang)

— sulphate, Pd(NH₃)₂SO₄

Moderately sol in H₂O (Muller)

— sulphite, Pd(NH₃)₂SO₃

Easily sol in H₂O (Muller)

Pentamine chromium compounds

See—

Bromopurpureochromium compounds

Chloropurpureochromium compounds

Iodopurpureochromium compounds

Xanthochromium compounds

Roseochromium compounds

Pentamine cobaltic compounds

See—

Bromopurpureocobaltic compounds,

Chloropurpureocobaltic compounds

Nitratopurpureocobaltic compounds

Nitritocobaltic compounds,

Purpureocobaltic compounds

Roseocobaltic compounds

Sulphatopurpureocobaltic compounds

Xanthocobaltic compounds

Pentamine dicobaltic sulphite

See Roseocobaltic cobaltic sulphite

Pentamine iridium compounds

See Iridopentamine, and Iridoquo-pentamine compounds

Pentamine rhodium compounds

See—

Bromopurpureorhodium compounds

Chloropurpureorhodium compounds

Iodopurpureorhodium compounds

Nitratopurpureorhodium compounds

Roseorhodium compounds

Xanthorhodium compounds

Pentathionic acid, H₂S₅O₆

Known only in aqueous solution
Conc solution is decomp by boiling, but made stable by addition of acids

Sp gr of aqueous solution of pentathionic acid at 22°

Sp gr	1 233	1 320	1 474	1 506
%H ₂ S ₅ O ₆	32 1	41 7	56	59 7

(Kessler, Pogg 74 279)

Does not exist (Spring, Bull Acad roy Belg)

Existence proven by Smith (Chem Soc 43 355)

Barium pentathionate, BaS₅O₆+2H₂O

Easily sol in H₂O Aqueous solution is precipitated by alcohol

Contains 3H₂O (Lewes, C N 43 41)

Barium pentathionate tetrathionate, BaS₅O₆, BaS₄O₆+6N₂O

Easily sol in H₂O Not precipitated from aqueous solution by two vols alcohol (Ludwig, Arch Pharm (2) 51 264)

Cupric pentathionate, CuS₅O₆+4H₂O

Easily sol in H₂O (Debus, Chem Soc 53 360)

Lead pentathionate, PbS₅O₆+4H₂O

Ppt

Potassium pentathionate, K₂S₅O₆

Sol in H₂O (Rammelsberg, J B 1857 136)

Solution decomposes very quickly when neutral, but is more stable in presence of salts or acids

Sol in about 2 pts H₂O

Insol in alcohol (Debus, Chem Soc 53 295)

+H₂O (Shaw, Chem Soc 43 351)

+1½H₂O (Debus, A 244 76)

+2H₂O (Lewes, C N 43 41)

Perarsenic acid**Sodium perarsenate, NaAsO₄**

(Alvarez, C N 1906, 94 270)

Perboric acid**Ammonium perborate, NH₄BO₃**

(Constam and Bennett, Z anorg 1900, 25 265)

+½H₂O Stable in dry air 100 pts H₂O at 17.5° dissolve 1.55 g anhydrous salt

Decomp in aqueous solution at ord temp

Decomp by dil and conc H₂SO₄ and by HCl (Melikoff, B 1898, 31 953)

+H₂O (Bruhat, C R 1905, 140 508)

Much more sol in H₂O than the Na salt (Tanatar, Z phys Ch 1898, 26 133)

+3H₂O (Melikoff, B 1898, 31 954)

NH₄BO₃, NH₄BO₄+H₂O (Petienko, C C 1902, I 1192)

Barium perborate, $\text{Ba}(\text{BO}_3)_2 \cdot 7\text{H}_2\text{O}$

Difficultly sol in H_2O (Melikoff, B 1898, 31 954)

Cæsium perborate, $\text{CsBO}_3 + \text{H}_2\text{O}$

As NH_4 salt (Christensen)

Calcium perborate

Sl sol in H_2O Decomp in water much more rapidly than the Ba salt (Melikoff, B 1898, 31 954)

Copper perborate

Very unstable Insol in H_2O (Melikoff, B 1898, 31 954)

Nickel perborate

Very unstable Insol in H_2O (Melikoff)

Potassium perborate, $2\text{KBO}_3 + \text{H}_2\text{O}$

1 25 pts are sol in 100 pts H_2O at 0° , 2 5 pts, at 15°
Insol in alcohol and ether (Girsewald, B 1909, 42 867)

Potassium perborate hydrogen peroxide, $2\text{KBO}_3, \text{H}_2\text{O}_2$

0 70 pt is sol in 100 pts H_2O at 15° (Girsewald, B 1909, 42 868)

Potassium perborate, $\text{KB}_2\text{O} + 2\text{H}_2\text{O}$

Ppt (Bruhat, C R 1905, 140 508)

Rubidium perborate, $\text{RbBO}_3 + \text{H}_2\text{O}$

As Na salt (Christensen)

Sodium perborate, $\text{Na}_2\text{B}_4\text{O}_7 + 10\text{H}_2\text{O}$

100 g H_2O dissolve 4 2 g at 11° , 7 1 g at 22° , 13 8 g at 32° (Jaubert C R 1904, 134 796)

+4 H_2O Slowly decomp in cold solution, rapidly when boiled (Tanatar, Z phys Ch 1898, 26 132)

Sol in H_2O 100 g H_2O dissolve 1 17 g Aq solution decomp on warming (Melikoff, B 1898, 31 679)

100 g H_2O dissolve 2 55 g at 15° , 2 69 g at 21° , 2 85 g at 26° , 3 78 g at 32° (Jaubert and Lion, Rev gén Chim 1905, (7) 8 163)

Uranyl perborate, UBO_3

(Bruhat, C R 1905, 140 508)

Perbromic acid, HBrO_4

Known only in aqueous solution, which can be concentrated to a thick liquid on water bath Not decomp by HCl , SO_2 , or H_2S (Kammerer, J pr 85 452, 90 190)

Does not exist (Murr, C N 33 256, MacIvor, C N 33 35)

Barium perbromate, $\text{Ba}(\text{BrO}_4)_2$

Very sl sol in boiling H_2O (Kammerer, J pr 90 190)

Does not exist (Wolfram, A 198 95)

Potassium perbromate, KBrO_4

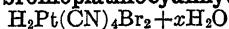
Less sol in H_2O than KBrO_3 , but more sol than KClO_4 (Kammerer, J pr 90 190)

Does not exist (Wolfram, A 198 95)

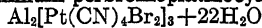
Silver perbromate, AgBrO_4

Sl sol in cold, more abundantly in hot H_2O (Kammerer, J pr 90 190)

Does not exist (Wolfram, A 198 95)

Perbromoplatinocyanhydric acid,

Deliquescent Easily sol in H_2O , alcohol, and ether (Holst, Bull Soc (2) 22 347)

Aluminum perbromoplatinocyanide,

Deliquescent Very sol in H_2O

Ammonium —, $(\text{NH}_4)_2\text{Pt}(\text{CN})_4\text{Br}_2$

Sol in H_2O

Barium —, $\text{BaPt}(\text{CN})_4\text{Br}_2 + 5\text{H}_2\text{O}$

Very sol in H_2O or alcohol

Cadmium —, $\text{CdPt}(\text{CN})_4\text{Br}_2 + x\text{H}_2\text{O}$

Very sol in H_2O

Calcium —, $\text{CaPt}(\text{CN})_4\text{Br}_2 + 7\text{H}_2\text{O}$

Sol in H_2O

Cobaltous —, $\text{CoPt}(\text{CN})_4\text{Br}_2 + 5\text{H}_2\text{O}$

Sol in H_2O Sl sol in alcohol

Glucinum —, $\text{GlPt}(\text{CN})_4\text{Br}_2$

Deliquescent Sol in H_2O

Ferrous —

Very sl sol in H_2O

Lead —, $\text{PbPt}(\text{CN})_4\text{Br}_2 + 2\text{H}_2\text{O}$

Sl sol in H_2O

Lithium —, $\text{Li}_2\text{Pt}(\text{CN})_4\text{Br}_2$

Deliquescent Sol in H_2O

Magnesium —, $\text{MgPt}(\text{CN})_4\text{Br}_2 + \text{H}_2\text{O}$

Sol in H_2O

Nickel —, $\text{NiPt}(\text{CN})_4\text{Br}_2 + r\text{H}_2\text{O}$

Sl sol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Potassium —, $\text{K}_2\text{Pt}(\text{CN})_4\text{Br}_2$

Sol in H_2O
+2 H_2O Efflorescent

Silver perbromoplatinocyanide,
 $\text{Ag}_2\text{PtBr}_2(\text{CN})_4$

Ppt (Miolati, Gazz ch it 1900, 30 588)

Sodium —, $\text{Na}_2\text{Pt}(\text{CN})_4\text{Br}_2$

Deliquescent Sol in H_2O

Strontium —, $\text{SrPt}(\text{CN})_4\text{Br}_2 \cdot 7\text{H}_2\text{O}$

Sol in H_2O

Zinc —, $\text{ZnPt}(\text{CN})_4\text{Br}_2 \cdot 5\text{H}_2\text{O}$

Not very sol in H_2O

Percarbonic acid

Ammonium percarbonate, $(\text{NH}_4)_2\text{CO}_4 \cdot 2\text{H}_2\text{O}$

Sol in H_2O with evolution of NH_3 Insol in alcohol and ether (Kasanezky, C C 1902, I 1263)

Barium percarbonate, BaCO_4

Insol in H_2O (Merck, C C 1906, II 1743)

Decomp slowly in the air Not rapidly decomp by H_2O Rapidly decomp by acids (Wolfenstein, B 1908, 41 280)

Potassium percarbonate, K_2CO_4

Sol in H_2O with decomp Sl sol in alcohol (v Hansen, Z Elektrochem 1897, 3 448)

$\text{K}_2\text{C}_2\text{O}_6$ Sol in H_2O at 0° with only slight decomp but is decomp at ord temp Sl sol in alcohol (Treadwell, Ch Z 1901, 25 1008)

Rubidium percarbonate, $\text{Rb}_2\text{CO}_4 \cdot 2\text{H}_2\text{O}_2 + \text{H}_2\text{O}$

Hydroscopic, decomp by H_2O , pptd by alcohol

$\text{Rb}_2\text{CO}_4 \cdot \text{H}_2\text{O} + 2\text{H}_2\text{O}$ Hydroscopic, decomp by H_2O , pptd by alcohol

$\text{Rb}_2\text{CO}_4 + 2\frac{1}{2}\text{H}_2\text{O}$ Hydroscopic, decomp by H_2O , pptd by alcohol (Peltner, B 1909, 42 1782)

$\text{Rb}_2\text{C}_2\text{O}_6$ Very deliquescent (Constam and Hansen, Z Elektrochem 1897, 3 144)

Sodium percarbonate, $\text{Na}_2\text{CO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O with gradual decomp (Tanatar, B 1899, 32 1544)

Sodium hydrogen percarbonate, $4\text{Na}_2\text{CO}_4 \cdot \text{H}_2\text{CO}_3$

Ppt (Merck, Chem Soc 1908, 94 (2) 180)

Perchloric acid, HClO_4

Combines with H_2O with a hissing sound and evolution of much heat

Solution in H_2O is very stable

When dil $\text{HClO}_4 + \text{Aq}$ is distilled, H_2O and HClO_4 distil off until a temp of 203° is reached, when an acid of constant composition containing 71.6–72.2% HClO_4 ($=\text{HClO}_4 + 2\text{H}_2\text{O}$) is obtained Forms hydrate $\text{HClO}_4 \cdot \text{H}_2\text{O}$, which is deliquescent, and dissolves in H_2O with evolution of much heat HClO_4 is very unstable, $\text{HClO}_4 + \text{H}_2\text{O}$ more stable, and $\text{HClO}_4 + 2\text{H}_2\text{O}$ is very stable (Roscoe, A 121 346)

Sp gr of $\text{HClO}_4 + \text{Aq}$ at $15^\circ/4^\circ$

Sp gr	% HClO_4	Sp gr	% HClO_4	Sp gr	% HClO_4
1.005	1.00	1.235	33.29	1.465	54.50
1.010	1.90	1.240	33.85	1.470	54.89
1.015	2.77	1.245	34.40	1.475	55.18
1.020	3.61	1.250	34.95	1.480	55.56
1.025	4.43	1.255	35.49	1.485	55.95
1.030	5.25	1.260	36.03	1.490	56.32
1.035	6.07	1.265	36.56	1.495	56.69
1.040	6.88	1.270	37.08	1.500	57.06
1.045	7.68	1.275	37.60	1.505	57.44
1.050	8.48	1.280	38.10	1.510	57.81
1.055	9.28	1.285	38.60	1.515	58.17
1.060	10.06	1.290	39.10	1.520	58.54
1.065	10.83	1.295	39.60	1.525	58.91
1.070	11.58	1.300	40.10	1.530	59.28
1.075	12.33	1.305	40.59	1.535	59.66
1.080	13.08	1.310	41.08	1.540	60.04
1.085	13.83	1.315	41.56	1.545	60.41
1.090	14.56	1.320	42.03	1.550	60.78
1.095	15.28	1.325	42.49	1.555	61.15
1.100	16.00	1.330	42.97	1.560	61.52
1.105	16.72	1.335	43.43	1.565	61.89
1.110	17.45	1.340	43.89	1.570	62.26
1.115	18.16	1.345	44.35	1.575	62.63
1.120	18.88	1.350	44.81	1.580	63.00
1.125	19.57	1.355	45.26	1.585	63.37
1.130	20.26	1.360	45.71	1.590	63.74
1.135	20.95	1.365	46.16	1.595	64.12
1.140	21.64	1.370	46.61	1.600	64.50
1.145	22.32	1.375	47.05	1.605	64.88
1.150	22.99	1.380	47.49	1.610	65.26
1.155	23.65	1.385	47.93	1.615	65.63
1.160	24.30	1.390	48.37	1.620	66.01
1.165	24.94	1.395	48.80	1.625	66.39
1.170	25.57	1.400	49.23	1.630	66.76
1.175	26.20	1.405	49.68	1.635	67.13
1.180	26.82	1.410	50.10	1.640	67.51
1.185	27.44	1.415	50.51	1.645	67.89
1.190	28.05	1.420	50.91	1.650	68.26
1.195	28.66	1.425	51.31	1.655	68.64
1.200	29.26	1.430	51.71	1.660	69.02
1.205	29.86	1.435	52.11	1.655	69.40
1.210	30.45	1.440	52.51	1.670	69.77
1.215	31.04	1.445	52.91	1.675	70.15
1.220	31.61	1.450	53.31		
1.225	32.18	1.455	53.71		
1.230	32.74	1.460	54.11		

(Emster, Z anorg 1907, 52 278)

Sp gr of $\text{HClO}_4 + \text{Aq}$			
HClO_4	Sp gr at $15^\circ/4^\circ$	Sp gr at $30^\circ/4^\circ$	Sp gr at $50^\circ/4^\circ$
11 14	1 0670		1 0507
35 63	1 2569	1 2451	1 2292
55 63	1 4807	1 4637	1 4421
69 81	1 6708		1 6284

(Emster, Z anorg 1907, 52 279)

Sp gr of HClO ₄ +Aq				
Sp gr				% by wt HClO ₄ in the liquid
corrected		uncorrected		
20°	50°	20°	50°	
7676	1 7098	1 7716	1 7312	100
7817	1 7259	1 7858	1 7475	98 62
8059	1 7531	1 8100	1 7751	94 67
	1 7690		1 7912	90 80
	1 7756		1 7979	84 81
	1 7619		1 7840	81 07
7386	1 7023	1 7425	1 7237	75 59
6471	1 6110	1 6508	1 6311	68 42
5353	1 5007	1 5386	1 5194	60 38
4078	1 3779	1 4108	1 3949	50 51
2901	1 2649	1 2927	1 2804	39 73
1778	1 1574	1 1800	1 1715	27 07

(v Wyk, Z anorg 1905, 48 45)

pt of $\text{HClO}_4 + \text{Aq}$ at atmospheric pressure

% by wt HClO_4 in the liquid	% by wt HClO_4 in the vapor	Initial bpt
72 4	72 4	203°
70 06	40 11	198 7
65 2	6 06	181 2
61 2	0 9	162 3
56 65		148 0
50 67		132 4
38 90		114 8
24 23		105 8
0 0	0 0	100

(v Wyk, Z anorg 1905, 48 33)

pt of $\text{HClO}_4 + \text{Aq}$ at 18 mm pressure

% by wt HClO_4 in the liquid	Bpt
100	16 0°
94 8	24 8
92 0	35
84 8	70
79 8	92
70 5	107

(v Wyk, Z anorg 1905, 48 36)

+ H_2O Deliquescent (Roscoe, A 121 6)
 + $2\text{H}_2\text{O}$ $\text{HClO}_4 + 2\text{H}_2\text{O}$ has 1 65 sp gr

and boils at 200° (Serullas), has 1 72-1 82 sp gr and boils at 200° (Nativelle, J pr 26 405)

Sol in alcohol with decomp, often explosive

+ $2\frac{1}{2}\text{H}_2\text{O}$ (v Wyck)
 + $3\text{H}_2\text{O}$ (v Wyck)
 + $3\frac{1}{2}\text{H}_2\text{O}$ (v Wyck)

Perchlorates

All perchlorates are sol in H_2O , KClO_4 , RbClO_4 , and CsClO_4 somewhat difficultly. They are all deliquescent, and sol in alcohol, excepting NH_4ClO_4 , KClO_4 , $\text{Pb}(\text{ClO}_4)_2$, and $\text{Hg}_2(\text{ClO}_4)_2$ (Serullas, A ch (2) 46 296)

Aluminum perchlorate, $\text{Al}(\text{ClO}_4)_3 + 6\text{H}_2\text{O}$

Very deliquescent (Weinland, Z anorg 1913, 84 370)

Aluminum sodium perchlorate, $\text{AlNa}(\text{ClO}_4)_4 + 12\text{H}_2\text{O}$

Sl hygroscopic (Weinland, Z anorg 1913, 84 370)

Sol in acetone (Naumann, B 1904, 37 4328)

Ammonium perchlorate, NH_4ClO_4

Permanent Sol in 5 pts H_2O , somewhat sol in alcohol (Mitscherlich, Pogg 25 300)

Solubility of NH_4ClO_4 in H_2O at t°

t°	G per l solution	Sp gr
0	115 63	1 059
20	208 45	1 098
40	305 77	1 128
60	390 50	1 158
80	481 86	1 193
100	570 06	1 216
107	591 15	1 221

(Carlson, Festsck Stockholm 1911 262)

100 g H_2O dissolve 18 5 g NH_4ClO_4 (Hofmann, Hobald and Quoos, A 1912, 386 304)

100 g sat solution in H_2O contain 1 735 (17 35%) g NH_4ClO_4 at 14.2° (Thun and Cumming, Chem Soc 1915, 107 361)

Insol in conc $\text{HClO}_4 + \text{Aq}$
 100 g sat solution in 98 8% ethyl alcohol contain 1 96 g NH_4ClO_4 at 25.2° (Thun and Cumming)

Sol in acetone Eidmann, C C 1899, II 1014)

Barium perchlorate, $\text{Ba}(\text{ClO}_4)_2 + 4\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O and alcohol

+3H₂O Solubility of Ba(ClO₄)₂+3H₂O in H₂O at t°

t°	G per 100 g H ₂ O	Sp gr
0	206	1 782
20	289	1 912
40	358	2 009
60	432	2 070
80	497	2 114
100	564	2 155
120	645	2 195
140	758	2 230

(Carlson, Festsck Stockholm, 1911 262)

Bismuth perchlorate, (BiO)ClO₄

Insol in H₂O Easily sol in HCl or HNO₃
 +Aq, less easily in H₂SO₄+Aq (Murr, C N 33 15)

Cadmium perchlorate, Cd(ClO₄)₂

Very deliquescent Sol in H₂O and alcohol (Serullas, A ch 46 305)
 +4H₂O (Salvadori, C C 1912, II 414)
 +6H₂O (S)

Cadmium perchlorate ammonia, Cd(ClO₄)₂, 6NH₃

Cd(ClO₄)₂, 4NH₃ (Salvadori, C C 1912, II 414)

Cæsium perchlorate, CsClO₄

Very sl sol in H₂O (Retgers, Z phys Ch 8. 17)

Solubility in H₂O 100 g H₂O dissolve at
 8 5° 14° 33 7° 42° 50°
 O 91 1 19 2 99 4 09 5 47 g CsClO₄,

60° 70° 84° 99°
 7 30 9 79 16 51 28 57 g CsClO₄
 (Calzolari, Acc Sc Med Ferrara, 1911, 85 150)

Solubility in H₂O at t°

t	C per 100 g H ₂ O	Sp gr
5	0 97	1 007
25	2 05	1 010
80	17 05	1 084

(Carlson, Festsck Stockholm, 1911 262)

Calcium perchlorate, Ca(ClO₄)₂

Very deliquescent Very sol in H₂O and alcohol (Serullas, A ch 46 304)

Cerous perchlorate, Ce(ClO₄)₃+8H₂O

Very deliquescent (John)

Chromic perchlorate, Cr(ClO₄)₃+6H₂O

Very hygroscopic (Weinland, Z anorg 1913, 84 371)
 +9H₂O Can be cryst from H₂O (Weinland)

Cobaltous perchlorate, Co(ClO₄)₂+9H₂O

Solubility in H₂O at t°

t°	G anhydrous salt in 100 cem	Sp gr of sat solution at t /4°
-30 7	83 14	
-21 3	90 57	
0	100 13	1 5639
+ 7 5	101 92	1 5658
18	103 80	1 5670
26	113 45	1 5811
45	115 10	1 5878

(Golblum and Terlikowsky, Bull Soc 1912, (4) 11 146)

+6H₂O (Salvadori, Gazz ch it 1912, 42 (1) 458)

Cobalt perchlorate ammonia, Co(ClO₄)₂, 6NH₃

Co(ClO₄)₂, 5NH₃
 Co(ClO₄)₂, 4NH₃, and +2H₂O
 Co(ClO₄)₂, 3NH₃, and +3H₂O
 Co(ClO₄)₂, 3NH₃+2H₂O
 (Salvadori, Gazz ch it 1912, 42 (1) 458)

Cupric perchlorate, basic, Cu(ClO₄)₂, Cu(OH)₂
 Ppt (Salvadori, C C 1912, II 414)

Cupric perchlorate, Cu(ClO₄)₂

Deliquescent Sol in H₂O and alcohol (Serullas, A ch 46 306)
 +4H₂O (Salvadori, C C 1912, II 414)

Cupric perchlorate ammonia, Cu(ClO₄)₂, 4NH₃+2H₂O

Not deliquescent Sol in NH₄OH+Aq (Roscoe, A 121 346)

Cu(ClO₄)₂, NH₃+H₂O
 Cu(ClO₄)₂, 2CuO+2H₂O, NH₃
 Cu(ClO₄)₂, 2CuO+2H₂O, 2NH₃
 Cu(ClO₄)₂, Cu(OH)₂+2H₂O, 6NH₃
 Cu(ClO₄)₂, Cu(OH)₂+2H₂O, 4NH₃
 (Salvadori, C C 1912, II 414)

Didymium perchlorate, Di(ClO₄)₃+9H₂O

Very deliquescent Very sol in H₂O and alcohol (Clvvc)

Erbium perchlorate, Er(ClO₄)₃+8H₂O

Very deliquescent

Glucinum perchlorate, Gl(ClO₄)₂+4H₂O

Very deliquescent, and sol in H₂O (Attberg)

Hydrazine perchlorate, (N₂H₄)(HClO₄)+3H₂O

1 l of sat solution in H₂O contains 417 2 g at 18°, sp gr = 1 264, 669 g at 35°, sp gr = 1 391 (Carlson, Festsck Stockholm, 1911 262)

Indium perchlorate, $\text{In}(\text{ClO}_4)_3 + 8\text{H}_2\text{O}$

Deliquescent H_2O solution decomp at 40° with separation of basic salt Sol in H_2O and easily forms sat solutions Sol in abs alcohol, but much less sol in ether (Mathers, J Am Chem Soc 1908, 30 212)

Iodine perchlorate, $\text{I}(\text{ClO}_4)_3 + 2\text{H}_2\text{O}$

Decomp by H_2O Indifferent toward organic solvents (Fichter, Z anorg 1915, 91 135)

Iron (ferrous) perchlorate, $\text{Fe}(\text{ClO}_4)_2$

Tolerably permanent, sol in H_2O (Serullas, A ch 46 335)

Iron (ferric) perchlorate, $\text{Fe}(\text{ClO}_4)_3$

Sol in H_2O (Serullas)

Iron (ferric) sodium perchlorate, $[\text{Fe}(\text{ClO}_4)_4]\text{Na} + 6\text{H}_2\text{O}$

Hygroscopic Can be cryst from H_2O (Weinland, Z anorg 1913, 84 366)

Lanthanum perchlorate, $\text{La}(\text{ClO}_4)_3 + 9\text{H}_2\text{O}$

Extremely deliquescent Sol in H_2O and absolute alcohol (Cleve)

Lead perchlorate, basic, 2PbO , $\text{Cl}_2\text{O}_7 + 2\text{H}_2\text{O}$

Decomp by H_2O into an insol more basic salt, and sol $\text{Pb}(\text{ClO}_4)_2$ (Marignac)

Lead perchlorate, $\text{Pb}(\text{ClO}_4)_2 + 3\text{H}_2\text{O}$

Permanent, extremely easily sol in H_2O (Roscoe, A 121 356)

Sol in about 1 pt H_2O (Serullas)

Lithium perchlorate, LiClO_4

Deliquescent Sol in H_2O and alcohol (Serullas)

+ $3\text{H}_2\text{O}$ (Wyrouboff, Zeit Kryst 10 626)

Magnesium perchlorate, $\text{Mg}(\text{ClO}_4)_2$

Deliquescent, and sol in H_2O and alcohol (Serullas)

+ $6\text{H}_2\text{O}$ (Weinland, Z anorg 1913, 84 372)

Manganous perchlorate, $\text{Mn}(\text{ClO}_4)_2$

Very deliquescent Sol in H_2O and alcohol (Serullas, A ch 46 335)

+ $6\text{H}_2\text{O}$ Sol in 0.342 pts H_2O (Salvadori, C C 1912, II 414)

Manganous perchlorate ammonia, $\text{Mn}(\text{ClO}_4)_2 \cdot 5\text{NH}_3 + \text{H}_2\text{O}$

Sol in HCl insol in HNO_3 (Salvadori, C C 1912, II 414)

Mercurous perchlorate, $(\text{HgClO}_4)_2 + 4\text{H}_2\text{O}$

Very sol in H_2O Gradually decomp by

H_2O Decomp by alcohol (Chikashigé, Chem Soc 1895, 67 1016)

+ $6\text{H}_2\text{O}$ Very deliquescent (Roscoe, A 121 356)

Permanent (Serullas)

Mercuric perchlorate, basic, HgO , $2\text{Hg}(\text{ClO}_4)_2$

Anhydrous Ppt Insol in either HCl or HNO_3 Decomp and dissolved by a mixture of the two (Chikashigé, Chem Soc 1905, 87 824)

+ $12\text{H}_2\text{O}$ Very sol in H_2O (Chikashigé) 2HgO , $\text{Hg}(\text{ClO}_4)_2$

α -salt Decomp by H_2O Sol in acids (Chikashigé, Chem Soc 1895, 67 1015)

β salt Insol in H_2O , insol in HCl or HNO_3 (Chikashigé, Chem Soc 1905, 87 825)

Mercuric perchlorate, $\text{Hg}(\text{ClO}_4)_2$

Very deliquescent Sol in H_2O , sl sol with decomp in alcohol (Serullas, A ch 34 243)

+ $6\text{H}_2\text{O}$ Very hygroscopic Very sol in H_2O Slowly decomp by H_2O , more easily by alcohol (Chikashigé, Chem Soc 1895, 67 1014)

Mercuric perchlorate bromide, HgClO_4Br

Decomp by H_2O (Borelli, Gazz ch it 1908, 38 (2) 421)

Mercuric perchlorate cyanide, $\text{Hg}(\text{ClO}_4)_2 \cdot \text{Hg}(\text{CN})_2$

Very sol in H_2O Sol in alcohol (Borelli)

Mercuric perchlorate iodide, $\text{Hg}(\text{ClO}_4)_2\text{I}$

Deliquescent Decomp by H_2O Sol in much alcohol Decomp by HNO_3 Completely sol in KI or KCN + Aq (Borelli)

Mercuric perchlorate sulphocyanide, $\text{Hg}(\text{ClO}_4)_2 \cdot \text{Hg}(\text{SCN})_2$

Insol in H_2O and conc acids Sol in aqua regia (Borelli)

+ $6\text{H}_2\text{O}$ (Salvadori, C C 1912, II 414)

Nickel perchlorate, $\text{Ni}(\text{ClO}_4)_2$

Deliquescent easily sol in alcohol and H_2O (Groth, Pogg 133 226)

Solubility in H_2O at t°

t°	C anhydrous salt in 100 cc	Sp gr of the sat solution
-30 7	89 98	
-21 3	92 48	
0	104 55	1 5726
+7 5	106 76	1 5755
18	110 05	1 5760
26	112 15	1 5841
45	118 60	1 5936

(Golblum and Terlikowsky, Bull Soc 1912, (4) 11 147)

- +5H₂O (Golblum and Terlikowsky)
 +6H₂O (Salvadori, C C 1912, II 414)
 +9H₂O (Golblum and Terlikowsky)

Nickel perchlorate, ammonia, Ni(ClO₄)₂,
 6NH₃
 Ppt (Salvadori)

Nitrosyl perchlorate, NO O ClO₃+H₂O
 Ppt, sl hygroscopic, decomp by H₂O
 (Hofmann, B 1909, 42 2032)

Platinum perchlorate, Pt₆ClO₃+15H₂O
 Insol in H₂O (Prost, Bull Soc (2) 46
 156)

Potassium perchlorate, KClO₄

Sol in 57.9 pts H₂O at 21.3° (Longuine A 121
 123) in 65 pts H₂O at 15° (Serullas A ch (2) 46 297)
 in 88 pts H₂O at 10° in 55 pts H₂O at 100° (Hutstein
 J B 1851 331)

Solubility in H₂O

1 pt KClO₄ dissolves in 142.9 pts H₂O at
 6°, and solution has sp gr = 1.0005, in 52.5
 pts H₂O at 25°, and solution has sp gr =
 1.0123, in 15.5 pts H₂O at 50°, and solution
 has sp gr = 1.0181, in 5.04 pts H₂O at 100°,
 and solution has sp gr = 1.0660 (Mur, C
 N 33 15)

1 l H₂O dissolves 78.07 millimols KClO₄
 at 10°, 120.4 millimols at 20°, 179.9 milli-
 mols at 30° (Noyes and Sammet, Z phys
 Ch 1903, 43 538)

1 l H₂O dissolves 0.1475 mol KClO₄ at
 25° (Rothmund, Z phys Ch 1909, 69 539)

Solubility in H₂O at t°

t°	C KClO ₄ in 100 g H ₂ O	t°	G KClO ₄ in 100 g H ₂ O
0	0.70	50	6.45
10	1.14	70	12.3
15	1.54	90	22.2
20.5	1.90		

(Calzolari, Acc Sci Med Ferrara, 1911, 85
 150)

t	C per 100 g H ₂ O	sp gr
0	0.79	1.007
20	1.80	1.011
40	4.81	1.022
60	8.71	1.033
80	14.78	1.053
100	20.98	1.067

(Carlson, Festsch Stockholm, 1911 262)

1 l H₂O dissolves 0.1481 equivalents
 KClO₄ at 25° (Noyes and Boggs, J Am
 Chem Soc 1911, 33 1652)

100 cc of sat solution of KClO₄ in H₂O con-

tains 2.085 g KClO₄ at 25.2° (Thun and Cum-
 mings, Chem Soc 1915, 107 361)

KClO₄ is sol in 22.6 pts H₂O at ord temp,
 and 4.00 pts at 100°, in 29.6 pts NH₄OH +
 Aq (conc) at ord temp, in 30.4 pts NH₄OH
 + Aq (1 vol conc + 3 vols H₂O) at ord
 temp, in 22.4 pts HNO₃ + Aq (1 vol conc +
 5 vols H₂O) at ord temp, and 5.00 pts at
 100°, in 30.4 pts HCl + Aq (1 vol conc +
 4 vols H₂O) at ord temp, 45.2 pts HC₂H₃O₂
 + Aq (1 vol commercial acid + 1 vol H₂O)
 at ord temp, in 24.4 pts NH₄C₂H₃O₂ + Aq
 (dil HC₂H₃O₂ + dil NH₄OH + Aq) at ord
 temp, and 6.00 pts at 100°, in 25.6 pts
 NH₄Cl + Aq (1 pt NH₄Cl + 10 pts H₂O) at
 ord temp, and 6.00 pts at 100°, in 16.0 pts
 NH₄NO₃ + Aq (1 pt NH₄NO₃ + 10 pts H₂O)
 at ord temp, and 4.00 pts at 100°, in 25.6
 pts NaC₂H₃O₂ + Aq (conc HC₂H₃O₂ +
 Na₂CO₃ + 4 vols H₂O) at ord temp, and
 7.00 pts at 100°, in 29.2 pts Cu(C₂H₃O₂)₂ +
 Aq (Stolba, Z anal 2 390) at ord temp,
 and 7.00 pts at 100°, in 27.2 pts cane sugar
 (1 pt + 10 pts H₂O) at ord temp, in 36.8
 pts grape sugar (1 pt + 10 pts H₂O) at ord
 temp (Approximate) (Pearson, Zeit Chem
 1869 662)

Solubility of KClO₄ in HClO₄ at 25.2°

Normality of HClO ₄	% KClO ₄
0.01	1.999
0.10	1.485
1.00	0.527

(Thun and Cumming, Chem Soc 1915, 107
 361)

Solubility in KCl + Aq at 25°

Concentration of KCl Equivalents per litre	Solubility of KClO ₄ Equivalents per litre
0.04973	0.1282
0.09933	0.1123

(Noyes and Boggs, J Am Chem Soc 1911,
 33 1652)

Solubility in K₂SO₄ + Aq at 25°

Concentration of K ₂ SO ₄ Equivalents per litre	Solubility of KClO ₄ Equivalents per litre
0.04976	0.1315
0.09922	0.1181

(Noyes and Boggs)

Very sl sol in abs alcohol, and insol if
 alcohol contains trace of an acetate (Ros-
 coe) Insol in alcohol of 0.835 sp gr (Schlos-
 sing, C R 73 1269)

Sol in 6400 pts 97.2% alcohol, in 5000
 pts 95.8% alcohol, in 2500-3000 pts 90%
 alcohol, in 25,000 pts alcohol-ether (2 pts
 97% alcohol 1 pt ether) Practically insol

in an alcoholic solution of HClO_4 (Wenze' Z angew Ch 1891 691)

Solubility of KClO_4 in ethyl alcohol + Aq at 25.2°

Vol % alcohol	G KClO_4 sol in 100 g alcohol
51 2	0 754
93 5	0 051
98 8	0 019

(Thun and Cumming, Chem Soc 1915, 107 361)

Solubility in organic compds + Aq at 25°

Solvent	Mol KClO_4 sol in 1 litre
0 5-N methyl alcohol	0 1402
" ethyl alcohol	0 1356
" propyl alcohol	0 1343
" tert amyl alcohol	0 1279
" acetone	0 1451
" ether	0 1336
" glycol	0 1416
" glycerine	0 1404
" urea	0 1510
" ammonia	0 1474
" diethylamine	0 1342
" pyridine	0 1410
" urethane	0 1400
" formamide	0 1539
" acetamide	0 1447
" acetic acid	0 1462
" phenol	0 1362
" methylal	0 1400
" methyl acetate	0 1429

(Rothmund, Z phys Ch 1909, 69 539)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Potassium rubidium perchlorate,
 $\text{KRb}_2(\text{ClO}_4)_3$

15.5 g are contained in 1 l solution sat at 20°, sp gr = 1.013 (Carlson)

Rubidium perchlorate, RbClO_4

Sol in 92.1 pts H_2O at 21.3° (Longuigne, A 121 123)

1 pt sol in 92.1 pts H_2O at 21° as compared with 1 pt KClO_4 sol in 57.9 pts H_2O at 21° (Erdmann, Arch Pharm 1894, 232 23)

Solubility in H_2O at t°

t°	G RbClO_4 in 100 g H_2O	t	G RbClO_4 in 100 g H_2O
0	2 46	42 2	14 94
8	3 50	50	19 40
19 8	6 28	77	41 65
30	9 53	99	76 5

(Calzolari, Acc Sci Med Ferrara, 1911, 85 150)

Solubility in H_2O at t°

t°	G in 100 g H_2O	Sp gr
0	1 10	1 007
20	1 56	1 010
40	3 26	1 017
60	6 27	1 028
80	11 04	1 050
100	15 75	1 070

(Carlson, Festsck Stockholm, 1911 262)

Scandrium perchlorate

(Crookes, Roy Soc Proc 1908, 80 A, 518)

Silver perchlorate, AgClO_4

Deliquescent Sol in H_2O and alcohol (Serullas, A ch 46 307)

Sodium perchlorate, NaClO_4

Deliquescent, and very sol in H_2O and alcohol (Serullas)

Not deliquescent (Potilitzin, J russ Soc 1889, 1 258)

Solubility in H_2O at t°

t°	G in 1 l of solution	Sp gr
15	1076	1 666
50	1234	1 731
143	1414	1 789

(Carlson, Festsck Stockholm, 1911 262)

+ H_2O Not deliquescent (Potilitzin)

Strontium perchlorate, $\text{Sr}(\text{ClO}_4)_2$

Very deliquescent Sol in H_2O and alcohol (Serullas, A ch 46 304)

Terbium perchlorate

Very sol in H_2O and in alcohol (Potratz, C N 1905, 92 3)

Thallous perchlorate, TlClO_4

1 pt salt dissolves in 10 pts H_2O at 15°, and 0.6 pt at 100° (Roscoe, Chem Soc (2) 4 504)

Solubility in H_2O at t°

t°	G per 100 g H_2O	Sp gr
0	6 00	1 060
10	8 04	1 075
30	19 72	1 146
50	39 62	1 251
70	65 32	1 430
80	81 49	1 520

(Carlson, Festsck Stockholm 1911 262)

Sl sol in alcohol (Roscoe)

Thalic perchlorate, $Tl(ClO_4)_3 \cdot 6H_2O$

Very hygroscopic, sol in H_2O Decomp in moist air (Gewecke, Z anorg 1912, 75 274)

Uranyl perchlorate, $(UO_2)(ClO_4)_2 \cdot 4H_2O$

(Salvadori, Ch Z 1912, 36 513)
+ $6H_2O$ (Salvadori)

Yttrium perchlorate, $Y(ClO_4)_3 \cdot 8H_2O$

Very deliquescent Sol in H_2O and alcohol (Cleve)

Zinc perchlorate, $Zn(ClO_4)_2$

Deliquescent Sol in H_2O and alcohol (Serullas, A ch 46 302)
+ $4H_2O$, and $6H_2O$ (Salvadori, C C 1912, II 414)

Zinc perchlorate, ammonia, $Zn(ClO_4)_2 \cdot 4NH_3$

Ppt (Salvadori, C C 1912, II 414)
 $Zn(ClO_4)_2 \cdot 6NH_3$ (Ephraim, B 1915, 48 643)

Perchromic acid

Sol in ethyl acetate and valerate, in amyl chloride, formate, acetate, butyrate, and valerate (All give blue solutions)

Insol in CS_2 , C_6H_6 , $CHCl_3$, CCl_4 , $C_6H_5NH_2$, $C_6H_5NO_2$ and toluene (Grosvenor, J Am Chem Soc 1895, 17 41-43)

$H_2CrO_8 \cdot 2H_2O$ Decomp above -30° (Riesenfeld, B 1914, 47 552)

Ammonium perchromate, $(NH_4)_2CrO_8$

Very unstable Sl sol in cold H_2O Decomp by conc H_2SO_4 Insol in pure alcohol and pure ether Decomp by boiling alcohol containing more than 50% H_2O (Wohlers, B 1905, 38 1888)

$CrO_4 \cdot 3NH_3$ Sol in 10% NH_4OH + Aq, sol in H_2O with decomp, insol in other solvents (Wiede B 1897, 30 2181)

$NH_4CrO_5 \cdot H_2O_2$ Decomp in the air Sol in ice cold H_2O , decomp when warmed Insol in alcohol, ether, ligroin and $CHCl_3$ (Wiede, B 1898, 31 518)

Ammonium hydrogen perchromate,

$CrO_2(O \cdot OH)(NH_4)(OH)$

Sol in H_2O with decomp Difficultly sol in cold abs alcohol (Hofmann, B 1904, 37 3406)

Barium perchromate, $BaCrO_8$

(Byers and Reid, Am Ch J 1904, 32 513)

Calcium perchromate, $CaCr_2O_8$

Very sol in H_2O (Mylus B 1900, 33 3689, Byers and Reid, Am Ch J 1904, 32 513)

Lithium perchromate, $Li_2Cr_2O_8$

(Byers and Reid, Am Ch J 1904, 32 511)

Magnesium perchromate, $MgCr_2O_8$

(Byers and Reid)

Potassium perchromate, K_2CrO_8

Sl sol in cold H_2O Decomp by conc H_2SO_4 Insol in pure alcohol and pure ether Decomp by boiling alcohol containing more than 50% H_2O (Wohlers, B 1905, 38 1888)

+ xH_2O Sol in H_2O at 0° without decomp (Riesenfeld and Kutsch, B 1908, 41 3948)

$K_2Cr_2O_8$ Sol in H_2O Decomp in the air (Byers and Reid, Am Ch J 1904, 32 505)

$KCrO_5 \cdot H_2O_2$ or KH_2CrO_7 Sol in alcohol H_2O , decomp when warmed explosively (Wiede, B 1898, 31 520)

Sodium perchromate, Na_2CrO_8

Sl sol in cold H_2O Decomp by conc H_2SO_4 Insol in pure alcohol and pure ether Decomp by boiling with alc containing more than 50% H_2O (Wohlers, B 1905, 38 1885)

$Na_2Cr_2O_8 \cdot 28H_2O$ Efflorescent Sl sol in cold, easily in hot H_2O , with decomp Not decomp by $NaOH$ + Aq (Haussmann J pr (2) 48 70)

$Na_2Cr_2O_8$ (Byers and Reid, Am Ch J 1904, 32 511)

Perchloroplatinocyanhydric acid,

$H_2Pt(CN)_4Cl_2 \cdot 4H_2O$

Verv sol in H_2O and alcohol

Ammonium perchloroplatinocyanide,

$(NH_4)_2Pt(CN)_4Cl + 2H_2O$

Sol in H_2O

Barium —, $BaPt(CN)_4Cl + 5H_2O$

Very sol in H_2O

Calcium —, $CaPt(CN)_4Cl$

Sol in H_2O

Magnesium —, $MgPt(CN)_4Cl + 4H_2O$

Sol in H_2O

Manganous —, $MnPt(CN)_4Cl + 4H_2O$

Sol in H_2O and alcohol

Potassium —, $KPt(CN)_4Cl + 2H_2O$

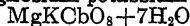
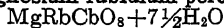
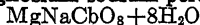
Very efflorescent, and sol in H_2O and alcohol

Percolumbic acid, $HCoO_4 + nH_2O$

Insol in H_2O Sol with decomp in conc H_2SO_4 (Melikoff, Z anorg 1899 20 11)

Cæsium percolumbate, Cs_3CoO_4

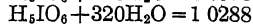
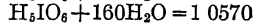
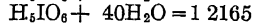
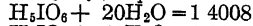
Ppt (E F Smith, J Am Chem Soc 1908, 30 1658)

Cæsium magnesium percolumbate,Sol in H_2O without decomp (E F Smith)**Calcium potassium percolumbate,**Difficultly sol in H_2O (E F Smith)**Calcium sodium percolumbate, $\text{CaNaCbO}_8 + 4\text{H}_2\text{O}$** Difficultly sol in H_2O (E F Smith)**Magnesium potassium percolumbate,**Sol in H_2O without decomp (E F Smith)**Magnesium rubidium percolumbate,**Sol in H_2O without decomp (E F Smith)**Magnesium sodium percolumbate,**Sol in H_2O without decomp (E F Smith)**Potassium percolumbate, K_3CbO_8** Sol in H_2O Ppt from aq solution by alcohol (E F Smith)Sol with decomp in
ol Sol in $\text{KOH} + \text{H}_2\text{O}_2$
anorg 1899, 20 342)**Rubidium percolumbate, Rb_3CbO_8** Sol in H_2O Insol in alcohol (E F Smith)**Sodium percolumbate, Na_3CbO_8** Sol in H_2O Insol in alcohol (E F Smith)**Perferricyanhydric acid****Potassium perferricyanide, $\text{K}_2\text{Fe}(\text{CN})_6 + \text{H}_2\text{O}$ (?)**Very hygroscopic, and sol in H_2O Nearly insol in absolute alcohol Decomp by hot H_2O (Skraup, A 189 368)**Periodic acid, H_5IO_6** Deliquescent in moist air, very sol in H_2O (Bengieser, A 17 254)

Rather easily sol in alcohol and ether (Bengieser)

Rather easily sol in alcohol, less in ether (Langtoch)

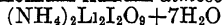
Sl sol in alcohol, still less in ether (Langlois, J pr 56 36)

Sp gr of $\text{H}_5\text{IO}_6 + \text{Aq}$ 

(Thomsen, B 7 71)

PeriodatesMost periodates are insol or sl sol in H_2O , all are insol or very sl sol in alcohol, but they all dissolve in dil $\text{HNO}_3 + \text{Aq}$ (Bengieser)**Aluminum metaperiodate, $\text{Al}(\text{IO}_4)_3 + 3\text{H}_2\text{O}$** Stable in solution containing HNO_3 (Eakle, C C 1896 II, 649)**Ammonium metaperiodate, NH_4IO_4** Sl sol in H_2O Cryst with $3\text{H}_2\text{O}$ (Ihre, B 3 316), $2\text{H}_2\text{O}$ (Langlois, A ch (3) 34 257)

Stable in solution containing free ammonia (Eakle, Zeit Kryst 1896, 26 258-88)

100 pts H_2O dissolve 27 pts NH_4IO_4 at 16° , sp gr of sat solution at $16^\circ/4^\circ = 1.0178$ (Barker, Chem Soc 1908, 93 17)**Ammonium dimesoperiodate, $(\text{NH}_4)_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$** Sol in H_2O (Rammelsberg, Pogg 134 379)Stable in solution containing free ammonia
Two modifications (Eakle, Zeit Kryst 1896, 26 558-88, C C 1896 II, 649)**Ammonium lithium dimesoperiodate,**Sol in H_2O (Ihre)**Ammonium magnesium mesoperiodate, $\text{NH}_4\text{MgIO}_5 + 3\text{H}_2\text{O}$**

Precipitate (Rammelsberg, Pogg 134 510)

Barium metaperiodate, $\text{Ba}(\text{IO}_4)_2$

Known only in solution

Barium dimesoperiodate, $\text{Ba}_2\text{I}_2\text{O}_9$ Sl sol in H_2O , easily sol in dil $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 134 391)Cryst also with $3\text{H}_2\text{O}$, $5\text{H}_2\text{O}$, and $7\text{H}_2\text{O}$ **Barium mesoperiodate, $\text{Ba}_2(\text{IO}_5)_2 + 6\text{H}_2\text{O}$**

(Ihre)

Barium orthoperiodate, $\text{Ba}_2(\text{IO}_6)_2$ Insol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)**Barium dimesodiperiodate, $\text{Ba}_5\text{I}_4\text{O}_{11} + 5\text{H}_2\text{O}$** Precipitate Sol in dil $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 134 395)**Barium periodate tungstate**

See Tungstoperiodate, barium

Cæsium metaperiodate, CsIO_4 Sl sol in cold H_2O , readily sol in hot H_2O (Wells, Am Ch J 1901, 26 279)215 pts are sol in 100 pts H_2O at 15°
Sp gr of the sat aq solution at $15^\circ/4^\circ = 1.0166$ (Barker, Chem Soc 1908, 93 17)

Cæsium periodate hydrogen fluoride, 2CsIO_4 , $3\text{HF} + \text{H}_2\text{O}$

Sol in 40-60% $\text{HF} + \text{Aq}$ Decomp by H_2O Efflorescent (Weinland, Z anorg 1899, 22 263)

Cadmium metaperiodate, $\text{Cd}(\text{IO}_4)_2$

Ppt (Rammelsberg, Pogg 134 516)

Cadmium dimesoperiodate, $\text{Cd}_2\text{I}_2\text{O}_9 + 9\text{H}_2\text{O}$

Insol in H_2O (Rammelsberg)

Cadmium mesoperiodate, $\text{Cd}_3(\text{IO}_5)_2 + 5\text{H}_2\text{O}$

Ppt
 CdHIO_5 (Kimmings, Chem Soc 55 151)

Cadmium diperiodate, $\text{Cd}_4\text{I}_2\text{O}_{11} + 3\text{H}_2\text{O}$

Insol in H_2O (Rammelsberg)

Cadmium periodate, $\text{Cd}_{10}\text{I}_6\text{O}_{31} + 15\text{H}_2\text{O}$

Insol in H_2O (Rammelsberg)

Calcium metaperiodate, $\text{Ca}(\text{IO}_4)_2$

Sol in $\text{H}_5\text{IO}_6 + \text{Aq}$ and acids (Rammelsberg, Pogg 134 405)

Calcium dimesoperiodate, $\text{Ca}_2\text{I}_2\text{O}_9 + 7\text{H}_2\text{O}$, and $9\text{H}_2\text{O}$

Sl sol in H_2O (Rammelsberg)
 $+ 3\text{H}_2\text{O}$ (Langlois)

Calcium orthoperiodate, $\text{Ca}_5(\text{IO}_6)_2$

Insol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 44 577)

Cobaltous periodate, 7CoO , $2\text{I}_2\text{O}_7 + 18\text{H}_2\text{O}$

Attacked by HCl , and sol on warming Slowly but completely sol in NHO_3 (Lautsch, J pr 100 89)

Could not be obtained by Rammelsberg

Cupric dimesoperiodate, $\text{Cu}_2\text{I}_2\text{O}_9 + 6\text{H}_2\text{O}$

Decomp by H_2O without dissolving (Rammelsberg)

Cupric orthoperiodate, CuHIO_6

Very sol in $\text{HNO}_3 + \text{Aq}$ (Kimmings, Chem Soc 55 150)

Cupric diperiodate, $\text{Cu}_4\text{I}_2\text{O}_{11} + \text{H}_2\text{O}$

Insol in H_2O , sol in dil $\text{HNO}_3 + \text{Aq}$ (Rammelsberg)
 $+ 7\text{H}_2\text{O}$ (R)

Cupric periodate, 5CuO , $\text{I}_2\text{O}_5 + 5\text{H}_2\text{O}$

Wholly insol in H_2O (Rammelsberg, B 1 73)

Didymium peroxide, $\text{Dy}_2\text{O}_3(\text{IO}_4)_2$

Precipitate
 $\text{DyIO}_5 + 4\text{H}_2\text{O}$ Ppt (Cleve, Bull Soc (2) 43 362)

Erbium periodate

Sol in H_2O (Hoglund)

Glucinum periodate, $\text{Gl}_3(\text{IO}_5)_2 + 11\text{H}_2\text{O}$

Decomp by H_2O without dissolving Easily sol in $\text{HNO}_3 + \text{Aq}$
 $+ 13\text{H}_2\text{O}$ Nearly insol in H_2O (Atterberg, B 7 474)

Iron (ferrous) orthoperiodate, $\text{Fe}_5(\text{IO}_6)_2$

(Kimmings, Chem Soc 55 150)

FeH_3IO_5 (Kimmings)

Iron (ferric) periodate, $2\text{Fe}_2\text{O}_3$, $\text{I}_2\text{O}_7 + 21\text{H}_2\text{O}$

Ppt (Rammelsberg)

Iron (ferric) dimesoperiodate, FeHI_2O_9

Insol in dil $\text{HNO}_3 + \text{Aq}$ (Kimmings, Chem Soc 55 149)

Iron (ferric) metaperiodate, $\text{Fe}(\text{IO}_4)_3$

(Kimmings)

Lanthanum periodate, $\text{La}(\text{IO}_4)_3 + 2\text{H}_2\text{O}$

Precipitate (Cleve)

Lead metaperiodate, $\text{Pb}(\text{IO}_4)_2$

Sol in $\text{HNO}_3 + \text{Aq}$ (Kimmings)

Lead orthoperiodate, $\text{Pb}_3\text{H}_4(\text{IO}_6)_2$

Sol in $\text{HNO}_3 + \text{Aq}$ (Kimmings, Chem Soc 55 149)

Lead mesoperiodate, $\text{Pb}_3(\text{IO}_5)_2 + 2\text{H}_2\text{O}$

Insol in H_2O or excess of periodic acid + Aq Decomp by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Bengieser, A 17 254)

Lithium metaperiodate, LiIO_4

Difficultly sol in H_2O (Rammelsberg, B 1 132)

Somewhat deliquescent

$+ \text{H}_2\text{O}$, sol in H_2O (Buker, Chem Soc 1911, 99 1326)

Lithium dimesoperiodate, $\text{Li}_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$

Very sl sol in H_2O (Rammelsberg, Pogg 134 387)

Lithium orthoperiodate, Li_5IO_6

H_2O dissolves out a slight amount of LiI Easily sol in $\text{HNO}_3 + \text{Aq}$ (Rammelsberg, Pogg 137 313)

Magnesium metaperiodate, $\text{Mg}(\text{IO}_4)_2 + 10\text{H}_2\text{O}$

Easily sol in H_2O (Rammelsberg)

Magnesium diperiodate, $\text{Mg}_4\text{I}_2\text{O}_{11} + 6\text{H}_2\text{O}$, or $9\text{H}_2\text{O}$

Sl efflorescent Insol in H_2O (Rammelsberg)

Magnesium dimesoperiodate, $\text{Mg}_2\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$

(Rammelsberg, Pogg **134** 499)
 $+15\text{H}_2\text{O}$ Insol in H_2O Sol in periodic acid + Aq (Langlois)

Manganic periodate

See Manganoperiodic acid

Mercurous diperiodate, $5\text{Hg}_2\text{O}$, I_2O_7 , or $4\text{Hg}_2\text{O}$, $\text{I}_2\text{O}_7 = \text{Hg}_8\text{I}_2\text{O}_{11}$

Insol in H_2O Easily sol in HNO_3 + Aq and in HCl + Aq (Lautsch, J pr **100** 86)

Mercuric orthoperiodate, $\text{Hg}_6(\text{IO}_6)_2$

Insol in H_2O Easily sol in HCl Sl sol in HNO_3 (Lautsch)

Mercuric potassium periodate, 10HgO , $5\text{K}_2\text{O}$, $6\text{I}_2\text{O}_7$

Insol in H_2O Difficultly sol in warm HNO_3 without decomp (Rammelsberg, Pogg **134** 526)

Nickel dimesoperiodate, $\text{Ni}_2\text{I}_2\text{O}_9$

(Kimmins, Chem Soc **55** 151)

Nickel mesoperiodate, $\text{Ni}_3(\text{IO}_6)_2$

(Kimmins)

Nickel periodate, 7NiO , $4\text{I}_2\text{O}_7 + 63\text{H}_2\text{O}$

Sl Easily sol in H_2IO_6 + Aq
 5, Pogg **134** 514)

Potassium metaperiodate, KIO_4

Sl sol in H_2O Sol in 290 pts cold H_2O (Rammelsberg, Pogg **134** 320)

Almost insol in KOH + Aq
 0.66 pt is sol in 100 pts H_2O at 13° Sp gr of the sat sol at $13^\circ/4^\circ = 1.0051$ (Barker, Chem Soc 1908, **93** 16)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)

Potassium mesoperiodate, $\text{K}_3\text{IO}_6 + 4\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O (Ihre)

Potassium dimesoperiodate, $\text{K}_4\text{I}_2\text{O}_9 + 9\text{H}_2\text{O}$

Sol in 9.7 pts cold H_2O (Rammelsberg, Pogg **134** 320)

Sol in KOH + Aq
 $+3\text{H}_2\text{O}$

Potassium hydrogen dimesoperiodate, $\text{K}_3\text{HI}_2\text{O}_9$

Less sol in H_2O than KIO_4 (Kimmins, Chem Soc **51** 356)

Potassium manganic periodate

See Manganoperiodate, potassium

Potassium zinc periodate, K_2O , 4ZnO , $2\text{I}_2\text{O}_7 + 4\text{H}_2\text{O}$

Ppt (Rammelsberg, Pogg **134** 368)

Potassium periodate tungstate

See Tungstoperiodate, potassium

Rubidium periodate, RbIO_4

0.65 pt is sol in 100 pts H_2O at 13° Sp gr of the sat aq solution at $13^\circ/4^\circ = 1.0052$ (Barker, Chem Soc 1908, **93** 16)

Samarium periodate, $\text{Sm}(\text{IO}_6) + 4\text{H}_2\text{O}$

Precipitate (Cleve)

Silver metaperiodate, AgIO_4

Decomp by cold H_2O into $\text{Ag}_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$, and by warm H_2O into $\text{Ag}_4\text{I}_2\text{O}_9 + \text{H}_2\text{O}$ (Ammermuller and Magnus, Pogg **28** 516)
 $+ \text{H}_2\text{O}$ Insol ppt (Kimmins)

Silver mesoperiodate, Ag_3IO_6

(Fernlund, J pr **100** 99)
 Ag_2HIO_6 Insol ppt (Kimmins, Chem Soc **51** 358)
 Ppt by dil HNO_3 , sol in HNO_3 (Rosenheim, A 1899, **308** 57)

Silver dimesoperiodate, $\text{Ag}_4\text{I}_2\text{O}_9 + \text{H}_2\text{O}$, or $3\text{H}_2\text{O}$

Insol ppt (Kimmins)
 Decomp by boiling H_2O into Ag_3IO_6 (Rammelsberg)

Silver orthoperiodate, Ag_6IO_8

Sol in HNO_3 or NH_4OH + Aq (Rammelsberg, Pogg **134** 386)

Sol in excess NH_4OH + Aq, pptd by HNO_3 (Rosenheim, A 1899 **308** 56)

$\text{Ag}_3\text{H}_2\text{IO}_6$ Insol ppt (Kimmins, Chem Soc **51** 358)

$\text{Ag}_2\text{H}_3\text{IO}_6$ As above (Kimmins)
 Sol in dil HNO_3 (Rosenheim, A 1899, **308** 53)

Silver diperiodate, $\text{Ag}_8\text{I}_2\text{O}_{11}$

Sl sol in HNO_3 + Aq, insol in NH_4OH + Aq (Lautsch, J pr **100** 75)

Silver dimesodiperiodate, $\text{Ag}_{10}\text{I}_4\text{O}_{11}$

HNO_3 + Aq dissolves out Ag_2O Insol in NH_4OH + Aq (Lautsch)

Sodium metaperiodate, NaIO_4

Easily sol in H_2O
 $+2\text{H}_2\text{O}$ (Langlois)
 $+3\text{H}_2\text{O}$ Efflorescent, sol in 12 pts H_2O at ord temp (Rammelsberg, J pr **103** 278)

Sodium dimesoperiodate, $\text{Na}_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$

Scarcely sol in cold, sl sol in hot H_2O (Magnus and Ammermuller, Pogg **28** 514)
 Very sol in dil HNO_3 + Aq (Langlois)
 Sol in $\text{HC}_2\text{H}_3\text{O}_2$ + Aq with decomp (Bengieser, A **17** 254)

Insol in methyl acetate (Naumann, B 1909, **42** 3790)
 $+4\text{H}_2\text{O}$

Sodium mesoperiodate, $\text{Na}_3\text{IO}_5 + \frac{5}{4}\text{H}_2\text{O}$

Sol in H_2O (Ihre)
 $+\text{H}_2\text{O} = \text{Na}_3\text{H}_3\text{IO}_6$ Less sol in H_2O than
 $\text{Na}_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O} (= \text{Na}_2\text{H}_3\text{IO}_6)$ (Kimmings,
 Chem Soc 51 357)

Sodium orthoperiodate, Na_5IO_6

$\text{Na}_2\text{H}_3\text{IO}_6$ Correct composition for
 $\text{Na}_4\text{I}_2\text{O}_9 + 3\text{H}_2\text{O}$ (Kimmings)
 $\text{Na}_3\text{H}_2\text{IO}_6$ Correct composition for Na_3IO_5
 $+\text{H}_2\text{O}$ (Kimmings)

Strontium metaperiodate, $\text{Sr}(\text{IO}_4)_2 + 6\text{H}_2\text{O}$

Sol in H_2O

Strontium dimesoperiodate, $\text{Sr}_2\text{I}_2\text{O}_9$

Decomp by H_2O
 $+3\text{H}_2\text{O}$

Strontium mesoperiodate, $\text{Sr}_3(\text{IO}_5)_2$

Precipitate

Strontium orthoperiodate, $\text{Sr}_5(\text{IO}_6)_3$

(Rammelsberg, Pogg 44 577)

Thallic periodate, $3\text{Ti}_2\text{O}_3, \text{I}_2\text{O}_7 + 30\text{H}_2\text{O}$

Insol in H_2O Decomp by alkalis
 (Rammelsberg, B 3 361)

Thorium periodate

Precipitate Sol in $\text{HNO}_3 + \text{Aq}$

Uranous periodate

Precipitate, which quickly decomposes

Ytterbium periodate, $\text{YbIO}_5 + 2\text{H}_2\text{O}$

Hygroscopic (Clve, Z anorg 1902, 32
 136)

Yttrium periodate, $\text{Y}_2(\text{IO}) + 9\text{H}_2\text{O}$

Verv slightly sol (Clve)
 $3\text{Y}_2\text{O}_3, 2\text{I}_2\text{O}_7 + 6\text{H}_2\text{O}$ Precipitate (Clve)

Zinc dimesoperiodate, $\text{Zn}_2\text{I}_2\text{O}_9 + 6\text{H}_2\text{O}$

(Rammelsberg, Pogg 134 513)

Zinc periodate, $3\text{ZnO}, 2\text{I}_2\text{O}_7 + 7\text{H}_2\text{O}$

(Langlois)

Zinc duperiodate, $\text{Zn}_4\text{I}_2\text{O}_{11} + \text{H}_2\text{O}$

Easily sol in H_2O , sl acid with HNO_3
 (Langlois, A ch (3) 34 257)

Zinc dimesoduperiodate, $\text{Zn}_5\text{I}_4\text{O}_{19} + 14\text{H}_2\text{O}$ (?)

(Rammelsberg)

Zinc periodate, $9\text{ZnO}, 2\text{I}_2\text{O}_7 + 12\text{H}_2\text{O}$

(Rammelsberg)

Periodoplatinocyanhydric acid

Barium periodoplatinocyanide, $\text{BaPt}(\text{CN})_4\text{I}_2$
 $+x\text{H}_2\text{O}$

Easily sol in H_2O or alcohol (Holst, Bull
 Soc (2) 22 347)

Potassium periodoplatinocyanide,

$\text{K}_2\text{Pt}(\text{CN})_4\text{I}_2$

Permanent Easily sol in H_2O or alcohol

Permanganic acid, HMnO_4

Known only in solution, which decomposes
 by evaporation or warming

Permanganates

All permanganates are sol in H_2O , except-
 ing AgMnO_4 , which is sl sol

Ammonium permanganate, NH_4MnO_4

Sol in 12.6 pts H_2O at 15° (Aschoff)
 Sol in H_2O with decomp (Christensen,
 Z anorg 1900, 24 206)

Barium permanganate, $\text{Ba}(\text{MnO}_4)_2$

Sol in H_2O

Cadmium permanganate, $\text{Cd}(\text{MnO}_4)_2 + 8\text{H}_2\text{O}$

Stable (Klobb, Bull Soc 1894, (3) 11
 607)

Cadmium permanganate ammonia,

$\text{Cd}(\text{MnO}_4)_2, 4\text{NH}_3$

Sol in H_2O with decomp (Klobb, Bull
 Soc (3) 3 510)

Cæsium permanganate, CsMnO_4

Sl sol in cold, somewhat more easily sol
 in hot H_2O (Muthmann, B 1893, 26 1018)
 Solubility in H_2O

100 cm of the sat solution contain at

1°	19°	59°
0.097	0.23	1.25 g CsMnO_4

(Patterson, J Am Chem Soc 1906, 28
 1735)

Calcium permanganate, $\text{Ca}(\text{MnO}_4)_2 + 5\text{H}_2\text{O}$

Deliquescent

Cupric permanganate

Deliquescent

Cupric permanganate ammonia, $\text{Cu}(\text{MnO}_4)_2 \cdot 4\text{NH}_3$

Sol in H_2O with slow decomp (Klobb, Bull Soc (3) 3 509)

Didymium permanganate, $\text{D}_1(\text{MnO}_4)_3 + 21\text{H}_2\text{O}$

Sl sol in H_2O (Frerichs and Smith, A 191 331)

Has not been prepared (Cleve, B 11 912)

Lanthanum permanganate, $\text{La}(\text{MnO}_4)_3 + 21\text{H}_2\text{O}$

Ppt (Frerichs and Smith, A 191 331)

Has not been prepared (Cleve, B 11 910)

Lead permanganate

Sol in $\text{HNO}_3 + \text{Aq}$ (Forchhammer)

Lithium permanganate, $\text{LiMnO}_4 + 3\text{H}_2\text{O}$

Sol in 14 pts H_2O at 16° (Aschoff)

Magnesium permanganate, $\text{Mg}(\text{MnO}_4)_2$

CHCl_3 , CCl_4 , C_6H_6 , toluene, nitrobenzene, ether and CS_2 Sol in acetone, pyridine, and readily cetic acid Only pyridine and cetic acid are sufficiently stable to use the salt to be of any practical use for oxidation purposes (Michael and Garner, Am Ch J 1906, 35 268)

+6 H_2O Easily deliquescent

Nickel permanganate ammonia, $\text{Ni}(\text{MnO}_4)_2 \cdot 4\text{NH}_3$

Sol in H_2O with decomp (Klobb, Bull Soc (3) 3 509)

Potassium permanganate, KMnO_4

Sol in 16 pts H_2O at 15° (Mitscherlich)

Solubility in 100 pts H_2O at t°

t	Pts KMnO_4
0	2 83
9 8	4 31
19 8	6 34
24 8	7 59
29 8	9 03
34 8	10 67
40 0	12 56
45 0	14 58
50 0	16 89
55 0	19 33
65 0	25 03

(Baxter, J Am Chem Soc 1906, 28 1343)

Solubility in H_2O at t°

p = pts KMnO_4 sol in 100 pts H_2O at t°

t°	p	t°	p	t°	p	t°	p
0	2 76	19	6 26	38	11 74	57	20 29
1	2 90	20	6 48	39	12 12	58	20 83
2	3 06	21	6 70	40	12 51	59	21 39
3	3 22	22	6 94	41	12 91	60	21 96
4	3 38	23	7 18	42	13 31	61	22 55
5	3 54	24	7 42	43	13 72	62	23 15
6	3 70	25	7 68	44	14 14	63	23 76
7	3 86	26	7 94	45	14 56	64	24 38
8	4 04	27	8 20	46	15 00	65	25 01
9	4 22	28	8 48	47	15 44	66	25 67
10	4 40	29	8 77	48	15 88	67	26 34
11	4 58	30	9 07	49	16 32	68	27 03
12	4 78	31	9 37	50	16 77	69	27 84
13	4 98	32	9 69	51	17 23	70	28 56
14	5 18	33	10 01	52	17 71	71	29 30
15	5 38	34	10 34	53	18 21	72	30 05
16	5 60	35	10 68	54	18 71	73	30 81
17	5 82	36	11 02	55	19 23	74	31 57
18	6 04	37	11 38	56	19 75	74 5	31 95

(Worden, J Soc Chem Ind 1907, 26 453)

Solubility in H_2O

100 ccm of the sat solution contain at

0° 15° 30°

2 84 5 22 5 30 8 69 g KMnO_4

Sp gr of sat solution at $15^\circ = 1.035$

(Patterson, J Am Chem Soc 1906, 28 1735)

1 l sat $\text{KMnO}_4 + \text{Aq}$ contains at

0° 10° 20° 30° 40°

0 176 0 278 0 411 0 573 0 792 mol KMnO_4

53° 63° 70° 75°

1 154 1 429 1 812 2 047 mol KMnO_4

(Sackur, Z Elektrochem 1912, 18 723)

Solubility of KMnO_4 in H_2O at t°

Grams KMnO_4 sol in 100 grams H_2O	t
0 58	0 18
1 01	0 27
2 02	- 0 48
2 91	- 0 58
4 22	+10
5 20	+15
7 53	+25
11 61	+40
16 75	+50

(Voerman, C C 1906, I 125)

Sol in conc H_2SO_4 Deliquesces in liquid HCl , but does not dissolve (Gore)

Slowly sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Chevillat and Edwards)

Solubility in KOH+Ac at t° expressed in mol per l of the sat solution

t°	H ₂ O	1 n KOH	2 n KOH	4 n KOH	6 n KOH	8 n KOH	10 n KOH
0	0 176	0 050	0 031	0 027	0 023	0 017	0 012
10	0 278	0 112	0 068	0 048	0 042	0 028	0 016
20	0 411	0 179	0 119	0 079	19° 0 074	0 032	0 029
30	0 573	32° 0 316	32° 0 213	32° 0 148	0 114	32° 0 062	0 040
40	0 792	0 439	0 306	0 211	0 161	0 084	0 052
50	53° 1 154	50° 0 638	0 462	0 304	0 219	0 111	
63	1 429	61° 0 904	60° 0 639	0 427	0 291	61° 0 143	0 071
70	1 812	1 172	0 869	0 572	0 390	0 188	0 082
75	2 047			0 651			0 089
80		1 513	1 190		0 500	0 231	
84		1 655	1 352	83° 0 803	85° 0 572		
90					0 649	0 297	

(Sackur, Z Elektrochem 1912, 18 723)

Solubility in salts+Aq at t°

Solvent	t°	Mol KMnO ₄ in 1 l of sat solution
0 1-n $\frac{K_2CO_3}{2}$	0	0 1462
	25	0 4375
	40	0 7380
1-n $\frac{K_2CO_3}{2}$	0	0 0629
	25	0 2589
	40	0 5007
2-n $\frac{K_2CO_3}{2}$	0	0 0446
	40	0 3519
4-n $\frac{K_2CO_3}{2}$	0	0 0270
	25	0 0930
6-n $\frac{K_2CO_3}{2}$	0	0 0156
0 1-n KCl	0	0 1395
	25	0 4315
	40	0 7380
0 5-n KCl	0	0 0760
	25	0 3060
	40	0 5840
1-n KCl	0	0 0532
	25	0 220
	40	0 444
2-n KCl	0	0 0379
	25	0 1432
	40	0 288

(Sackur, Z Elektrochem 1912, 18 723)

Very sol in liquid NH₃ (Moissan, A ch 1895 (7) 6 428, Franklin, Am Ch J 1898, 20 829)

Decomp immediately by alcohol Sol in acetone (Eidmann, C C 1899 II, 1014, Naumann, B 1904, 37 4328)

Solubility in acetone+Aq at 13°

A = ccm acetone in 100 ccm acetone+Aq
1/5 KMnO₄ = millimols KMnO₄ in 100 ccm of the solution

A	1/5 KMnO ₄
0	148 5
10	162 2
20	177 3
30	208 2
40	257 4
50	289 7
60	316 8
70	328 0
80	312 5
90	227 0
100	67 6

(Herz and Knoch, Z anorg 1904, 41 317)

Sol in benzonitrile (Naumann B 1914, 47 1369)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3795)

Sol in ethyl acetate (Naumann, B 1904, 37 3601)

Rubidium permanganate, RbMnO₄

Solubility in H₂O lies between K and Cs salts (Muthmann, B 1893 26 1018)

Solubility in H₂O

100 ccm of the sat solution contain at

2 19° 60°
0 46 1 06 4 68 g RbMnO₄

(Patterson, J Am Chem Soc 1906, 28 1735)

Silver permanganate, Ag₂MnO₄

Sol in 109 pts cold H₂O and much less hot H₂O Decomp by boiling (Mitscherlich, Pogg 25 301)

Silver permanganate ammonia

Sl sol in cold, more easily in hot H₂O (Klobb, C R 103 384)

Sodium permanganate, $\text{NaMnO}_4 + 3\text{H}_2\text{O}$

Deliquescent Extremely sol in H_2O
Moderately sol in liquid NH_3 (Franklin,
Am Ch J 1898, 20 829)

Strontium permanganate, $\text{Sr}(\text{MnO}_4)_2 + 4\text{H}_2\text{O}$

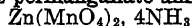
Deliquescent Sol in H_2O (Fromherz)

Thalious permanganate, TlMnO_4

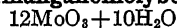
Sol in H_2O with decomp (R. Meyer, Z
anorg 1899, 22 188)

Zinc permanganate, $\text{Zn}(\text{MnO}_4)_2 + 6\text{H}_2\text{O}$

Deliquescent Verv sol in H_2O (Marten-
son, J B 1873 274)

Zinc permanganate ammonia,

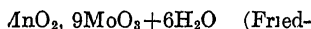
Sol in H_2O with decomp (Klobb, Bull
Soc (3) 3 509)

Permanganomolybdic acid, MnO_2 ,

Sol in H_2O Decomp by alkalis Sol in
alcohol (Péchar, C R 1897, 125 31)



and Samelson, Z anorg 1900,



(Fried-
heilmann, Mitt d Nat Ges Bern

1904 23)

+ $7\text{H}_2\text{O}$ (Friedheim and Samelson, Z
anorg 1900, 24 70)

$4(\text{NH}_4)_2\text{O}, \text{MnO}_2, 11\text{MoO}_3 + 7\text{H}_2\text{O}$ (Fried-
heim and Samelson)

$3(\text{NH}_4)_2\text{O}, \text{MnO}_2, 12\text{MoO}_3 + 5\text{H}_2\text{O}$ Sol
sol in cold H_2O Decomp by alkalis Insol
in alcohol (Péchar, C R 1897, 125 30)

**Ammonium manganous permanganomolyb-
date, $3[(\text{NH}_4)_2, \text{Mn}]\text{O}, \text{MnO}_2, 9\text{MoO}_3 +$
 $6\text{H}_2\text{O}$ and $+7\text{H}_2\text{O}$**

(Friedheim and Allemann, Mitt d Nat
Ges Bern 1904 23)

$3[(\text{NH}_4)_2, \text{Mn}]\text{O}, \text{MnO}_2, 10\text{MoO}_3 + 10\text{H}_2\text{O}$
(Friedheim and Samelson, Z anorg 1900, 24
94)

$4[(\text{NH}_4)_2, \text{Mn}]\text{O}, \text{MnO}_2, 10\text{MoO}_3 + 6\text{H}_2\text{O}$
(Friedheim and Samelson, Z anorg 1900, 24
75)

$4[(\text{NH}_4)_2, \text{Mn}]\text{O}, \text{MnO}_2, 11\text{MoO}_3 + 8\text{H}_2\text{O}$
(Friedheim and Samelson, Z anorg 1900, 24
72)

**Ammonium manganous potassium perman-
ganomolybdate, $2(\text{NH}_4)_2\text{O}, \text{MnO}, \text{K}_2\text{O},$
 $\text{MnO}_2, 10\text{MoO}_3 + 5\text{H}_2\text{O}$**

Very sl sol in cold, easily sol in H_2O at
70–80° (Rosenheim, Z anorg 1898, 16 79)

$3[(\text{NH}_4)_2, \text{K}_2, \text{Mn}]\text{O}, \text{MnO}_2, 9\text{MoO}_3 +$
 $7\text{H}_2\text{O}$ (Friedheim and Allemann, Mitt d
Nat Ges Bern 1904 23)

$4[(\text{NH}_4)_2, \text{K}_2, \text{Mn}]\text{O}, \text{MnO}_2, 10\text{MoO}_3 +$
 $5\text{H}_2\text{O}$ (Friedheim and Samelson, Z anorg
1900, 24 97)

$3[(\text{NH}_4)_2, \text{K}_2, \text{Mn}]\text{O}, \text{MnO}_2, 10\text{MoO}_3 +$
 $6\text{H}_2\text{O}$, and $+10\text{H}_2\text{O}$ (Friedheim and Samel-
son, Z anorg 1900, 24 92)

**Ammonium potassium permanganomolyb-
date, $3[(\text{NH}_4)_2, \text{K}_2]\text{O}, \text{MnO}_2, 8\text{MoO}_3 +$
 $4\text{H}_2\text{O}$**

(Friedheim and Samelson)

**Barium permanganomolybdate, $3\text{BaO}, \text{MnO}_2,$
 $9\text{MoO}_3 + 12\text{H}_2\text{O}$**

Ppt (Hall, J Am Chem Soc 1907, 29
700)

**Manganous potassium permanganomolyb-
date, $2\text{K}_2\text{O}, \text{MnO}, \text{MnO}_2, 9\text{MoO}_3 +$
 $8\text{H}_2\text{O}$**

True formula for $5\text{K}_2\text{O}, \text{Mn}_2\text{O}_3, 16\text{MoO}_3 +$
 $12\text{H}_2\text{O}$ of Struve (Friedheim and Samelson,
Z anorg 1900, 24 86)

$3[\text{K}_2, \text{Mn}]\text{O}, \text{MnO}_2, 9\text{MoO}_3 + 6\text{H}_2\text{O}$ (Fried-
heim and Allemann, Mitt d Nat Ges Bern
1904 23)

$2\text{K}_2\text{O}, 0\text{K}_2\text{O}, 0\text{K}_2\text{O}, \text{MnO}, \text{MnO}_2, 9\text{MoO}_3 + 7\text{H}_2\text{O}$
Ppt (Hall, J Am Chem Soc 1907, 29
700)

$4[\text{K}_2, \text{Mn}]\text{O}, \text{MnO}_2, 11\text{MoO}_3 + 7\text{H}_2\text{O}$
(Friedheim and Samelson, Z anorg 1900, 24
80)

**Manganous potassium sodium permanganomolyb-
date, $3[\text{K}, \text{Na}, \text{Mn}]\text{O}, \text{MnO}_2,$
 $8\text{MoO}_3 + 4\text{H}_2\text{O}$**

(Friedheim and Allemann, Mitt d Nat
Ges Bern 1904 48)

**Manganous sodium permanganomolybdate, $3[\text{Na}, \text{Mn}]\text{O}, \text{MnO}_2,$
 $9\text{MoO}_3 + 15\text{H}_2\text{O}$**

(Friedheim and Allemann)

**Potassium permanganomolybdate, $3\text{K}_2\text{O},$
 $\text{MnO}_2, 8\text{MoO}_3 + 3\text{H}_2\text{O}$**

Much less sol in H_2O than NH_4 comp
(Friedheim and Samelson, Z anorg 1900, 24
78)

+ $5\text{H}_2\text{O}$ Nearly insol in cold or hot H_2O
(Rosenheim and Itz, Z anorg 1898, 16 81)

$3\text{K}_2\text{O}, \text{MnO}_2, 9\text{MoO}_3 + 5\text{H}_2\text{O}$ (Friedheim
and Samelson, Z anorg 1900, 24 81)

+ $6\text{H}_2\text{O}$ (Hall, J Am Chem Soc 1907,
29 700)

$3\text{K}_2\text{O}, \text{MnO}_2, 12\text{MoO}_3 + 4\text{H}_2\text{O}$ Nearly
insol in cold H_2O Decomp by alkalis

Insol in alcohol (Péchar, C R 1897, 125
31)

**Silver permanganomolybdate, $3\text{Ag}_2\text{O}, \text{MnO}_2,$
 $9\text{MoO}_3 + 6\text{H}_2\text{O}$**

Ppt (Hall, J Am Chem Soc 1907, 29
700)

Sodium permanganomolybdate, $3\text{Na}_2\text{O}$, MnO_2 , $12\text{MoO}_3 + 13\text{H}_2\text{O}$

Efflorescent Verv sol in H_2O Decomp by alkalis Insol in alcohol (Péchar d, C R 125 31)

Permanganotungstic acid

Ammonium manganous permanganotungstate, $4(\text{NH}_4)_2\text{O}$, MnO , MnO_2 , $12\text{WO}_3 + 23\text{H}_2\text{O}$

Readily sol in H_2O Can be cryst therefrom (Rogers and Smith, J Am Chem Soc 1904, 26 1475)

Sodium permanganotungstate, $3\text{Na}_2\text{O}$, MnO_2 , $5\text{WO}_3 + 18\text{H}_2\text{O}$

Rather easily sol in hot H_2O Solution decomp on long boiling with separation of manganese peroxide (Just, B 1903, 36 3621)

Permolybdic acid, Mo_2O_7 , $5\text{H}_2\text{O} = \text{HMoO}_4 + 2\text{H}_2\text{O}$

Very sol in H_2O , and not decomp by boiling (Péchar d, A ch (6) 28 550)

$\text{H}_2\text{MoO}_6 + 1\frac{1}{2}\text{H}_2\text{O}$ "Ozo-molybdic acid" Only very sl sol in H_2O after being dried in the air Sol in fairly conc H_2SO_4 (Muthmann, B 1898, 31 1838)

$\text{H}_2\text{Mo}_2\text{O}_7$, H_2O_2 Sl sol in cold, more easily sol in hot H_2O , but does not separate on cooling Sol in dil acids, also in H_3PO_4 (Cammereis, Ch Z 1891, 15 957)

Ammonium permolybdate, $\text{NH}_4\text{MoO}_4 + 2\text{H}_2\text{O}$

Very sol in H_2O , sl sol in alcohol, but alcohol extracts it from H_2O , forming a very conc supersat solution, which is pptd by a crystal of NH_4MoO_4 , and only a sl amount remains in solution (Péchar d)

$3(\text{NH}_4)_2\text{O}$, 5MoO_3 , $2\text{MoO}_4 + 6\text{H}_2\text{O}$ (Muthmann, B 1898, 31 1837)

$3(\text{NH}_4)_2\text{O}$, $7\text{MoO}_4 + 12\text{H}_2\text{O}$ Ppt (Muthmann, Z anorg 1898, 17 76)

$3(\text{NH}_4)_2\text{O}$, $5\text{MoO}_4 + 6\text{H}_2\text{O}$ Ppt (Muthmann)

Ammonium nickel permolybdate ammonia, $(\text{NH}_4)_2\text{Ni}(\text{MoO}_4)_2$, 2NH_3

Decomp by H_2O Sol in dil NH_4OH (Briggs, Chem Soc 1904, 85 674)

Barium permolybdate, $\text{Ba}(\text{MoO}_4) + 2\text{H}_2\text{O}$

(Péchar d, A ch 1893, (6) 28 537)
 8BaO , 19MoO_3 , $2\text{H}_2\text{O}_2 + 13\text{H}_2\text{O}$ (Baerwald, Dissert 1885)

Cesium permolybdate, Cs_2O , $4\text{MoO}_4 + 6\text{H}_2\text{O}$

Sol hot H_2O (Muthmann, B 1898, 31 1841)

$3\text{Cs}_2\text{O}$, 7MoO_3 , $3\text{MoO}_4 + 4\text{H}_2\text{O}$ Ppt (Muthmann)

Copper permolybdate, $\text{Cu}(\text{MoO}_4)_2 + \text{H}_2\text{O}$

Insol in H_2O , easily sol in acids Sol in $\text{NH}_4\text{OH} + \text{Aq}$ with decomp (Péchar d)

Magnesium permolybdate, $\text{Mg}(\text{MoO}_4)_2 + 10\text{H}_2\text{O}$

Very sol in H_2O , sl sol in alcohol (Péchar d)

Mercurous permolybdate

Insol in H_2O or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Péchar d)

Potassium permolybdate, $\text{KMoO}_4 + 2\text{H}_2\text{O}$

Sl sol in cold, more in hot H_2O Sl sol in alcohol (Péchar d)

K_2O , 2MoO_3 , $\text{MoO}_4 + 3\text{H}_2\text{O}$ Ppt (Muthmann, Z anorg 1898, 17 77)

K_2O , MoO_4 , H_2O_2 Decomp by H_2O (Melikoff and Pissarjewsky, B 1898, 31 2449)

$\text{K}_2\text{MoO}_6 + 3\text{H}_2\text{O}$ Nearly insol in cold, easily sol in hot H_2O (Mazzuchelli and Zangrilli, Gazz ch it 1910, 40 (2) 56)

Rubidium permolybdates

"Rubidium ozo-molybdate"

$3\text{Rb}_2\text{O}$, $10\text{MoO}_4 + 14\text{H}_2\text{O}$ Ppt

Rb_2O , 2MoO_3 , $\text{MoO}_4 + 3\text{H}_2\text{O}$ May be recryst from $\text{H}_2\text{O}_2 + \text{Aq}$

$3\text{Rb}_2\text{O}$, 5MoO_3 , $2\text{MoO}_4 + 6\text{H}_2\text{O}$ Ppt

Rb_2O , 3MoO_3 , $\text{MoO}_4 + 4\text{H}_2\text{O}$ Ppt (Muthmann, B 1898, 31 1839-41)

Silver permolybdate, AgMoO_4

(Péchar d)

Sodium permolybdate, $\text{NaMoO}_4 + 3\text{H}_2\text{O}$

Very sol in H_2O , insol in alcohol, but behaves similarly to K salt (Péchar d)

Thallous permolybdate

Insol in H_2O (Péchar d, A ch 1893, (6) 28 559)

Pernitric acid, NO_3

See Nitrogen hexoxide

Silver pernitrate, basic, $3\text{Ag}_2\text{O}_2$, AgNO_3

Decomp H_2O (Mulder, R t c 1898, 17 142)

Perosmic acid

Potassium perosmate (?)

Sol in H_2O , but very easily decomp

Peroxyntic acid

Silver peroxyntate

Analysis of the black compound formed, under certain circumstances, in a silver voltameter when an aqueous solution of AgNO_3

is electrolyzed, points to the composition $3\text{Ag}_2\text{O}$, 5O , AgNO_3 , perhaps $2\text{Ag}_2\text{O}_4$, AgNO_3 or $3\text{Ag}_2\text{O}_2$, AgNO_3 (Mulder, Chem Soc 1896, 70 (2) 561)

Peroxyaminesulphonic acid

Potassium peroxyaminesulphonate, $\text{N}_2\text{O}_2(\text{SO}_3\text{K})_4$

Very unstable in H_2O Very sl sol in cold H_2O More stable in $\text{N}/10$ $\text{KOH} + \text{Aq}$
100 pts $\text{N}/10$ $\text{KOH} + \text{Aq}$ dissolve 0.62 pt of the salt at 3° , 6.6 pts at 29° (Haga, Chem Soc 1904, 85 86)

Perstannic acid, $\text{H}_2\text{Sn}_2\text{O}_7$

Known in colloidal state, sol in H_2O (Spring, Bull Soc (2) 51 180)

Potassium perstannate, $\text{KSnO}_4 + 2\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol (Tanatar, B 1905, 38 1185)

Sodium perstannate, $\text{NaSnO}_4 + 2\text{H}_2\text{O}$

Difficultly sol in H_2O with decomp (Tanatar)

Persulphuric acid, S_2O_7

See Sulphur heptoxide
 $\text{H}_2\text{S}_2\text{O}_8$

Sp gr of $\text{H}_2\text{S}_2\text{O}_8 + \text{Aq}$

Sp gr $14^\circ/14^\circ$	% $\text{H}_2\text{S}_2\text{O}_8$	g $\text{H}_2\text{S}_2\text{O}_8$ per l
1.042	7.2	75
1.096	15.4	169
1.154	23.6	272
1.246	35.2	438

(Elbs and Schonherr, Z Elektrochem 1896, 2 245)

Ammonium persulphate, $(\text{NH}_4)_2\text{S}_2\text{O}_8$

Very sol in H_2O 100 pts H_2O at 0° dissolve 58.2 pts $(\text{NH}_4)_2\text{S}_2\text{O}_8$ (Marshall, Chem Soc 59 771)

Solubility in H_2O equals 58% at 8° (Moreau, C C 1901, II 56)

100 pts H_2O dissolve 65 pts at ord temp (Elbs, J pr 1893, (2) 48 185)

Ammonium lead persulphate,

$(\text{NH}_4)_2\text{Pb}(\text{SO}_4)_3$

Decomp by H_2O Almost insol in cold H_2SO_4 of sp gr = 1.7 Sl sol in H_2SO_4 (sp gr = 1.7) at 50° Sol in fuming H_2SO_4 and in cold conc HCl Sol in acetic acid, in Na acetate + Aq acidified with acetic acid and in excess of cold 20% $\text{NaOH} + \text{Aq}$ (Elbs, Z Elektrochem 1900, 7 346)

Ammonium mercurous persulphate ammonia, $(\text{NH}_4)_2\text{HgS}_2\text{O}_8, 2\text{NH}_3$

Decomp by H_2O Insol in dil or conc hot or cold H_2SO_4 or HNO_3 Sol in HC (Tarugi, Gazz ch it 1903, 33 (1) 131)

Barium persulphate, $\text{BaS}_2\text{O}_8 + 4\text{H}_2\text{O}$

Very sol in H_2O 100 pts H_2O at 0° dissolve 39.1 pts BaS_2O_8 , or 52.2 pts $\text{BaS}_2\text{O}_8 \cdot 4\text{H}_2\text{O}$ Sol in absolute alcohol with pptn, $\text{BaS}_2\text{O}_8 + \text{H}_2\text{O}$ Insol in alcohol (Marshall)

Cadmium persulphate ammonia, $\text{CdS}_2\text{O}_8 \cdot 6\text{NH}_3$

Sol in H_2O (Barbieri, Z anorg 1911, 7 350)

Cæsium persulphate, $\text{Cs}_2\text{S}_2\text{O}_8$

Sol in H_2O 8.71–8.98 pts are sol in 10 pts H_2O at 23° (E F Smith, J Am Chem Soc 1899, 21 935)

Calcium persulphate

Very sol in H_2O (Marshall, J Soc Chem Ind 1897, 16 396)

Copper persulphate ammonia, $\text{CuS}_2\text{O}_8, 4\text{NH}_3$

Sol in H_2O (Barbieri, Z anorg 1911, 7 351)

Lead persulphate, PbS_2O_8

Decomp by H_2O Sl sol in H_2SO_4 , and pyrosulphuric acid Sol in cold conc HC Insol or sol with decomp in ill ord solvents (Flbs, Z Elektrochem 1900, 7 345)

Solubility of $\text{Pb}(\text{SO}_4)_2$ in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 22°
 v = moles of H_2SO_4 per mole of H_2O
 c = millimols $\text{Pb}(\text{SO}_4)_2$ in 1 l

v	c	v	c
0.304	0.00	0.555	37.2
0.348	1.8	0.699	40.5
0.387	3.0	0.917	23.3
0.407	3.9	1.11	23.7
0.435	5.3	1.54	49.6
0.477	14.4	2.08	83.5
0.515	23.3	2.13	88.2

(Dolezalek and Finckl, Z anorg 1906, 51 321)

+ $3\text{H}_2\text{O}$ Deliquescent Very sol in H_2O (Marshall)

Lead potassium persulphate, $\text{K}_2\text{Pb}(\text{SO}_4)_3$

Decomp by H_2O Almost insol in cold H_2SO_4 of sp gr = 1.7 Sl sol in H_2SO_4 (sp gr = 1.7) at 50° Sol in fuming H_2SO_4 , cold conc HCl , excess of cold 20% $\text{NaOH} + \text{Aq}$ acetic acid and in Na acetate + Aq acidified with acetic acid (Elbs, Z Elektrochem 1900, 7 346)

Nickel persulphate ammonia, NiS_2O_8 , 6NH_3
Unstable in the air Sol in H_2O with decomp (Barbieri, Z anorg 1911, **71** 351)

Potassium persulphate, $\text{K}_2\text{S}_2\text{O}_8$

100 pts H_2O at 0° dissolve 1.77 pts $\text{K}_2\text{S}_2\text{O}_8$, more sol in hot H_2O with very sl decomp Less sol in H_2O than any other persulphate (Marshall)

Rubidium persulphate, $\text{Rb}_2\text{S}_2\text{O}_8$

Sol in H_2O 3.32–3.49 pts are sol in 100 pts H_2O at 22.5° (E F Smith, J Am Chem Soc 1899, **21** 934)

Silver persulphate, basic, $5\text{Ag}_2\text{O}_2$, $2\text{Ag}_2\text{SO}_7$

Decomp by H_2O and acids (Mulder, C C 1899 I, 16)

Sodium persulphate, $\text{Na}_2\text{S}_2\text{O}_8$

Very sol in H_2O (Lowenherz)

Strontium persulphate

Verv sol in H_2O (Marshall, J Soc Chem Ind 1897, **16** 396)

Thallium persulphate, $\text{Tl}_2\text{S}_2\text{O}_8$

Very sol in H_2O (Smith, J Am Chem Soc 1898, **21** 936)

Zinc persulphate ammonia, ZnS_2O_8 , 4NH_3

Sol in H_2O (Barbieri, Z anorg 1911, **71** 350)

Persulphomolybdc acid

See Persulphomolybdc acid

Pertantallic acid, $\text{HTaO}_4 + n\text{H}_2\text{O}$

Ppt (Melikoff, Z anorg 1899, **20** 345)

Cæsium pertantalate, $\text{Cs}_4\text{Ta}_2\text{O}_{11}$

Ppt (E F Smith, J Am Chem Soc 1908, **30** 1667)

Calcium potassium pertantalate, $\text{CaK}_2\text{Ta}_2\text{O}_{11} + 4\frac{1}{2}\text{H}_2\text{O}$

Insol in cold H_2O , decomp by hot H_2O (Melikoff, Z anorg 1899, **20** 347)

Calcium sodium pertantalate, $\text{CaNa}_2\text{Ta}_2\text{O}_{11} + 4\frac{1}{2}\text{H}_2\text{O}$

Difficultly sol in H_2O (E F Smith, J Am Chem Soc 1908, **30** 1668)

Magnesium potassium pertantalate,

$\text{MgK}_2\text{Ta}_2\text{O}_{11} + 7\text{H}_2\text{O}$

Somewhat sol in H_2O (E F Smith)

Magnesium rubidium pertantalate,

$\text{MgRb}_2\text{Ta}_2\text{O}_{11} + 9\text{H}_2\text{O}$

Somewhat sol in H_2O (E F Smith)

Magnesium sodium pertantalate, $\text{MgNaTaO}_5 + 8\text{H}_2\text{O}$

Somewhat sol in H_2O (E F Smith)

Potassium pertantalate, $\text{K}_3\text{TaO}_8 + \frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O with decomp, sol in $\text{KOH} + \text{H}_2\text{O}_2 + \text{Ag}$, pptd by alcohol (Melikoff, Z anorg 1899, **20** 346)

Rubidium pertantalate, Rb_3TaO_8

Somewhat sol in H_2O (E F Smith)

Sodium pertantalate, $\text{Na}_3\text{TaO}_8 + \text{H}_2\text{O}$

Pptd by alcohol Sl sol in H_2O , decomp on heating with H_2O (Melikoff, Z anorg 1899, **20** 348)

$\text{NaTaO}_4 + \text{NaOTaO}_4 + 13\text{H}_2\text{O}$ Sol in $\text{H}_2\text{O}_2 + \text{Ag}$, pptd by alcohol (Melikoff, Z anorg 1899, **20** 349)

Pertitanic acid

Ammonium pertitanate, $(\text{NH}_4)_2\text{O}_2$, $\text{TiO}_3 + \text{H}_2\text{O}_2$

Fairly stable, decomp rapidly in aq solution (Melikoff, B 1898, **31** 955)

Barium pertitanate, BaO_2 , $\text{TiO}_3 + 5\text{H}_2\text{O}$

Sl sol in H_2O (Melikoff and Pissarjewsky, Z anorg 1898, **18** 59)

Potassium pertitanate, K_2O , TiO_3 , $\text{K}_2\text{O}_4 + 10\text{H}_2\text{O}$

Stable at zero, deliquesces and decomp at ordinary temp (Melikoff, B 1898, **31** 680)

Sodium pertitanate, Na_2O_2 , $\text{TiO}_3 + 3\text{H}_2\text{O}$

Sol in H_2O Pptd in alcohol (Melikoff, B 1898 **31** 955)

$4\text{Na}_2\text{O}_2$, $\text{Ti}_2\text{O}_7 + 10\text{H}_2\text{O}$ Decomp by H_2O (Melikoff)

Pertungstic acid

Barium pertungstate, BaO , 2WO_3 , $\text{O} + 6\text{H}_2\text{O}$

Insol in H_2O Decomp by acids (Kellner, Dissert 1909)

Cæsium pertungstate, $3\text{Cs}_2\text{O}$, 12WO_3 , $2\text{O} + 12\text{H}_2\text{O}$

Sl sol in cold, easily sol in warm H_2O (Kellner)

$5\text{Cs}_2\text{O}$, 12WO_3 , $24\text{O} + 11\text{H}_2\text{O}$

Sl sol in H_2O (Kellner)

Calcium pertungstate, 3CaO , 6WO_3 , $8\text{O} + 8\text{H}_2\text{O}$

Sol in H_2O (Kellner)

Lithium pertungstate, Li_2O , 2WO_3 , $2\text{O} + 6\text{H}_2\text{O}$

Sl sol in H_2O (Kellner)

$3\text{Li}_2\text{O}$, 4WO_3 , $\text{O} + 9\text{H}_2\text{O}$ Sol in H_2O (Kellner)

Magnesium pertungstate, 2MgO , 4WO_3 , $6\text{O} + 9\text{H}_2\text{O}$

Easily sol in H_2O (Kellner)

Potassium pertungstate, K_2O_4 , $\text{WO}_4 + \text{H}_2\text{O}$

Sol in H_2O with decomp, explodes in the air at 80° (Melikoff, B 1898, 31 634)

K_2O , 2WO_3 , $4\text{O} + 4\text{H}_2\text{O}$ Sol in H_2O from which it is ppt by alcohol and ether (Kellner)

$7\text{K}_2\text{O}$, 10WO_3 , $5\text{O} + 22\text{H}_2\text{O}$ Very sl sol in H_2O (Kellner)

Rubidium pertungstate, $2\text{Rb}_2\text{O}$, 4WO_3 , $\text{O} + 3\text{H}_2\text{O}$

Sol in H_2O with slow decomp (Kellner)
 $5\text{Rb}_2\text{O}$, 12WO_3 , $3\text{O} + 12\text{H}_2\text{O}$ Insol in H_2O (Kellner)

Sodium pertungstate, $\text{Na}_2\text{WO}_4 + \text{H}_2\text{O}$

Very sol in H_2O (Péchar, C R 112 1060)

$+2\text{H}_2\text{O}$ Sol in H_2O but easily decomp (Kellner)

$\text{Na}_2\text{W}_2\text{O}_9 + 6\text{H}_2\text{O}$ Sol in H_2O and can be cryst therefrom (Pissarjewsky, Z anorg 1900, 24 113)

Na_2O_2 , $\text{WO}_4 + \text{H}_2\text{O}_2$, $(\text{Na}_2\text{O}_2)\text{WO}_4 + 7\text{H}_2\text{O}$ Decomp in the air Sol in H_2O with decomp (Melikoff, B 1898, 31 633)

Na_2O_2 , WO_4 , H_2O_2 Very unstable Decomp in the air and by H_2O (Melikoff)

Strontium pertungstate, SrO , 2WO_3 , $\text{O} + 6\text{H}_2\text{O}$

(Kellner)

Peruranic acid, UO_6 , $x\text{H}_2\text{O}$ (?)

Known only in its salts

Ammonium peruranate, $(\text{NH}_4)_2\text{O}_2$, $(\text{UO}_4)_2 + 8\text{H}_2\text{O}$

Sol in H_2O , decomp by acids and by $\text{Al}(\text{OH})_3$ in aq solution (Melikoff, B 1897, 30 2904)

Ammonium uranyl peruranate, $(\text{NH}_4)_2(\text{UO}_2)\text{UO}_6 + 8\text{H}_2\text{O}$ (?)

Easily sol in H_2O (Fairley, Chem Soc (2) 31 134)

Barium peruranate, BaUO_6

As K salt (de Coninck, C C 1909, I 1970)

$(\text{BaO}_2)_2\text{UO}_4 + 8\text{H}_2\text{O}$ Decomp by H_2SO_4 and H_2CO_3 (Melikoff, B 1897, 30 2905)

$\text{BaO}_2(\text{UO}_4)_2 + 9\text{H}_2\text{O}$ Ppt (Melikoff)

Calcium peruranate, CaUO_6

As K salt (de Coninck)

Calcium peruranate, $(\text{CaO}_2)_2\text{UO}_4 + 10\text{H}_2\text{O}$

Ppt (Melikoff, B 1897, 30 2906)

Copper peruranate, $(\text{CuO}_2)_2\text{UO}_4$

Ppt (Melikoff)

Lead peruranate, $(\text{PbO})_2\text{UO}_4$, PbO , UO_3

Ppt (Melikoff)

Lithium peruranate, $(\text{Li}_2\text{O}_2)(\text{UO}_4)_2 + 8\text{H}_2\text{O}$

Sol in H_2O , decomp by acids and by $\text{Al}(\text{OH})_3$ in aq solution, very unstable (Melikoff)

Nickel peruranate, $(\text{NiO})_2\text{UO}_4$

Ppt (Melikoff)

Potassium peruranate, $\text{K}_4\text{UO}_6 + 10\text{H}_2\text{O}$ (?)

Unstable (Fairley)

K_2UO_6 (de Coninck, C R 1909, 148 1769)

$+3\text{H}_2\text{O}$ Decomp by H_2O , HCl and dil HNO_3 (Aloy, Bull Soc 1903, (3) 29 293)

Silver peruranate, $\text{Ag}_2\text{U}_2\text{O}_{11}$ (?)

(Guyard, Bull Soc (2) 1 95)

Does not exist (Albigoff, A 233 117)

Sodium peruranate, $\text{Na}_4\text{UO}_6 + 8\text{H}_2\text{O}$

Sol in H_2O Sl sol in alcohol (Fairley)

Na_2UO_6 As K salt (de Coninck, C C 1909, I 1970)

$+5\text{H}_2\text{O}$ Decomp by H_2O and HCl (Aloy, Bull Soc 1903, (3) 29 293)

$(\text{Na}_2\text{O}_2)_2\text{UO}_4 + 8\text{H}_2\text{O}$ Sol in H_2O , decomp by dil HCl , H_2SO_4 , and by $\text{Al}(\text{OH})_3$ in aq solution (Melikoff, B 1897, 30 2903)

Sodium uranyl peruranate, $\text{Na}_2(\text{UO}_2)\text{UO}_6 + 6\text{H}_2\text{O}$ (?)

Sol in H_2O (Fairley)

Pervanadic acid, HVO_4 (?)

Sol in H_2O (Pissarjewsky, C C 1902, II 565)

Ammonium pervanadate, NH_4VO_4

Sol in $\text{H}_2\text{O} + \text{Aq}$, insol in alcohol (Scheuer Z anorg 1895, 16 294)

$(\text{NH}_4)_2\text{VO}_6 + 2\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O , insol in alcohol (Melikoff, B 1909, 42 2292)

$(\text{NH}_4)_4\text{V}_2\text{O}_{11}$ Sol in $\text{H}_2\text{O} + \text{Aq}$, ppt from aq solution by alcohol (Melikoff, Z anorg 1899, 19 406)

Barium pervanadate, $\text{Ba}(\text{VO}_4)_2$

Sl sol in $\text{H}_2\text{O}_2 + \text{Aq}$ free from H_2SO_4 , insol in alcohol (Scheuer, Z anorg 1895, 16 288)

Cadmium pervanadate, $\text{Cd}(\text{VO}_4)_2$

Sl sol in $\text{H}_2\text{O}_2 + \text{Aq}$, insol in alcohol (Scheuer)

Calcium pervanadate, $\text{Ca}(\text{VO}_4)_2$

Sol in $\text{H}_2\text{O}_2 + \text{Aq}$, insol in alcohol (Scheuer)

Lead pervanadate, Pb(VO₄)₂

Sl sol in H₂O + Aq free from H₂SO₄, insol in alcohol (Scheuer)

Lithium pervanadate, LiVO₄

Sol in H₂O₂ + Aq, insol in alcohol (Scheuer)

Potassium pervanadate, KVO₄

Sol in H₂O₂ + Aq acidified with H₂SO₄, insol in alcohol (Scheuer)

K₂VO₆ + 2½H₂O Sol in H₂O, insol in alcohol (Mehkoff, B 1909, 42 2293)

3K₂O₂VO₄, 2KVO₄ + 2H₂O 0.855 g is sol in 100 g H₂O at 19°, sl sol in KOH + Aq, very stable in the air (Mehkoff and Pissarjewsky, Z anorg 1899, 19 408)

K₄V₂O₁₂ + 2H₂O (Mehkoff and Pissarjewsky, Z anorg 1899, 19 411)

K₄V₂O₁₃ + 3½H₂O Moderately sol in H₂O with slow decomp (Mehkoff and Pissarjewsky, Z anorg 1899, 19 410)

Silver pervanadate, AgVO₄

Sl sol in H₂O₂ + Aq free from H₂SO₄, sol in alcohol (Scheuer)

Sodium pervanadate, NaVO₄

Sol in H₂O₂ acidified with H₂SO₄, insol in alcohol (Scheuer)

Strontium pervanadate, Sr(VO₄)₂

Sl sol in H₂O₂ + Aq free from H₂SO₄, insol in alcohol (Schröder)

Philippium, Ph (?)

(Delafontaine, C R 87 559)
Consists of cerium and yttrium (Roscoe, B 15 1274)

Phosgene, CoCl₂

See Carbonyl chloride

Phosphame, PN₂H (?)

Insol in H₂O Insol in dil HNO₃ + Aq, gradually decomp by conc HNO₃ (Rose, Pogg 24 308)

Insol in conc HNO₃ (Pauli, A 123 236)
Sol in H₂SO₄ with decomp (Rose)

Insol in dil, but decomp by conc KOH or NaOH + Aq

Insol in alcohol or ether
Formula is perhaps P₃N₃H₄ (Sulzmann, B 6 494)

Phosphamic acid, PO$\begin{smallmatrix} \text{NH} \\ \text{OH} \end{smallmatrix}$

(Schiff)

Does not exist, but was impure *pyrophosphodiamic acid* (Gladstone) Also Mente (A 248 245)

Pyrophosphamic acid, P₂NH₂O₃ = P₂O₃(OH)₂NH₂

Deliquescent in moist air, easily sol in H₂O or alcohol, sl sol in ether (Gladstone, Chem Soc 3 152)

Correct composition is imidodiphosphoric acid, P₂NH₄O₃ = HO—PO$\begin{smallmatrix} \text{O} \\ \text{NH} \end{smallmatrix}>\text{PO—OH}$ (Mente, A 248 232)

Barium pyrophosphamate, Ba₃(P NH₂O₃)₂

Sol in HCl or HNO₃ + Aq, not in HC₂H₃O₂ + Aq (Gladstone and Holmes, Chem Soc (2) 2 233)

Cupric —, Cu₃(P₂NH₂O₃)₂ + 2H₂O

Ppt Decomp by cold KOH + Aq (Gladstone, Chem Soc 3 135)

Ferric —, Fe₃(P₂NH₂O₃)₂ + 2H₂O

Insol in dil acids Sol in conc H₂SO₄, and decomp by warming Easily sol in NH₄OH + Aq Decomp by KOH + Aq (Gladstone, Chem Soc 3 142)

Lead —, Pb₃(P₂NH₂O₃)₂ + 4H₂O

Insol in NH₄OH + Aq

Potassium —, K₃P₂NH₂O₃

Deliquescent Sol in H₂O Insol in alcohol (Gladstone A 76 85)

Silver —, Ag₃P NH₂O₃ + 5H₂O

Ppt

Zinc —, Zn₃(P₂NH₂O₃)₂

(Gladstone and Holmes, Chem Soc (2) 2 225)

Phosphamide, PON

See Phosphoryl nitride

PN₂H₃O

See Phosphoryl imidoamide

Triphosphamide, PON₃H₃

See Phosphoryl triamide

Trimetaphosphumic acid, P₃N₃H₃O₃

Sol in H₂O, aq solution does not coagulate albumen (Stokes, Am Ch J 1895, 17 275)

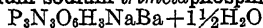
Ammonium trimetaphosphumate,

(NH₄)₃P₃N₃O₃H₃

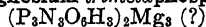
Sol in H₂O, insol in alcohol, unstable (Stokes, Am Ch J 1896, 18 643)

Barium trimetaphosphumate, Ba₃(P₃N₃O₃H₃)₂ + 4H₂O

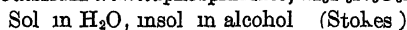
+ 6H₂O Sl sol in H₂O Easily sol in NH₄Cl + Aq and in NaCl + Aq (Stokes)

Barium sodium trimetaphosphumate,

Almost insol in H_2O , easily sol in $NH_4Cl + Aq$ and in $NaCl + Aq$ (Stokes)

Magnesium trimetaphosphumate,

Sol in H_2O , insol in alcohol, aq solution decomp on boiling (Stokes)

Potassium trimetaphosphumate,

Sol in H_2O , insol in alcohol (Stokes)

Silver trimetaphosphumate,

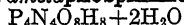
Ppt, sol in $NH_4OH + Aq$, insol in H_2O , sl sol in $HNO_3 + Aq$ (Stokes)

 α Sodium trimetaphosphumate,

183 pts are sol in 100 pts H_2O at 20° , very sol in hot H_2O , decomp by alkali on long boiling (Stokes)

 β Sodium trimetaphosphumate,

Sol in H_2O , insol in alcohol (Stokes)

Tetrametaphosphimic acid,

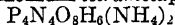
Very sl sol in H_2O , decomposes the sol salts of HCl , H_2SO_4 and HNO_3 (Stokes, Am Ch J 1895, 17 290)

100 pts H_2O at 20° dissolve 0.64 pt crystallized acid. Somewhat more sol in boiling H_2O (Stokes)

100 pts 10% $HNO_3 + Aq$ at 20° dissolve 0.26 pt of crystallized acid (Stokes)

Not decomp by boiling alkalies + Aq (Stokes, Am Ch J 1896, 18 785)

Insol in alcohol (Stokes, Am Ch J 1896, 18 784)

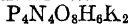
Ammonium tetrametaphosphumate,

Only sl sol in boiling H_2O , sol in excess of hot 5% HNO_3 (Stokes)

$P_4N_4O_8H_8(NH_4)_4 + 4H_2O$ Readily sol in H_2O , sl sol in $NH_4OH + Aq$ (Stokes)

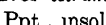
Barium tetrametaphosphumate,

Ppt, insol in H_2O (Stokes)

Potassium tetrametaphosphumate,

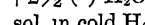
Sl sol in boiling H_2O , sol in cold dil $KOH + Aq$ (Stokes)

$P_4N_4O_8H_8K_4 (?)$ Very sol in H_2O (Stokes)

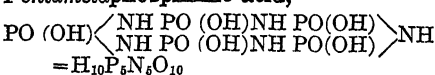
Silver tetrametaphosphumate,

Ppt, insol in H_2O , sl sol in $HNO_3 + Aq$ (Stokes)

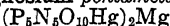
$P_4N_4O_8Ag_8$ Ppt, sol in $NH_4NO_3 + Aq$ (Stokes)

Sodium tetrametaphosphumate,

Sl sol in cold H_2O Easily sol in hot H_2O Ppt from aqueous solution by excess of alkali (Stokes)

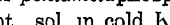
Pentametaphosphimic acid,

Sol in H_2O , pptd by alcohol (Stokes, Am Ch J 1898, 20 748)

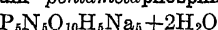
Magnesium pentametaphosphumate,

Ppt (Stokes)

$P_5N_5O_{10}H_{10}Mg_2 + 5H_2O$ Ppt, insol in alcohol, almost insol in H_2O , sl sol in conc acetic acid (Stokes)

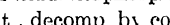
Silver pentametaphosphumate,

Ppt, sol in cold $KOH + Aq$ with decomp (Stokes)

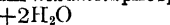
Sodium pentametaphosphumate,

Sol in H_2O , insol in alcohol (Stokes)

$P_5N_5O_{10}H_{10}Na_4 + 2H_2O$ Sol in 80% acetic acid, pptd by alcohol (Stokes)

Hexametaphosphimic acid**Silver hexametaphosphumate,**

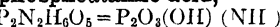
Ppt, decomp by cold $KOH + Aq$ (Stokes, Am Ch J 1896, 20 757)

Sodium hexametaphosphumate,

Sol in H_2O , pptd by alcohol (Stokes)

Phosphine

See Hydrogen phosphide

Pyrophosphodiamic acid,

Deliquescent. Easily sol in H_2O , alcohol, or ether. Sol in cold conc H_2SO_4 without decomp (Gladstone, Chem Soc 3 353)

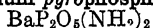
Correct composition is dimetadiphosphoric acid, $P_2N_2H_4O_4 + H_2O = H(O - P(O) = NH) = PO - OH$ (Metc)

Aluminum pyrophosphodiamic acid

Precipitate. Sol in $NH_4OH + Aq$ Insol in acids (Gladstone, A 76 82)

Ammonium —, $P_2O_3(OH)(NH_2)$

Very deliquescent in moist air. Sol in H_2O (Schiff, A 103 168)

Barium pyrophosphodiamate,

Precipitate SI sol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gladstone)

Calcium —, $\text{CaP}_2\text{O}_5(\text{NH}_2)_2$

Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{NH}_4\text{Cl} + \text{Aq}$ and acids (Gladstone and Holmes)

Lead —

Ppt Decomp by H_2O

Magnesium —

Ppt (Gladstone and Holmes)

Silver —, $\text{Ag}_2\text{P}_2\text{O}_5(\text{NH}_2)_2$

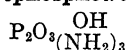
SI sol in H_2O Sol in $\text{HNO}_3 + \text{Aq}$ (Gladstone and Holmes)

Strontium —

Sol in acids and $\text{NH}_4\text{Cl} + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gladstone and Holmes, Chem Soc (2) 4 295)

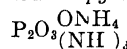
Zinc —, $\text{ZnP}_2\text{O}_5(\text{NH}_2)_2$

Ppt (Gladstone and Holmes)

Pyrophosphotriamic acid, $\text{P}_2\text{N}_3\text{H}_7\text{O}_4 =$ 

Decomp bv boiling H_2O or HCl Sol in conc H_2SO_4 upon heating (Gladstone and Holmes)

Correct formula is $\text{HO}-\text{PO} < \begin{array}{c} \text{NH} \\ | \\ \text{NH} \end{array} > \text{PO}-\text{NH}_2 = \text{dimidodiphosphomonamic acid}$ (Mente, A 248 241)

Ammonium pyrophosphotriamate,

Insol in H_2O (Gladstone and Holmes)

Barium —, $\text{BaP}_2\text{N}_3\text{H O}_4$

$\text{BaH}_2(\text{P}_2\text{N}_3\text{H}_6\text{O}_4)_2$ Decomp by $\text{HCl} + \text{Aq}$ (Gladstone, Chem Soc 4 6)

Cobaltous —, $\text{CoP}_2\text{N}_3\text{H}_6\text{O}_4$

Slowly decomp by dil $\text{H}_2\text{SO}_4 + \text{Aq}$, not by $\text{HCl} + \text{Aq}$ (Gladstone and Holmes, Chem Soc (2) 4 1)

Cupric —, $\text{CuP}_2\text{N}_3\text{H}_6\text{O}_4$

Insol in H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ (Gladstone and Holmes, Chem Soc (2) 4 1)

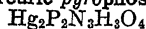
Ferrous —, $\text{FeH}_6(\text{P}_2\text{N}_3\text{H}_6\text{O}_4)_2$

Insol in dil acids (Gladstone, Chem Soc (2) 4 1)

Lead —, $\text{H}_2\text{Pb}_3(\text{P}_2\text{N}_3\text{H}_6\text{O}_4)_2$

Ppt (Gladstone and Holmes, Chem Soc (2) 4 1)

$\text{H}_4\text{Pb}_2(\text{P}_2\text{N}_3\text{H}_6\text{O}_4)_2$ Ppt (G and H)
 $\text{H}_4\text{Pb}(\text{P}_2\text{N}_3\text{H}_6\text{O}_4)_2$ (G and H)

Mercuric pyrophosphotriamate,

Insol in H_2O or dil HCl or $\text{HNO}_3 + \text{Aq}$ (Gladstone and Holmes, Chem Soc (2) 4 1)

Platinum —, $\text{Pt}_2\text{P}_2\text{N}_3\text{H}_6\text{O}_4$

Decomp by H_2O when freshly pptd (G and H)

Potassium —, $\text{KP}_2\text{N}_3\text{H}_6\text{O}_4$

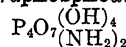
Almost insol in H_2O (Gladstone, Chem Soc 4 10)

Silver —, $\text{Ag}_3\text{P}_2\text{N}_3\text{H}_6\text{O}_4$

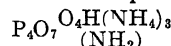
Ppt SI attacked by $\text{HC}_2\text{H}_3\text{O}_2$, decomp by HNO_3 or $\text{NH}_4\text{OH} + \text{Aq}$ into—
 $\text{AgH}_2\text{P}_2\text{N}_3\text{H}_6\text{O}_4$ Insol in H_2O Decomp bv HCl (Gladstone, Chem Soc (2) 4 1)

Zinc —

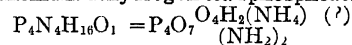
Insol in H_2O (Gladstone and Holmes)

Tetraphosphodiamic acid, $\text{P}_4\text{N}_2\text{H}_8\text{O}_{11} =$ 

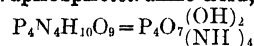
Known only as NH_4 salt

Ammonium tetraphosphodiamate,

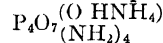
Very deliquescent, and sol in H_2O (Gladstone)

Ammonium dihydrogen tetraphosphodiamate,

Insol in cold, easily sol in hot H_2O and dil acids (Gladstone)

Tetraphosphotetramic acid,

Sol in H_2O Insol in alcohol (Gladstone)

Ammonium tetraphosphotetramate,

Sol in H_2O , and precipitated from solution by alcohol (Gladstone)

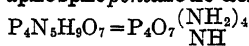
Silver —, $\text{Ag}_6\text{P}_4\text{N}_4\text{H}_4\text{O}_9$

Ppt

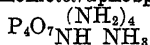
$\text{Ag}_4\text{P}_4\text{N}_4\text{H}_4\text{O}_9$ Ppt

Ammonium phosphoarseniovanadico-vanadiotungstate

See Arseniophosphovanadico-vanadiotungstate, ammonium

Tetraphosphopentazotic acid,

Insol in H_2O Decomp gradually by boiling with H_2O (Gladstone)

Ammoniotetraphosphopentazotic acid ('),

Decomp by H_2O (Gladstone)

Uptic tetraphosphopentazotate

(Gladstone, Chem Soc (2) 6 261)

Lead —

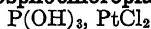
(Gladstone, Chem Soc (2) 6 261)

Potassium —, $KOP_4N_5H_9O_6$

Insol in H_2O (Gladstone, Chem Soc (2) 268)

Phosphoboric acid, H_3BO_3 , $H_3PO_4 = BPO_4 + 3H_2O$

Not decomp by boiling H_2O or conc acids
Sol in boiling solution of caustic alkalis
Vogel, N Repert Pharm 18 611)

Phosphochloroplatinous acid,

See Chloroplatinophosphoric acid

Phosphochromic acid**Ammonium phosphochromate, $3(NH_4)_2O$, P_2O_5 , $8CrO_3 + H_2O$**

Sol in H_2O with decomp (Friedheim, Z anorg 1894, 6 284)

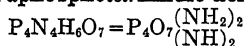
Potassium phosphochromate, $2K_2O$, P_2O_5 , $4CrO_3 + H_2O$

Sol in H_2O but cannot be cryst therefrom without decomp Can be cryst without decomp from H_2O containing phosphoric acid (Friedheim)

$3K_2O$, P_2O_5 , $8CrO_3$ Sol in H_2O but cannot be cryst therefrom without decomp (Blondel, C R 1894, 118 194)

Phosphohypophosphotungstic acid**Potassium sodium phosphohypophosphotungstate, $9K_2O$, Na_2O , $4P_2O_5$, $2PO_2H_3$, $26WO_3 + 23H_2O$**

Precipitate Easily sol in hot H_2O (Gibbs, Am Ch J 7 313)

Tetraphosphotetrimidic acid,

Known only in its salts (Gladstone)

Silver tetraphosphotetrimidate

Ppt (Gladstone)

Phosphoiodic acid, P_2O_5 , $18I_2O_5 + 4H_2O$

Decomp by H_2O (Chrétien, A ch 1898, (7) 15 389)

Ammonium phosphiodate, $4(NH_4)_2O$, P_2O_5 , $18I_2O_5 + 12H_2O$

Sol in H_2O Sl sol in conc $H_3PO_4 + Aq$ (Chrétien)

Lithium phosphiodate, $3Li_2O$, P_2O_5 , $18I_2O_5 + 11H_2O$

Sol in H_2O Sl sol in conc $H_3PO_4 + Aq$ (Chrétien)

Potassium phosphiodate, $4K_2O$, P_2O_5 , $18I_2O_5 + 5H_2O$

Decomp by a small amt of H_2O , sol in a large amt Sl sol in conc $H_3PO_4 + Aq$ (Chrétien)

Sodium phosphiodate, $6Na_2O$, P_2O_5 , $18I_2O_5 + 5H_2O$

Sol in H_2O Sl sol in conc $H_3PO_4 + Aq$ (Chrétien)

Phosphoiridic acid

See Chlorophosphoiridic acid

Phospholuteotungstic acid, $H_6PW_8O_{29}$

See under Phosphotungstic acid

Phosphomolybdic acid, P_2O_5 , $18MoO_3 + xH_2O$

"Phospholuteomolybdic acid"

Deliquescent Sol in H_2O in all proportions (Kehrmann, Z anorg 1894, 7 418)

$3H_2O$, P_2O_5 , $20MoO_3 + 21H_2O$ Very sol in H_2O Sol in ether By vaporization of H_2O solution crystals with $44H_2O$, or from a strong solution in conc $HNO_3 + Aq$, with $19H_2O$, are obtained, also crystals with 38 , and $48H_2O$ are known (Dribav, C R 66 704)

According to Rammelsberg (B 10 177b) formula is $3H_2O$ P_2O_5 , $22MoO_3$

According to Gibbs (Am Ch J 3 317) formula is $3H_2O$, P_2O_5 , $24MoO_3 + 59H_2O$

Finkner (B 11 1638) gives the formula as $3H_2O$, P_2O_5 , $24MoO_3 + 58H_2O$, also with $29H_2O$

P_2O_5 , $20MoO_3 + 52H_2O$ Sol in dry ether with evolution of heat, and subsequent separation into two layers, the upper consisting of pure ether, and lower of a solution of acid in ether Sp gr of lower layer, when sat at 13° , is 1.3 On warming lower layer, ether separates out and forms an upper layer This redissolves on cooling and shaking The lower layer is insol in H_2O and miscible with alcohol

100 pts ether thus dissolve 80.6 pts acid at 0°, 84.7 pts at 81°, 96.7 pts at 19.3°, 103.9 pts at 27.4°, 107.9 pts at 32.9° (Parmentier, C R **104** 688)

P_2O_5 , 22MoO₃+57H₂O, and +58H₂O (Pohl, Dissert **1906**)

P_2O_5 , 23MoO₃+61H₂O (Pohl)

P_2O_5 , 24MoO₃+61H₂O (Miolati, C C **1903**, 11 789)

+64H₂O (Pohl)

Diphosphopentamolybdic acid,

$H_4P_2Mo_5O_{23} = 3H_2O, P_2O_5, 5MoO_3$

Not known in free state

Ammonium phosphomolybdate, (NH₄)₂O,

$P_2O_5, 2MoO_3+2H_2O$

(Meschorier, Dissert **1894**)

2(NH₄)₂O, P₂O₅, 4MoO₃+5H₂O (Friedheim, Z anorg **1894**, 6 33)

+6H₂O (Perlberger, Dissert **1904**)

(NH₄)₃PO₄, 11MoO₃+6H₂O

Formula is (NH₄)₃PO₄, 10MoO₃+1½H₂O, according to the older authorities

Scarcely sol in H₂O or aqueous acid solutions. Easily sol in ammonia, and alkalies + Aq (Svanberg and Struve, J pr **44** 291)

It is almost completely insol in a mixture of (NH₄)₂MoO₄+Aq, and dil HNO₃+Aq. Absolutely insol in a dil nitric acid solution of ammonium nitrate (Richters, Z anal **10** 471)

Solubility is increased even in presence of ammonium molybdate and free HNO₃ by HCl, ammonium, and other chlorides, tartaric acid, or large quantities of ammonium oxalate or citrate. Not precipitated in presence of excess of H₃PO₄ (Fresenius, Z anal **3** 446)

Sol in 10,000 pts H₂O at 16°, in 6600 pts H₂O containing 1 vol % HNO₃, in 550 pts HCl+Aq of 1.12 sp gr, in 620 pts alcohol of 0.80 sp gr, in 190 pts HNO₃+Aq (sp gr = 1.2) at 50°, in 5 pts conc H₂SO₄ at 100°, in 3 pts NH₄OH+Aq of 0.95 sp gr (Lggertz, J pr **79** 496)

Sol in 21,186 pts H₂O, 35,117 pts dil alcohol, and 13,513 pts strong alcohol (Hehner, Analyst, **1879** 23)

According to Sonnenschein, the solubility is increased by much H₂O or alcohol, alkaline hydroxides, carbonates, ortho-, pyro-, and metaphosphates, ammonium borate, hyposulphate, thiosulphate, acetate, arsenate, and arsenite, potassium sodium tartrate, ammonium oxalate, orthophosphoric acid, and sulphuric acid. It is not increased by ammonium molybdate or sulphate, potassium sulphate, acid tartrate, acid oxalate, nitrate, or chlorate, iodide, chloride, or bromide, sodium bromide or nitrate, nitric, hydrochloric, boric, tartaric, oxalic, and dilute sulphuric acids (Sonnenschein, J pr **53** 342)

Sol in hot H₂O. Sol in cold caustic alkalies, alkali carbonates, and phosphates,

NH₄Cl, and (NH₄)₂C₂O₄+Aq, sl sol in (NH₄)₂SO₄, KNO₃, and KCl+Aq, very sl sol in NH₄NO₃+Aq. Sol in K₂SO₄, Na₂SO₄, NaCl, MgCl₂, H₂SO₄, HCl, and conc or dil HNO₃+Aq

Presence of (NH₄)₂MoO₄ totally changes the effect of acid liquids, insol in dil HNO₃ or H₂SO₄+Aq containing (NH₄)₂MoO₄, but somewhat sol in HCl+Aq, even in presence of that salt. Tartaric acid and similar organic substances totally prevent the precipitation of this salt (Eggertz in Fresenius' Quant anal)

5(NH₄)₂O, 48MoO₃, 2P₂O₅+17H₂O = 3(NH₄)₂O, 24MoO₃, P₂O₅+2(NH₄)₂O, H₂O, 24MoO₃, P₂O₅+16H₂O. Formula of above salt according to Gibbs

3(NH₄)₂O, 22MoO₃, P₂O₅+9H₂O, or 12H₂O

8(NH₄)₂O, H₂O, 60MoO₃, 3P₂O₅+11H₂O. Sl sol in H₂O

3(NH₄)₂O, 16MoO₃, P₂O₅+14H₂O. Insol in cold, sol with decomp in hot H₂O. Sol in NH₄OH+Aq (Gibbs, Am Ch J **3** 317)

5(NH₄)₂O, P₂O₅, 16MoO₃ (Meschorier, Dissert **1894**)

3(NH₄)₂O, P₂O₅, 18MoO₃+14H₂O. Sol in H₂O. The aqueous solution is stable at ordinary temp for several days, but when warmed ordinary ammonium phosphomolybdate separates (Kehrmann, Z anorg **1894**, **7** 414)

3(NH₄)₂O, P₂O₅, 28MoO₃+8H₂O. 100 g H₂O dissolve 0.0238 g at 15°. 1 pt is sol at 15° in 4206 pts H₂O, 7300 pts 5% NH₄NO₃+Aq, 4930 pts 1% HNO₃+Aq (de Lucchi, Rass Min **1910**, **32** 21)

9(NH₄)₂O, 2P₂O₅, 28MoO₃+8H₂O (Meschorier, Dissert **1894**)

Ammonium diphosphopentamolybdate,

2(NH₄)₃PO₄, 5MoO₃+7H₂O = 3(NH₄)₂O, 5MoO₃, P₂O₅+7H₂O

Easily sol in hot, less in cold H₂O (Zenlner, J pr **58** 256)

5(NH₄)₂O, H₂O, 10MoO₃, 2P₂O₅+6H₂O = 3(NH₄)₂O, 5MoO₃, P₂O₅+2(NH₄)₂O, H₂O, 5MoO₃, P₂O₅+6H₂O. Sol in H₂O (Gibbs, Am Ch J **1895**, **17** 87)

+8H₂O (Perlberger)

+18H₂O (Mazzuchelli and Zungilli, Gazz ch it **1910** **40** (2) 55)

5(NH₄)₂O, P₂O₅, 10MoO₃+13H₂O, and +14H₂O (Perlberger, Dissert **1904**)

Ammonium barium phosphomolybdate,

3(NH₄)₂O, 30BaO, P₂O₅, 30MoO₃

Insol precipitate (Seligsohn, J pr **67** 475)

Ammonium cadmium phosphomolybdate,

5(NH₄)₂O, CdO, P₂O₅, 6MoO₃+8H₂O

(Perlberger, Dissert **1904**)

3(NH₄)₂O, 2CdO, 2P₂O₅, 9MoO₃+14H₂O (Perlberger)

Ammonium cobaltous phosphomolybdate,
 $(\text{NH}_4)_2\text{O}, 2\text{CoO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 10\text{H}_2\text{O}$

Decomp by cold H_2O Sol in acids and hot H_2O (Arnfeld, Dissert 1898)

$4(\text{NH}_4)_2\text{O}, \text{CoO}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 12\text{H}_2\text{O}$
 Sl sol in cold, easily sol in hot H_2O (Arnfeld)

Ammonium manganous phosphomolybdate,
 $(\text{NH}_4)_2\text{O}, 2\text{MnO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 20\text{H}_2\text{O}$

Decomp by H_2O , but dissolves clear on heating (Arnfeld)

$4(\text{NH}_4)_2\text{O}, \text{MnO}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 13\text{H}_2\text{O}$
 (Arnfeld)

$5(\text{NH}_4)_2\text{O}, 10\text{MnO}, 2\text{P}_2\text{O}_5, 20\text{MoO}_3 + 10\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs, Am Ch J 1895, 17 87)

Ammonium nickel phosphomolybdate,
 $(\text{NH}_4)_2\text{O}, 2\text{NiO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 10\text{H}_2\text{O}$

Decomp by cold, but sol in hot H_2O (Arnfeld)

$(\text{NH}_4)_2\text{O}, \text{NiO}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 12\text{H}_2\text{O}$
 Very sol in H_2O (Arnfeld)

Ammonium potassium phosphomolybdate,
 $6(\text{NH}_4)_2\text{O}, 15\text{K}_2\text{O}, 2\text{P}_2\text{O}_5, 60\text{MoO}_3 + 12\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol (Seligsohn, J pr 67 477)

Ammonium sodium phosphomolybdate,
 $6(\text{NH}_4)_2\text{O}, 15\text{Na}_2\text{O}, 2\text{P}_2\text{O}_5, 60\text{MoO}_3 + 18\text{H}_2\text{O}$

Sol in much boiling H_2O Insol in alcohol (Seligsohn, J pr 67 474)

Barium phosphomolybdate, $3\text{BaO}, \text{P}_2\text{O}_5, 24\text{MoO}_3 + x\text{H}_2\text{O}$

Moderately sol in cold, very easily sol in hot H_2O Decomp in aqueous solution at ordinary temp on standing (Kehrmann, Z anorg 1894, 7 414)

Cæsium phosphomolybdate, $3\text{Cs}_2\text{O}, \text{P}_2\text{O}_5, 6\text{MoO}_3 + 8\text{H}_2\text{O}$

Ppt (Ephraim, Z anorg 1910, 65 240)

$2\text{Cs}_2\text{O}, \text{P}_2\text{O}_5, 14\text{MoO}_3 + 3\text{H}_2\text{O}$ Difficultly sol in H_2O (Ephraim)

$3\text{Cs}_2\text{O}, \text{P}_2\text{O}_5, 21\text{MoO}_3 + 4\text{H}_2\text{O}$ (?) (Ephraim)

Calcium potassium phosphomolybdate, $2\text{CaO}, 3\text{K}_2\text{O}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 22\text{H}_2\text{O}$

(Friedheim, Z anorg 1893, 4 293)

Cobaltous phosphomolybdate, $2\text{CoO}, \text{P}_2\text{O}_5, 4\text{MoO}_3 + 2\text{H}_2\text{O}$

(Arnfeld, Dissert 1898)

$3\text{CoO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 16\frac{1}{2}\text{H}_2\text{O}$, and $+17\frac{1}{2}\text{H}_2\text{O}$ Extremely sol in H_2O (Arnfeld)

$3\text{CoO}, \text{P}_2\text{O}_5, 18\text{MoO}_3 + 38\text{H}_2\text{O}$ Sol in H_2O (Arnfeld)

$3\text{CoO}, \text{P}_2\text{O}_5, 24\text{MoO}_3 + 56\text{H}_2\text{O}$, and $+60\text{H}_2\text{O}$
 Sol in H_2O (Arnfeld)

Cobaltous potassium phosphomolybdate,
 $\text{K}_2\text{O}, 2\text{CoO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 15\text{H}_2\text{O}$

(Arnfeld)
 $4\text{K}_2\text{O}, \text{CoO}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 12\text{H}_2\text{O}$ Sl sol in cold, easily sol in hot H_2O (Arnfeld)

Croceocobaltic phosphomolybdate, $24\text{MoO}_3, \text{P}_2\text{O}_5, [\text{Co}(\text{NH}_3)_4(\text{NO}_2)_2]\text{H}_2\text{O}, 2\text{H}_2\text{O} + 21\text{H}_2\text{O}$

Sl sol in cold, easily in hot H_2O (Gibbs, Am Ch J 3 317)

Gold phosphomolybdate ammonia, $12\text{Au}_2\text{O}_3, 7\text{P}_2\text{O}_5, 3\text{MoO}_3, 24\text{NH}_3 + 21\text{H}_2\text{O}$

Insol in H_2O (Gibbs, Am Ch J 1895, 17 172)

Gold sodium phosphomolybdate ammonia,
 $5\text{Au}_2\text{O}_3, \text{Na}_2\text{O}, \text{P}_2\text{O}_5, 11\text{MoO}_3, 15\text{NH}_3 + 10\text{H}_2\text{O}$

Sol in dil HCl Almost insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gibbs)

Lead phosphomolybdate, $23\text{PbMoO}_4, \text{P}_2\text{O}_5, 2\text{PbPO}_4 + 7\text{H}_2\text{O}$

Sol in 500,000 pts H_2O Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in KOH, NaOH , or $\text{HNO}_3 + \text{Aq}$, somewhat less sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Beuf, Bull Soc (3) 3 852)

Lithium phosphomolybdate, $12\text{Li}_2\text{O}, 4\text{P}_2\text{O}_5, 5\text{MoO}_3 + 18\text{H}_2\text{O}$

Partially sol in H_2O (Ephraim, Z anorg 1909, 64 233)

$3\text{Li}_2\text{O}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 16\text{H}_2\text{O}$ Ppt (Ephraim, Z anorg 1910, 65 233-6)

$3\text{Li}_2\text{O}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 17\text{H}_2\text{O}$ Ppt (F)

$5\text{Li}_2\text{O}, 2\text{P}_2\text{O}_5, 8\text{MoO}_3 + 28\text{H}_2\text{O}$ Insol in H_2O (E)

$3\text{Li}_2\text{O}, \text{P}_2\text{O}_5, 12\text{MoO}_3 + 18\text{H}_2\text{O}$ Ppt (F)

$3\text{Li}_2\text{O}, \text{P}_2\text{O}_5, 18\text{MoO}_3 + 27\text{H}_2\text{O}$ Sol in H_2O (E)

Manganous phosphomolybdate, $3\text{MnO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 20\text{H}_2\text{O}$

Very sol in H_2O Sl sol in alcohol (Arnfeld)

$3\text{MnO}, \text{P}_2\text{O}_5, 18\text{MoO}_3 + 38\text{H}_2\text{O}$ Sol in H_2O (Arnfeld)

$3\text{MnO}, \text{P}_2\text{O}_5, 24\text{MoO}_3 + 58\text{H}_2\text{O}$, and $+60\text{H}_2\text{O}$ Easily sol in H_2O (Arnfeld)

Manganous potassium phosphomolybdate,
 $2\text{MnO}, 3\text{K}_2\text{O}, 2\text{P}_2\text{O}_5, 10\text{MoO}_3 + 30\text{H}_2\text{O}$

Sol in hot H_2O (Arnfeld)

Manganous sodium $7\text{MnO}, 9\text{Na}_2\text{O}, \text{H}_2\text{O}$

Nearly insol in cold H_2O Sol in boiling H_2O but decomp thereby (Gibbs, Am Ch J 1895, 17 85)

Nickel phosphomolybdate, $2\text{NiO}, \text{P}_2\text{O}_5, 4\text{MoO}_3 + x\text{H}_2\text{O}$

Ppt (Arnfeld)
 $3\text{NiO}, \text{P}_2\text{O}_5, 5\text{MoO}_3 + 20\text{H}_2\text{O}$ Decomp by H_2O (Arnfeld)

3NiO , P_2O_5 , $18\text{MoO}_3 + 34\text{H}_2\text{O}$ Sol in H_2O (Arnfeld)
 3NiO , P_2O_5 , $24\text{MoO}_3 + 58\text{H}_2\text{O}$, and $+60\text{H}_2\text{O}$ Efflorescent Sol in H_2O (Arnfeld)

Nickel potassium phosphomolybdate, K_2O , 2NiO , P_2O_5 , $5\text{MoO}_3 + 13\text{H}_2\text{O}$

Decomp by cold H_2O , but goes into solution by boiling (Arnfeld)

$4\text{K}_2\text{O}$, NiO , $2\text{P}_2\text{O}_5$, $10\text{MoO}_3 + 12\text{H}_2\text{O}$ Sol in H_2O (Arnfeld)

Potassium phosphomolybdate, K_3PO_4 ,

$11\text{MoO}_3 + 1\frac{1}{2}\text{H}_2\text{O} = 3\text{K}_2\text{O}$, P_2O_5 , $22\text{MoO}_3 + 3\text{H}_2\text{O}$

Insol in H_2O Easily sol in alkalis (Svanberg and Struve)

100 g H_2O dissolve 0.007 g at 30° , 100 g 10% $\text{HNO}_3 + \text{Aq}$ dissolve 0.204 g at 30° (Donk, Bull 90, Bur of Chem, U S Dept of Agric 1905)

According to older authorities the formula is K_3PO_4 , $10\text{MoO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$

$+6\text{H}_2\text{O}$ (Rammelsberg)
 $2\text{K}_2\text{O}$, H_2O , 24MoO_3 , $\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$ Sl sol in cold H_2O

$5\text{K}_2\text{O}$, H_2O , 44MoO_3 , $2\text{P}_2\text{O}_5 + 21\text{H}_2\text{O}$ (Gibbs Am Ch J 3 317)

$3\text{K}_2\text{O}$, P_2O_5 , $18\text{MoO}_3 + 11\text{H}_2\text{O}$, and $+15\text{H}_2\text{O}$ (Elias)

$+14\text{H}_2\text{O}$ Sl sol in cold, very easily sol in hot H_2O Can be cryst from hot H_2O (Kehrmann, Z anorg 1894, 7 416)

$3\text{K}_2\text{O}$, P_2O_5 , $17\text{MoO}_3 + 12\text{H}_2\text{O}$ Moderately sol in H_2O (Fluiss, Dissert 1906)

$5\text{K}_2\text{O}$, P_2O_5 , $17\text{MoO}_3 + x\text{H}_2\text{O}$ Aqueous solution decomp rapidly in the cold (Kehrmann, Z anorg 1894, 7 423)

$4\text{K}_2\text{O}$, $2\text{H}_2\text{O}$, 9MoO_3 , $\text{P}_2\text{O}_5 + 18\text{H}_2\text{O}$ (Zenkner)

$5\text{K}_2\text{O}$, H_2O , 10MoO_3 , $\text{P}_2\text{O}_5 + 19\text{H}_2\text{O}$ Easily sol in H_2O (Rammelsberg, B 10 1776)

$6\text{K}_2\text{O}$, 15MoO_3 , P_2O_5 Insol in H_2O Sol in $\text{KOH} + \text{Aq}$ (Rammelsberg)

K_2O , P_2O_5 , $2\text{MoO}_3 + 13\text{H}_2\text{O}$ Very sol in H_2O (Friedheim Z anorg 4 287)

$2\text{K}_2\text{O}$, P_2O_5 , $4\text{MoO}_3 + 8\text{H}_2\text{O}$ Sol in H_2O (Friedheim)

Potassium diphosphopentamolybdate, $3\text{K}_2\text{O}$, P_2O_5 , $5\text{MoO}_3 + 7\text{H}_2\text{O}$

Sol in H_2O , precipitated by HNO_3 or $\text{HCl} + \text{Aq}$ (Zenkner, J pr 58 261)

$2\text{K}_2\text{O}$, P_2O_5 , $5\text{MoO}_3 + 6\text{H}_2\text{O}$ (Friedheim)

Potassium phosphomolybdate nitrate, $2\text{K}_3\text{PO}_4$

(Debray, C R 66 706)

Rubidium phosphomolybdates

$7\text{Rb}_2\text{O}$, P_2O_5 , $22\text{MoO}_3 + 12\text{H}_2\text{O}$, $3\text{Rb}_2\text{O}$, P_2O_5 , $20\text{MoO}_3 + 12\text{H}_2\text{O}$, $6\text{Rb}_2\text{O}$, P_2O_5 , $18\text{MoO}_3 + 10\text{H}_2\text{O}$, $5\text{Rb}_2\text{O}$, $2\text{P}_2\text{O}_5$, $9\text{MoO}_3 + 13\text{H}_2\text{O}$, $7\text{Rb}_2\text{O}$, $3\text{P}_2\text{O}_5$, $10\text{MoO}_3 + 15\text{H}_2\text{O}$ (Ephraim, Z anorg 1910, 65 237 9)

Silver phosphomolybdate, $7\text{Ag}_2\text{O}$, P_2O_5 , $20\text{MoO}_3 + 24\text{H}_2\text{O}$

Ppt Sol in dil $\text{HNO}_3 + \text{Aq}$, forming—
 $2\text{Ag}_2\text{O}$, P_2O_5 , $20\text{MoO}_3 + 7\text{H}_2\text{O}$ Sl sol in H_2O (Rammelsberg)

Formula of first salt is—

$7\text{Ag}_2\text{O}$, 22MoO_3 , $\text{P}_2\text{O}_5 + 14\text{H}_2\text{O}$ Sol in hot H_2O , but solution is quickly decomp (Gibbs, Am Ch J 3 317)

$7\text{Ag}_2\text{O}$, P_2O_5 , 24MoO_3 Ppt (Miolati, J pr 1908 (2) 77 451)

Silver diphosphopentamolybdate,

$\text{Ag}_5\text{Mo}_5\text{P}_2\text{O}_{23} + 7\text{H}_2\text{O}$

Easily sol in H_2O (Debray, C R 66 706)

Sodium phosphomolybdate

Sol in H_2O and $\text{HNO}_3 + \text{Aq}$ (Sonnen-schein, A 104 45)

Na_2O , $5\text{H}_2\text{O}$, P_2O_5 , $18\text{MoO}_3 + x\text{H}_2\text{O}$
 $2\text{Na}_2\text{O}$, $4\text{H}_2\text{O}$, P_2O_5 , $18\text{MoO}_3 + x\text{H}_2\text{O}$

$3\text{Na}_2\text{O}$, P_2O_5 , $18\text{MoO}_3 + 26\text{H}_2\text{O}$ (Friedheim)

$3\text{Na}_2\text{O}$, P_2O_5 , $24\text{MoO}_3 + 42\text{H}_2\text{O}$ (Rosenheim and Pinsker, Z anorg 1911, 70 79)

Sodium diphosphopentamolybdate, $3\text{Na}_2\text{O}$, P_2O_5 , $5\text{MoO}_3 + 14\text{H}_2\text{O}$

Easily sol in H_2O (Debray)

Sodium auramine phosphomolybdate, Na_2O , $5\text{Au}_2\text{O}_3$, $2\text{P}_2\text{O}_5$, 11MoO_3 , 15NH_3

Sol in hot H_2O Very sol in hot HCl (Gibbs, Am Ch J 1895, 17 171)

Metaphosphomolybdic acid

Ammonium monometaphosphomolybdate, $3(\text{NH}_4)_2\text{O}$, $4\text{NH}_4\text{PO}_3$, $10\text{MoO}_3 + 9\text{H}_2\text{O}$

Very sol in H_2O (Gibbs, Am Ch J 7 392)

Barium hexametaphosphomolybdate, BaO , $\text{Ba}_3(\text{PO}_3)_6$, $14\text{MoO}_3 + 55\text{H}_2\text{O}$

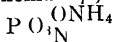
Sol in H_2O (Gibbs)

Pyrophosphonitrylic acid, $\text{P}(\text{HNO})_2 =$



Not known in free state

Ammonium pyrophosphonitrylate,



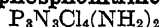
Insol but gradually decomp by H_2O (Gladstone)

Potassium —, $\text{K}_2\text{P}_2\text{NO}_4$

Insol in H_2O (Gladstone)

Silver —, $\text{Ag}_2\text{P}_2\text{NO}_4$

Ppt

Triphosphonitrilic chloramide,

Sol in H_2O without decomp, sol in ether, alcohol, sl sol in benzene (Stokes, Am Ch J 1895, 17 287)

Triphosphonitrilic tetrachlorhydrin,

Sol in ether, alcohol, and H_2O insol in benzene and CS_2 (Stokes, Am Ch J 1895, 17 286)

Triphosphonitrilic chloride, $P_3N_3Cl_6$

Sol in glacial acetic acid and H_2SO_4 100 pts ether dissolve 46.5 pts at 20° (Liebig)

Insol in light petroleum, sol in benzene (Stokes, Am Ch J 1897, 19 783)

Tetraphosphonitrilic chloride, $P_4N_4Cl_8$

Sol in alcohol, ether, benzene, H_2SO_4 Sl sol in H_2O with decomp 100 pts ether dissolve 12.3 pts at 20° (Stokes, Am Ch J 1895, 17 281)

Pentaphosphonitrilic chloride, $(PNCl_2)_5 = P_5N_5Cl_{10}$

Sol in benzene, light petroleum, acetic acid, ether, CS_2 , insol in H_2O (Stokes, Am Ch J 1897, 19 790)

Hexaphosphonitrilic chloride, $(PNCl_2)_6 = P_6N_6Cl_{12}$

Sol in benzene, light petroleum, ether, CS_2 , insol in H_2O (Stokes)

Heptaphosphonitrilic chloride, $(PNCl_2)_7 = P_7N_7Cl_{14}$

Sol in benzene, light petroleum, ether, CS_2 insol in H_2O , sol in alcohol with decomp (Stokes)

Polyphosphonitrilic chloride, $(PNCl_2)_x$

Depolymerizes on distillation, insol in benzene and light petroleum and all neutral solvents, sol in H_2O with decomp (Stokes)

Phosphonitrilochloramide, $P_2NCl_3(NH_2)$

Slowly sol in H_2O with decomp Insol in ether and CS_2 Sl sol in boiling CCl_4 (Besson and Rosset, C R 1908, 146 1149)

Phosphonium bromide, PH_4Br

Decomp violently by H_2O

Phosphonium chloride, PH_4Cl

(Ogier, Bull Soc (2) 32 483)

Phosphonium titanium chloride, $2PH_4Cl, 3TiCl_4$

Decomp by H_2O , HCl , or alkalis + Aq (Rose)

Phosphonium iodide, PH_4I

Decomp by H_2O , alkalis, alcohol, etc (Rose, Pogg 46 636)

Decomp by PCl (Wilde, B 16 217)

Phosphonium sulphate (?)

Deliquescent, very unstable (Besson, C R 109 644)

Phosphoramidate, $P(NH_2)_3$

Insol in NH_4Br , $3NH_3$, sol in NH_4I , $3NH_3$ (Hugot, C R 1905, 141 1235)

Phosphortriamide, PON_3H_3

See Phosphoryl triamide

Phosphoric acid, anhydrous, P_2O_5

See Phosphorus pentoxide

Metaphosphoric acid, HPO_3

Sol in H_2O Not isolated (Fleitmann, Pogg 78 362)

Deliquescent Sol in H_2O , but aqueous solution decomp into H_3PO_4 , slowly in the cold, but more rapidly on heating Conc solutions decomp more rapidly than when dil (Grahn, A ch 1903, (7) 30 203)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Dimetaphosphoric acid, $H_2P_2O_6$

Not isolated (Fleitmann)

Trimetaphosphoric acid, $H_3P_3O_9$

Sol in H_2O , the solution is permanent in the cold, but on evaporation it is quickly decomp to H_3PO_4

Tetrametaphosphoric acid, $H_4P_4O_{12}$

Not isolated

Hexametaphosphoric acid, $H_6P_6O_{18}$

(Glacial phosphoric acid)

Deliquescent, easily sol in H_2O with evolution of heat and conversion into H_3PO_4 Not easily sol in presence of slight impurities

Insol in liquid NH_3 (Gore, Am Ch J 1895, 20 824)

Orthophosphoric acid, H_3PO_4

Very sol in H_2O

100 pts of the solution contain at

26.23° 27.02° 29.42° 29.77°
95.9 95.98 96.15 96.11 pts H_3PO_4 ,

37.65° 39.35 42.30° (mpt)

97.5 98.48 100 pts H_3PO_4

(Smith and Menzies, J Am Chem Soc 1909, 31 1186)

See also $10H_3PO_4 + H_2O$, and $2H_3PO_4 + H_2O$

Sp gr of $H_3PO_4 + Aq$ containing

10 20 30 40 50 % P_2O_5

1.1 1.23 1.39 1.6 1.85

(Dalton)

Sp gr of $\text{H}_3\text{PO}_4 + \text{Aq}$

Sp gr	% P_2O_5	Sp gr	% P_2O_5	Sp gr	% P_2O_5
1 508	49 60	1 328	36 15	1 144	17 89
1 492	48 41	1 315	34 82	1 136	16 95
1 476	47 10	1 302	33 49	1 124	15 64
1 464	45 63	1 293	32 71	1 113	14 33
1 453	45 38	1 285	31 94	1 109	13 25
1 442	44 13	1 276	31 03	1 095	12 18
1 434	43 95	1 268	30 13	1 081	10 44
1 426	43 28	1 257	29 16	1 073	9 53
1 418	42 61	1 247	28 24	1 066	8 62
1 401	41 60	1 236	27 30	1 056	7 39
1 392	40 86	1 226	26 36	1 047	6 17
1 384	40 12	1 211	24 79	1 031	4 15
1 376	39 66	1 197	23 23	1 022	3 03
1 369	39 21	1 185	22 07	1 014	1 91
1 356	38 00	1 173	20 91	1 006	0 79
1 347	37 37	1 162	19 73		
1 339	36 74	1 153	18 81		

(Watts, C N 12 160)

Specific gravity of $\text{H}_3\text{PO}_4 + \text{Aq}$ containing6 12 18 % H_3PO_4 ,

1 0333 1 0388 1 1065

24 36 54 % H_3PO_4

1 1463 1 2338 1 3840

(Schiff, A 113 183)

Sp gr of $\text{H}_3\text{PO}_4 + \text{Aq}$ at 15° a = sp gr if %
is P_2O_5 , b = sp gr if % is H_3PO_4

%	a	b	%	a	b
1	1 009	1 0054	31	1 288	1 1962
2	1 017	1 0109	32	1 299	1 2036
3	1 025	1 0164	33	1 310	1 2111
4	1 032	1 0220	34	1 321	1 2186
5	1 039	1 0276	35	1 333	1 2262
6	1 047	1 0333	36	1 345	1 2338
7	1 055	1 0390	37	1 357	1 2415
8	1 063	1 0449	38	1 369	1 2493
9	1 071	1 0508	39	1 381	1 2572
10	1 080	1 0567	40	1 393	1 2651
11	1 089	1 0627	41	1 407	1 2731
12	1 098	1 0688	42	1 420	1 2812
13	1 106	1 0749	43	1 432	1 2894
14	1 115	1 0811	44	1 445	1 2976
15	1 124	1 0874	45		1 3059
16	1 133	1 0937	46		1 3143
17	1 142	1 1001	47		1 3227
18	1 151	1 1065	48		1 3313
19	1 161	1 1130	49		1 3399
20	1 171	1 1196	50		1 3486
21	1 182	1 1262	51		1 3573
22	1 192	1 1329	52		1 3661
23	1 202	1 1397	53		1 3750
24	1 212	1 1465	54		1 3840
25	1 223	1 1534	55		1 3931
26	1 233	1 1604	56		1 4022
27	1 244	1 1674	57		1 4114
28	1 254	1 1745	58		1 4207
29	1 265	1 1817	59		1 4301
30	1 277	1 1889	60		1 4395

(Schiff, calculated by Gerlach, Z anal 8 292)

Sp gr of $\text{H}_3\text{PO}_4 + \text{Aq}$ at 17.5°

% P_2O_5	Sp gr	% P_2O_5	Sp gr	% P_2O_5	Sp gr
1	1 007	24	1 208	47	1 476
2	1 014	25	1 219	48	1 491
3	1 021	26	1 229	49	1 505
4	1 028	27	1 240	50	1 521
5	1 036	28	1 250	51	1 536
6	1 044	29	1 261	52	1 551
7	1 053	30	1 272	53	1 566
8	1 061	31	1 282	54	1 581
9	1 070	32	1 293	55	1 597
10	1 078	33	1 304	56	1 613
11	1 086	34	1 315	57	1 629
12	1 095	35	1 326	58	1 645
13	1 103	36	1 338	59	1 661
14	1 112	37	1 350	60	1 677
15	1 120	38	1 362	61	1 693
16	1 129	39	1 374	62	1 709
17	1 139	40	1 386	63	1 725
18	1 148	41	1 398	64	1 741
19	1 158	42	1 410	65	1 758
20	1 168	43	1 423	66	1 775
21	1 178	44	1 436	67	1 792
22	1 188	45	1 448	68	1 809
23	1 198	46	1 462		

(Hager, Adjumenta varia, Leipzig, 1876)

Table for correction to be added or subtracted
for 1° change in temperature

% P_2O_5	Corr	% P_2O_5	Corr
10-14	0 00035	36-45	0 00068
15-25	0 0004	46-55	0 00082
26-35	0 00052	56-68	0 001

(Hager)

Sp gr of $\text{H}_3\text{PO}_4 + \text{Aq}$

G equivalents H_3PO_4 per litre	t°	Sp gr t°, t°
0 002572	17 714	1 001552
0 005142	17 706	1 0003051
0 01025	17 685	1 000595
0 02042	17 683	1 001158
0 03056	17 687	1 001708
0 04065	17 704	1 002252
~ 37	17 663	1 002790
0 10046	17 696	1 005412
0 19951	17 749	1 010560
0 29716	17 701	1 015584
0 49057	17 719	1 025469
0 5070	17 58	1 02627
5 0700	17 84	1 25162

(Kohlrausch, W Ann 1894, 53 29)

Miscible with conc $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol
in 30 pts warm creosote
1 cc of a sat solution of ether in H_2O dis-
solves 0 0886 grams H_3PO_4

1 cc of a sat solution of H_2O in ether dissolves 0.00033 grams H_3PO_4 .

Solutions of H_3PO_4 in H_2O containing less than 0.434 grams acid per 1 cc lose an insignificant amount of acid to ether when agitated therewith (Berthelot, C R 1896, 123 345).

The composition of the hydrates formed by H_3PO_4 at different dilutions is calculated from determinations of the lowering of the fr-pt produced by H_3PO_4 and of the conductivity and sp gr of $H_3PO_4 + Aq$ (Jones, Am Ch J 1905, 34 331).

$10H_3PO_4 + H_2O$ Solubility in H_2O

100 pts of the solution contain at

24 11°	24 38°	24 40°
94 78	94 80	94 84 pts H_3PO_4 ,

24 81°	25 41°	25 85°
94 95	95 26	95 54 pts H_3PO_4

(Smith and Menzies, J Am Chem Soc 1909, 31 1186)

$2H_3PO_4 + H_2O$ Solubility in H_2O

100 pts of the solution contain at

-16 3°	0 5°	14 95°	24 03°	27 0°
76 7	78 7	81 7	85 7	87 7 pts H_3PO_4 ,

29 15°	29 35° (mpt)
90 5	91 6 pts H_3PO_4 ,

28 5°	27 0°	25 41°
92 5	93 4	94 1 pts H_3PO_4

Retroflex part of curve

(Smith and Menzies, J Am Chem Soc 1909, 31 1186)

Pyrophosphoric acid (Diphosphoric acid),
 $H_4P_2O_7$

Very sol in H_2O . The solution may be kept without change, but on heating it is converted into H_3PO_4 .

The acid in solution gradually changes to H_3PO_4 , the conversion being more rapid with more concentrated solutions (Montemartini and Egidi, Gazz ch it 1902, 32 (1) 381).

Phosphoric acid, $H_3P_2O_5$ (?)

Sol in H_2O (Joly, C R 100 447)

Phosphates

The phosphates of NH_4 , K, Na, Li, Cs, and Rb are sol in H_2O , with the exception of certain metaphosphates, the other phosphates excepting neutral Ti salts, are nearly insol in H_2O , excepting when an excess of H_3PO_4 is present. The latter are all sol in $HNO_3 + Aq$.

(a) **Metaphosphates**

Monometaphosphates Only alkali monometaphosphates are known, and they are all insol in H_2O .

Dimetaphosphates Alkali dimetaphosphates and some double salts containing an alkali as one of the bases are sol in H_2O , the rest are sl sol or insol in H_2O .

Trimetaphosphates All salts are sol in H_2O .

Tetrametaphosphates The alkali salts are sol in H_2O , the others are insol.

Hexametaphosphates The alkali salts are sol, the others insol, in H_2O , but are mostly sol in Na hexametaphosphate + Aq.

(b) **Orthophosphates** K, Na, Li, Cs, and Rb orthophosphates are sol in H_2O . All the others are insol in H_2O , but sol in excess of H_3PO_4 and $HNO_3 + Aq$, less easily sol in $HC_2H_3O_2 + Aq$. Pb, Al, and Fe₂ phosphates are insol in $HC_2H_3O_2 + Aq$. Sl sol in NH_4 salts + Aq, especially $NH_4Cl + Aq$, from which solution they are pptd by $NH_4OH + Aq$. Orthophosphates insol in H_2O are also insol in an excess of alkali orthophosphates + Aq.

All orthophosphates are insol, or very sl sol in alcohol.

(c) **Pyrophosphates** Alkali pyrophosphates are sol in H_2O , the others are insol in H_2O , but are mostly sol in an excess of Na pyrophosphate + Aq.

Aluminum metaphosphate, $Al_2(PO_3)_6$

Insol in H_2O and conc acids (Muddiell, A 61 59)

Aluminum orthophosphate, basic, $3Al_2O_3 \cdot P_2O_5 + 18H_2O$

Min *Evansite*
 $4Al_2O_3 \cdot 3P_2O_5 + 18H_2O$ Ppt Insol in H_2O (Rammelsberg)

$2Al_2O_3 \cdot P_2O_5$
+ $3H_2O$ Min *Angeleite*
+ $5H_2O$ Min *Kalaite* (Turquoise) Sol in $HCl + Aq$

+ $6H_2O$ Decomp by H_2O (Hautefeuille, J pr (2) 37 111)

Min *Pegante* More or less sol in HCl , and $HNO_3 + Aq$

+ $8H_2O$ Ppt (Mumloc, A 159 275)

Min *Fischerite* Sl attacked by HCl or $HNO_3 + Aq$, sol in $H_2SO_4 + Aq$

$3Al_2O_3 \cdot 2P_2O_5 + 8H_2O$, or $12H_2O$ Sol in acids, even after ignition (Millot, C R 82 89)

+ $10H_2O$ Min *Cæulocolute* Sol in acids

+ $12H_2O$ Min *Wavellite*

Aluminum orthophosphate, $Al(PO_4)$

Crystalline Not attacked by conc HCl or $HNO_3 + Aq$, difficultly by hot conc H_2SO_4 (de Schulten, C R 98 1583)

Ignited $Al_2(PO_4)_3$ is sl decomp by H_2O , so that solubility determinations are variable. For an extended discussion, see original paper (Cameron and Hurst, 1904, 26 898)

+4H₂O Easily sol in mineral acids, insol in acetic and other organic acids Easily sol in KOH+Aq, but is reprecipitated by NH₄Cl+Aq Sol in NH₄OH+Aq Sol in a large amount of alum+Aq (Rose), in aluminum acetate and other aluminum salts +Aq (Fleischer, Z anal 6 28) More sol than ferric phosphate in ammonium oxalate or citrate+Aq (Millot)

Acid NH₄ citrate+Aq dissolves 3% of the P₂O₅, neutral NH₄ citrate+Aq dissolves 6.6% of the P₂O₅, ammoniacal NH₄ citrate+Aq dissolves completely in 25 min (Erlenmeyer, B 14 1869)

Sol in NH₄OH+Aq, especially in presence of alkali phosphates (de Koninck, Z anal 23 90)

Not pptd in presence of alkali tartrates or citrates, sugar, glycerine, etc

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Min *Variscite* Very quickly sol in warm conc HCl+Aq

+5H₂O Min *Zepharovitchite*

+8H₂O Min *Gibbsite*

Aluminum orthophosphate, acid, 2Al₂O₃, 3P₂O₅+16H₂O

Insol in acids after being ignited (Millot, Bull Soc (2) 22 244)

+4H₂O, and 6H₂O Insol in H₂O or alcohol (Hautefeuille and Margottet, J pr (2) 37 111)

Al₂O₃, 2P₂O₅+8H₂O Insol in acids or aqua regia after being ignited (Millot)

2Al₂O₃, 5P₂O₅+14H₂O Decomp by cold H₂O into—

4Al₂O₃, 7P₂O₅+9H₂O Decomp by hot H₂O (Erlenmeyer, A 194 200)

Al₂O₃, 3P₂O₅+3H₂O=Al₂(H₂PO₄)₃ Deliquescent, completely sol in a little cold H₂O, and conc solution can be boiled without decomp, but dil solution (1 20) separates Al₂(PO₄)₂ on boiling, which redissolves on cooling, the more quickly the more dilute the original solution (Erlenmeyer, A 194 198)

Aluminum pyrophosphate, Al₄(P O₇)₃+10H₂O

Precipitate Sol in mineral acids, and Na₄P₂O₇+Aq, insol in acetic acid Sol in KOH+Aq, sol in NH₄OH+Aq, but when dissolved in HCl+Aq is reprecipitated by NH₄OH+Aq, and is not redissolved in an excess thereof (Schwarzenberg, A 65 147)

Sol in alum+Aq (Rose, Pogg 76 19)

Aluminum pyrometaphosphate, Al₂O₃, 2P₂O₅ (Hautefeuille and Margottet, C R 96 849)

Aluminum ammonium dihydrogen orthophosphate, NH₄H₂PO₄, AlPO₄

Partially decomp by H₂O Sol in acids and alkalies Nearly insol in 50% acetic acid (Cohen, J Am Chem Soc 1907, 29 720)

Aluminum calcium phosphate, Al₂O₃, 3CaO, P₂O₅+3H₂O

Min *Tamstockite*

2Al₂O₃, 6CaO, 3P₂O₅+3H₂O Min *Karro-lite*

Aluminum calcium phosphate sulphate, 3Al₂O₃, SO₃, Ca₃(PO₄)₂+6H₂O

Min *Svanbergite* Scarcely attacked by HCl+Aq, and only sl by H₂SO₄+Aq

Aluminum ferrous magnesium phosphate, (Mg, Fe) Al₂P₂O₁₀+4H₂O

Min *Childrenite* Slowly sol in HCl+Aq

Min *Eosphorite* Sol in HNO₃ or HCl+Aq

(Mg, Fe) Al₂P₂O₉+H₂O Min *Lazulite* Only sl attacked by acids, when not previously ignited

Aluminum lithium phosphate, Al(PO₄)₂, 4Li₂PO₄+30H₂O

Precipitate (Berzelius)

Insol in H₂O, easily sol in acids

Aluminum magnesium phosphate

Min *Lazulite*

See Phosphate, aluminum ferrous magnesium

Aluminum potassium phosphate, Al₂O₃, K₂O, 2P₂O₅

Insol in acids (Ouvrard, A ch (6) 16 289)

2Al₂O₃, 2K₂O, 3P₂O₅ (Ouvrard)

Aluminum silver metaphosphate, 2Al₂O₃, Ag₂O, 4P₂O₅

(Hautefeuille and Margottet, C R 96 849, 1142)

Aluminum sodium pyrophosphate,

Al Na (P O)₂

Insol in H₂O and acids (Wallroth)

Nearly insol in acids (Ouvrard A ch (6) 16 338)

2Al₂O₃, 3Na₂O, 3P₂O₅ Sol in HNO₃+Aq (Ouvrard)

Al₄(P₂O₇)₃, 2Na₄P O₇+30H₂O

Very difficultly sol in H₂O (Pahl, Bull Soc (2) 22 122)

Aluminum phosphate lithium fluoride,

2Al(PO₄)₂, 3LiF

Min *Amblygonite* Sl attacked by HCl+Aq, more easily by H₂SO₄+Aq

Ammonium metaphosphate, NH₄PO₃

Insol in H₂O (Fleitmann, Pogg 78 345)

Ammonium dimetaphosphate, (NH₄)₂(PO₃)₂

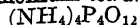
Sol in 1 15 pts cold or hot H₂O (Fleitmann, Pogg 78 245) More sol in dil alcohol than Na or K salt

Sol in 0.9 pts H_2O , easily sol in acids especially by boiling with conc H_2SO_4 (Glatzel, Dissert 1880)

Ammonium trimetaphosphate, $(NH_4)_3P_3O_9$

Very sol in H_2O (Lindbom, Acta Lund 1873 15)

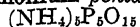
Ammonium tetrametaphosphate,



Sol in H_2O (Warschauer, Z anorg 1903, 36 177)

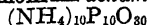
+4 H_2O Much more sol in H_2O than the K or Na salt 1 pt is sol in 8 pts H_2O (Glatzel, Dissert 1880)

Ammonium pentametaphosphate,



Sol in H_2O (Tammann, J pr 1892, (2) 45 455)

Ammonium dekametaphosphate,



Very sl sol in H_2O , 100 g H_2O dissolved 1.20-1.54 g in 2 months Easily sol in hot H_2O with decomp (Tammann, J pr 1892, (2) 45 448)

+12 H_2O (Tammann, J pr 1892, (2) 45 465)

Ammonium orthophosphate, $(NH_4)_3PO_4 + 3H_2O$

Difficultly sol in H_2O
Less sol in H_2O than $(NH_4)_2HPO_4$ (Berzelius)

Insol in alkalis+Aq (Berzelius)

Sl sol in H_2O Decomp in the an (Schottlander, Z anorg 1894, 7 344)

Solubility in $H_3PO_4 + Aq$ at 25°

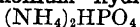
In 1000 g of the solution mols	
NH_4	PO_4
7 42	0 084
5 02	0 20
2 95	0 46
3 04	1 02
3 32	1 32
4 78	2 32

(D'Ans and Schreiner, Z phys Ch 1910, 75 105)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

+5 H_2O (Sestini, Gazz ch it 9 298)

Ammonium hydrogen orthophosphate,



Easily sol in H_2O Effloresces to form $NH_4H_2PO_4$ (Schiff, A 112 88)

Sol in 4 pts cold, and less hot H_2O Solution loses NH_3 by boiling Insol in alcohol

100 g H_2O dissolve 131 g at 15°, sp gr of sat solution=1.343 (Greenish and Smith, Pharm J 1901, 66 774)

Solubility in $H_3PO_4 + Aq$ at 25°

In 1000 g of the solution mols	
NH_4	PO_4
6 42	3 23
6 46	3 74
6 56	4 01
6 78	4 34
7 26	4 83
7 16	4 82

(D'Ans and Schreiner, Z phys Ch 1910, 75 105)

Insol in acetone (Eidmann, C C 1899 II, 1014, Naumann, B 1904, 37 4329)

Ammonium dihydrogen orthophosphate, $NH_4H_2PO_4$

Does not effloresce

Less easily sol in H_2O than $(NH_4)_2HPO_4$ (Mitscherlich, A ch 19 385)

Sol in 5 pts cold, and less hot H_2O

Solubility in $H_3PO_4 + Aq$ at 25°

In 1000 g of the solution mols	
NH_4	PO_4
6 72	4 54
5 62	3 88
4 62	3 36
2 72	2 59
2 50	2 51
2 58	4 29
2 76	6 21
3 06	7 70
3 10	7 86

(D'Ans and Schreiner, Z phys Ch 1910, 75 106)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Ammonium orthophosphate, acid

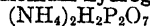
Decomp into $NH_4H_2PO_4$ at 77-78° (Parravano and Miel, Gazz ch it 1908, 38, II 536)

Ammonium pyrophosphate, $(NH_4)_4P_2O_7$

Easily sol in H_2O Alcohol precipitates it from the aqueous solution (Schwarzenberg, A 65 141)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Ammonium hydrogen pyrophosphate



Very sol in H_2O Insol in alcohol (Schwarzenberg, A 65 141)

Ammonium barium trimetaphosphate,
 $(\text{NH}_4)_2\text{BaP}_3\text{O}_9 + \text{H}_2\text{O}$ Easily sol in H_2O (Lindbom)**Ammonium cadmium dimetaphosphate,**
 $(\text{NH}_4)_2\text{O}, \text{CdO}, 2\text{P}_2\text{O}_5 + 3\text{H}_2\text{O} =$
 $(\text{NH}_4)_2\text{Cd}(\text{P}_2\text{O}_5)_2$

Efflorescent (Fleitmann, Pogg 78 347)

Ammonium cadmium orthophosphate,
 $\text{NH}_4\text{CdPO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$ Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ and acids (Drewson, Gm K Handb 6te Aufl III 74)**Ammonium calcium dimetaphosphate,**
 $(\text{NH}_4)_2\text{Ca}(\text{P}_2\text{O}_5)_2 + 2\text{H}_2\text{O}$ Very sl sol in H_2O Not decomp by acids (Fleitmann, Pogg 78 344)**Ammonium calcium phosphate, $\text{NH}_4\text{CaPO}_4 + x\text{H}_2\text{O}$** Ppt (Herzfeld and Feuerlein, Z anal 20 191)
+ $7\text{H}_2\text{O}$ Not completely decomp by cold H_2O in $\frac{3}{4}$ hour, rapidly by hot H_2O (Lasne, Bull Soc 1902, (3) 27 131)**Ammonium chromium orthophosphate, basic,**
 $5(\text{NH}_4)_2\text{HPO}_4, 2\text{CrPO}_4, 4\text{Cr}(\text{OH})_3$ (Cohen, J Am Chem Soc 1907, 29 1196)
 $(\text{NH}_4)_2\text{HPO}_4, 2\text{CrPO}_4 + 3\text{H}_2\text{O}$ Ppt (Cohen)**Ammonium chromic pyrophosphate,**
 $\text{NH}_4(\text{CrP}_2\text{O}_7) + 6\text{H}_2\text{O}$ Sl sol in cold H_2O Decomp by boiling H_2O (Rosenheim, B 1915, 48 586)**Ammonium cobaltous metaphosphate**Extremely sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Persoz, J pr 3 215)**Ammonium cobaltous orthophosphate,**
 $\text{NH}_4\text{CoPO}_4 + \text{H}_2\text{O}$ Not decomp by boiling H_2O (Debray, J Pharm (3) 46 121)
+ $12\text{H}_2\text{O}$ Ppt (Chancel, 1862)
 $\text{Co}(\text{NH}_4)_2\text{H}_2(\text{PO}_4)_2 + 4\text{H}_2\text{O}$ Insol in H_2O (Debray)**Ammonium copper dimetaphosphate,**
 $(\text{NH}_4)_2\text{P}_2\text{O}_6, \text{CuP}_2\text{O}_6 + 2\text{H}_2\text{O}$ Very sl sol in H_2O , insol in alcohol (Fleitmann, Pogg 78 345)
+ $4\text{H}_2\text{O}$ Efflorescent Very sl sol in H_2O , insol in alcohol (F)
Sol in 50 pts H_2O Slowly attacked by acids Only boiling H_2SO_4 attacks easily (Glatzel, Dissert 1880)**Ammonium glaucinum orthophosphate,**
 $\text{NH}_4\text{GlaPO}_4$ Insol in cold, sl sol in hot H_2O (Rossler, Z anal 17 148)**Ammonium glaucinum sodium orthophosphate,**
 $(\text{NH}_4)_2\text{GlaNa}_2(\text{PO}_4) + 7\text{H}_2\text{O}$

(Scheffer, A 109 146)

Ammonium iron (ferrous) orthophosphate,
 $\text{NH}_4\text{FePO}_4 + \text{H}_2\text{O}$ Insol even in boiling H_2O When still moist, easily sol in dil acids, but sparingly and slowly sol after drying, even in conc acids Decomp by NH_4OH , KOH , and $\text{NaOH} + \text{Aq}$ Insol in alcohol (Otto, J pr 2 409)
 $(\text{NH}_4)_2\text{FeH}(\text{PO}_4)_2 + 4\text{H}_2\text{O}$ (Debray)**Ammonium iron (ferric) hydrogen orthophosphate, basic,** $2(\text{NH}_4)_2\text{HPO}_4, 3\text{FePO}_4, 3\text{Fe}(\text{OH})_3$

Ppt Insol in 95% alcohol (Cohen, J Am Chem Soc 1907, 29 719)

Ammonium iron (ferric) hydrogen orthophosphate, $\text{NH}_4\text{H}_2\text{Fe}(\text{PO}_4)$.Ppt Same properties as Na salt (Weinland, Z anorg 1913, 84 356)
Partially hydrolyzed by H_2O Readily sol in HCl , HNO_3 , H_2SO_4 and H_3PO_4 Partially hydrolyzed by cold $\text{NH}_4\text{OH} + \text{Aq}$ Sol in excess of hot $\text{NH}_4\text{OH} + \text{Aq}$ Completely hydrolyzed by caustic alkalis Practically insol in 50% acetic acid (Cohen, J Am Chem Soc 1907, 29 718)**Ammonium lead dimetaphosphate,**
 $(\text{NH}_4)_2\text{Pb}(\text{P}_2\text{O}_5)_2$ Very difficultly sol in H_2O and acids (Fleitmann, Pogg 78 343)**Ammonium lithium metaphosphate, $\text{Li}_2\text{O}, 2(\text{NH}_4)_2\text{O}, 3\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$** Not appreciably sol in cold H_2O but rapidly and abundantly sol in H_2O at 70° (Tammann, J pr 1892, (2) 45 442)**Ammonium lithium phosphate, $(\text{NH}_4)_2\text{LiPO}_4$** Sl sol in H_2O (Berzelius)**Ammonium magnesium metaphosphate,**
 $(\text{NH}_4)_2\text{O}, 2\text{MgO}, 2\text{P}_2\text{O}_5 + 9\text{H}_2\text{O}$ (?)Sol with difficulty in H_2O or acids when heated Easily sol in H_2O before heating (Wach, Schw J 59 29)

Precipitated from aqueous solution by alcohol

Ammonium magnesium dimetaphosphate,
 $(\text{NH}_4)_2\text{Mg}(\text{P}_2\text{O}_5)_2 + 6\text{H}_2\text{O}$

Efflorescent (Fleitmann, Pogg 78 346)

Ammonium magnesium phosphate,
 $\text{NH}_4\text{MgPO}_4 + 6\text{H}_2\text{O}$ 1 l H_2O dissolves 66 mg anhydrous NH_4MgPO_4 at 15° (Fresenius, A 55 109)
1 l H_2O dissolves 741 mg anhydrous NH_4MgPO_4 at $20.5-22.5^\circ$ (Ebermayer)

1 l H₂O dissolves 106 mg anhydrous NH₄MgPO₄ (Liebig)

Insol in H₂O, but when boiled with H₂O it loses NH₃ and H₂O (Struve, Z anal 1898, 37 485)

Solubility of NH₄MgPO₄+6H₂O in H₂O at t°

t°	G salt in 100 g H ₂ O
0	0 0231
20	0 0516
40	0 0359
50	0 0303
60	0 0401
70	0 0163
80	0 0195

(Wenger, Dissert Geneva, 1911)

Aqueous solution is precipitated by NH₄OH, but not by Na₂HPO₄+Aq (Fresenius)

Sol in 44,600 pts H₂O containing ammonia. More sol in H₂O containing NH₄Cl, and is sol in 7548 pts of a solution containing 1 pt NH₄Cl to 5 pts H₂O and ammonia, and in 15,627 pts of a solution containing 1 pt of NH₄Cl to 7 pts H₂O and ammonia (Fresenius)

According to Kremers (J pr 55 190), a solution of 3 pts H₂O to 1 pt NH₄OH+Aq of 0.96 sp gr is best suited for washing the precipitated NH₄MgPO₄

According to Ebermayer (J pr 60 41), 1 pt anhydrous salt is sol in 13,497 pts H₂O at 23°, in 31,098 pts NH₄OH+Aq (4 pts H₂O 1 pt NH₄OH+Aq of 0.961 sp gr) at 21.25°, in 36,764 pts NH₄OH+Aq (3 pts H₂O 1 pt NH₄OH+Aq) at 20.6°, in 43,089 pts NH₄OH+Aq (1 pt H₂O 1 pt NH₄OH+Aq) at 22.5°, in 45,206 pts NH₄OH+Aq (1 pt H₂O 2 pts NH₄OH+Aq) at 22.5°, in 52,412 pts NH₄OH+Aq (1 pt H₂O 3 pts NH₄OH+Aq) at 22.5°, in 60,883 pts pure NH₄OH+Aq (sp gr 0.961) at 22.5°

Almost absolutely insol in H₂O containing 1/4 vol NH₄OH+Aq (sp gr 0.96) and NH₄Cl, i.e., much more insol than given by Fresenius (Kubel, Z anal 8 125)

According to Kissel (Z anal 8 173), 1 l NH₄OH+Aq (3 pts H₂O 1 pt NH₄OH+Aq of 0.96 sp gr) dissolves 4.98 mg in 24 hours, while 13.9 mg are dissolved if 18 g NH₄Cl to a litre of H₂O are also present

(NH₄)₂SO₄+Aq containing 2.2 g per litre dissolves 7.7 mg, 3.0 g, 1.13 mg, 10 g, 147 mg, NaCl+Aq containing 2 g NaCl per l dissolves 123.4 mg, NaNO₃+Aq containing 3 g NaNO₃ per l dissolves 93.1 mg (Liebig, A 106 196)

Completely insol in water containing ammonium phosphate or ammonium sodium phosphate (Berzelius)

800 ccm H₂O, sat with CO₂, dissolve 1.425 g (Liebig)

Easily sol in H₂SO₄+Aq, acetic and other

acids, also in boiling solution of ammonium citrate (Milot, Bull Soc (2) 18 20)

When in presence of Fe or Al salts it is sol to a considerable extent in H₂C₄H₄O₆+Aq

6 g NH₄Cl in 100 ccm H₂O containing 10 ccm 6.34% NH₄OH+Aq dissolve pptd salt = 0.0029 g Mg₂P₂O₇, 1 g (NH₄)₂C₂O₄ in 100 ccm H₂O, and NH₄OH+Aq dissolve = 0.0061 g Mg₂P₂O₇, 2 g citric acid in excess of NH₄OH+Aq dissolve = 0.0147 g Mg₂P₂O₇. Solubility prevented by excess of magnesia mixture (Lando, C N 48 217)

Solubility of NH₄MgPO₄+6H₂O in salts+Aq at t°

(G salt dissolved in 100 g solvent)

t°	5% NH ₄ NO ₃ +Aq	5% NH ₄ Cl+Aq	1 pt NH ₄ OH (D=0.96)+4 pts H ₂ O
0	0 1100	0 0597	0 0087
20	0 0463	0 1055	0 0098
30	0 0546	0 1133	
40	0 0645	0 0713	0 0135
50	0 0723	0 0931	0 0153
60	0 0846	0 1728	0 0174
70	0 0834	0 1239	0 0178
80	0 1009	0 1913	0 0145

t°	4% NH ₄ OH+Aq and 5% NH ₄ Cl+Aq	4% NH ₄ OH+Aq and 10% NH ₄ Cl+Aq
20	0 0165	0 0541
60	0 0274	0 0731

(Wenger, Dissert Geneva, 1911)

About 3 times as sol in Ca(C₂H₃O₂)₂+Aq as in NaC₂H₃O₂+Aq, but solubility is prevented by excess of MgCl₂ (Ville, Bull Soc (2) 18 316)

Sl sol in ammonium citrate+Aq containing 400 g ammonium citrate in 1 litre. Solubility = 0.457% at ord temp and 0.58% at 50° (Bolis, Ch Z 1903, 27 1151)

Min Struive
+H₂O Insol in H₂O or citric acid+Aq (Milot and Maquenne, Bull Soc (2) 23 238)

Ammonium magnesium hydrogen orthophosphate, (NH₄)₂MgH₂(PO₄)₂+3H₂O (?) (Graham)

Ammonium magnesium phosphate, 5MgO, (NH₄)₂O, 2P₂O₅+24H₂O (Gawalovskv, C C 1885 721)

Ammonium magnesium sodium pyrophosphate, (NH₄)₃Mg₂Na(P₂O₇)₄

Insol in H₂O and not decomp thereby (Berthelot and André, A ch 1897, (7) 11 186)

Ammonium manganous dimetaphosphate,
 $(\text{NH}_4)_2\text{Mn}(\text{PO}_3)_4 + 4\text{H}_2\text{O}$

Relatively easily attacked by acids (Glatzel, Dissert 1880)



Efflorescent (Fleitmann, Pogg 78 346)

Ammonium manganous orthophosphate,
 $\text{NH}_4\text{MnPO}_4 + \text{H}_2\text{O}$

Sol in 32,092 pts cold, and 20,122 pts boiling H_2O , and in 17,755 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (1.4% NH_4Cl) (Fresenius)

+7 H_2O Insol in H_2O below 70°, at 70° 100 g H_2O dissolve 0.0052 g salt, at 80°, 0.0067 (Wenger, Dissert Geneva, 1911)

Easily sol in dil acids Decomp by $\text{KOH} + \text{Aq}$, but not by $\text{NH}_4\text{OH} + \text{Aq}$ or $\text{K}_2\text{CO}_3 + \text{Aq}$ Insol in NH_4OH or NH_4 salts + Aq (Gibbs)

Solubility in salts + Aq at t°
(G in 100 g solvent)

t°	5% NH_4NO_3 + Aq	5% $\text{NH}_4\text{Cl} + \text{Aq}$	1 pt NH_4OH D = 0.96 +4 pts H_2O
0	0.0206	0.0020	0.0116
20	0.0200	0.0255	0.0122
30	0.0226	0.0345	
40	0.0209	0.0386	0.0118
50	0.0226	0.0355	0.0132
60	0.0270	0.0384	0.0193
70	0.0281	0.0414	0.0191
80	0.0326	0.0451	0.0197

(Wenger, l c)

Insol in alcohol

Insol in acetone (Naumann, B 1904, 37 4329)

Ammonium manganic pyrophosphate,
 $\text{NH}_4\text{Mn}_2\text{P}_2\text{O}_7 + 3\text{H}_2\text{O}$

Decomp by cold H_2O with separation of Mn_2O_3 (Rosenheim, B 1915, 48 584)

Ammonium manganous sodium pyrophosphate,
 $\text{NH}_4\text{N}^+\text{Mn}^+\text{P}_2\text{O}_7 + 3\text{H}_2\text{O}$

Insol in H_2O or alcohol Easily sol in very dil acids (Otto, J pr 2 418)

Formula is $\text{N}_4(\text{NH}_4)_4\text{Mn}_2(\text{P}_2\text{O}_7)_3 + 12\text{H}_2\text{O}$, according to Berzelius

Ammonium mercuric metaphosphate

Sol in H_2O , or at least in $\text{NH}_4\text{OH} + \text{Aq}$ (Persoz, J pr 3 216)

Ammonium nickel metaphosphate

Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$, from which it is reprecipitated on evaporation of the NH_3 (Persoz, J pr 3 215)

Ammonium nickel dimetaphosphate,
 $(\text{NH}_4)_2\text{NiP}_2\text{O}_7 + 4\text{H}_2\text{O}$

Sol in 12.5 pts H_2O (Glatzel, Dissert 1880)

Ammonium nickel orthophosphate,
 $\text{NH}_4\text{NiPO}_4 + 2\text{H}_2\text{O}$

Ppt (Debray, C R 59 40)
+6 H_2O Decomp by boiling H_2O (Debray)

Ammonium potassium dimetaphosphate,
 $(\text{NH}_4)_2\text{K}_4(\text{P}_2\text{O}_6)_7$

More sol in H_2O than following salt (Fleitmann, Pogg 78 341)

$\text{NH}_4\text{K}_3\text{P}_4\text{O}_{12} + 2\text{H}_2\text{O}$ Difficultly sol in H_2O (Fleitmann)

Ammonium potassium pyrophosphate,
 $\text{NH}_4\text{K}_2\text{HP}_2\text{O}_7 + \frac{1}{2}\text{H}_2\text{O}$

Deliquescent Sol in H_2O Decomp on boiling (Schwarzenberg)

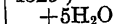
Ammonium sodium dimetaphosphate,
 $\text{NH}_4\text{NaP}_2\text{O}_6 + \text{H}_2\text{O}$

More sol in H_2O than $\text{Na}_2\text{P}_2\text{O}_6$, but less than $(\text{NH}_4)_2\text{P}_2\text{O}_6$ Less sol in alcohol than in H_2O (Fleitmann, Pogg 78 340)

Ammonium sodium orthophosphate,
 $(\text{NH}_4)_2\text{NaPO}_4 + 4\text{H}_2\text{O}$

Decomp by H_2O Cryst from $\text{NH}_4\text{OH} + \text{Aq}$ of 0.96 sp gr From H_2O solution, $\text{NaNH}_4\text{HPO}_4 + 4\text{H}_2\text{O}$ separates out (Uelsmann, Arch Pharm (2) 99 138)

Insol in acetone (Naumann, B 1904, 37 4329)



$\text{NH}_4\text{Na}_2\text{PO}_4 + 12\text{H}_2\text{O}$ (Herzfeld, Z anal 20 191)

$(\text{NH}_4)_3\text{Na}(\text{PO}_4)_2 + 6\text{H}_2\text{O}$ Sol in H_2O with decomp Cryst from hot conc $\text{NH}_4\text{OH} + \text{Aq}$ (Uelsmann, Arch Pharm (2) 99 138)

Ammonium sodium hydrogen phosphate (Microcosmic salt),
 $\text{NH}_4\text{NaHPO}_4 + 4\text{H}_2\text{O}$

Efflorescent Easily sol in H_2O Sol in 6 pts cold, and 1 pt boiling H_2O Insol in alcohol

Aqueous solution gives off NH_3 , especially if hot

Insol in acetone (Fidmann, C C 1899, II 1014)

Min *Stercorite*

+5 H_2O (Uelsmann)

The composition of the hydrates formed by this salt at different dilutions is calculated from determinations of the lowering of the fr-pt produced by the salt and of the conductivity and sp gr of its aqueous solutions (Jones Am Ch J 1905, 34 319)

$(\text{NH}_4)_3\text{Na}_2\text{H}_2(\text{PO}_4)_4 + 3\text{H}_2\text{O}$ Decomp by H_2O (Filhol and Senderens, C R 93 388)

Ammonium sodium pyrophosphate,
 $(\text{NH}_4)_2\text{Na}_2\text{P}_2\text{O}_7 + 5\text{H}_2\text{O}$

Easily sol in H_2O Aqueous solution decomp by boiling (Schwarzenberg, A 65 142)
+6 H_2O (Rammelsberg)

Ammonium sodium glucinum orthophosphate,
 $(\text{NH}_4)_2\text{Na}_2\text{G}(\text{PO}_4)_2 + 7\text{H}_2\text{O}$

Precipitate (Scheffer)

Ammonium thalious orthophosphate,
 $(\text{NH}_4)_3\text{PO}_4$, $(\text{NH}_4)_2\text{TiPO}_4$, or $\text{H}_2\text{Ni}_2\text{PO}_4$,
 HTl_2PO_4

Sol in H_2O (Lamy, Rammelsberg)

Ammonium uranyl phosphate,
 $\text{NH}_4(\text{UO}_2)\text{PO}_4 + x\text{H}_2\text{O}$

Insol in H_2O and $\text{HC H}_3\text{O}_2 + \text{Aq}$ Sol in mineral acids, from which it is precipitated by $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$, in which it is insol (Knop)

+ $3\text{H}_2\text{O}$ Insol in H_2O and acetic acid Sol in all mineral acids, oxalic acid and $\text{M}_2\text{CO}_3 + \text{Aq}$ (Lienau, Dissert 1898)

Ammonium vanadium phosphate

See Phosphovanadate, ammonium

Ammonium zinc dimetaphosphate,
 $(\text{NH}_4)_2\text{Zn}(\text{P}_2\text{O}_5)_2 + 6\text{H}_2\text{O}$

Efflorescent (Fleitmann, Pogg 78 347)
 + $4\text{H}_2\text{O}$ Sol in 70 pts H_2O Decomp by H_2SO_4 (Glatzel, Dissert 1880)

Ammonium zinc orthophosphate, basic,
 3NH_3 , 2ZnO , $\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$

(Rother, A 1867, 143 356)
 $4(\text{NH}_4)_2\text{O}$, 6ZnO , $3\text{P}_2\text{O}_5 + 4\text{H}_2\text{O}$ (Schweikert, A 1868, 145 57)

Ammonium zinc orthophosphate, NH_4ZnPO_4
 + H_2O

Insol in H_2O Sol in acids, and caustic alkalis (Bette, A 15 129)

Ammonium zinc hydrogen phosphate,
 $\text{NH}_4\text{H}_2\text{PO}_4$, $\text{ZnHPO}_4 + \text{H}_2\text{O}$

Insol in H_2O (Debray)
 $4(\text{NH}_4)_2\text{O}$, 6ZnO , $3\text{P}_2\text{O}_5$, (Schweikert, A 145 57)
 $3(\text{NH}_4)_2\text{O}$, 4ZnO , $2\text{P}_2\text{O}_5 + 13\text{H}_2\text{O}$ (Rother, A 143 356)

Ammonium phosphate selenate

See Selenophosphate, ammonium

Barium triphosphate, 5BaO , $3\text{P}_2\text{O}_5$

Insol in H_2O , insol in acids after heating to a high temp (Schwarz, Z anorg 1895, 9 264)

Barium metaphosphate, $\text{Ba}(\text{PO}_3)_2$

Insol in H_2O or dil acids (Maddrell, A 61 61)

Not decomp by boiling with acids or alkali carbonates + Aq (Fleitmann, Pogg 78 352)

Barium dimetaphosphate, $\text{BaP}_2\text{O}_6 + 2\text{H}_2\text{O}$

More difficultly sol in H_2O than $\text{Ba}_3(\text{P}_3\text{O}_{10})_2$ Slightly attacked by boiling conc $\text{HCl} + \text{Aq}$ or $\text{HNO}_3 + \text{Aq}$ Easily decomp by H_2SO_4 (Fleitmann, Pogg 78 254)

Barium trimetaphosphate, $\text{Ba}_3(\text{P}_3\text{O}_{10})_2 + 2\text{H}_2\text{O}$

Somewhat sol in H_2O (Fleitmann, A 65 313)

+ $6\text{H}_2\text{O}$ Easily sol in $\text{HCl} + \text{Aq}$ (Lindbom)

1 l H_2O dissolves 2 589 g at ord temp (Wiesler, Z anorg 1901, 28 198)

Barium hexametaphosphate, $\text{Ba}_3\text{P}_6\text{O}_{18}$ (?)

Sol in H_2O only after boiling several hours

Nearly insol in H_2O (Ludert, Z anorg 5 15)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Wackenroder)

Sol in $\text{Na}_2\text{P}_2\text{O}_7 + \text{Aq}$ Sol in $\text{HNO}_3 + \text{Aq}$ After ignition it is nearly insol in $\text{HNO}_3 + \text{Aq}$

Barium orthophosphate, $\text{Ba}_3(\text{PO}_4)_2$

Precipitate Very sl sol or insol in H_2O (Graham, Pogg 32 49)

Sol in $\text{HCl} + \text{Aq}$ Decomp by $\text{SO}_2 + \text{Aq}$ Insol in methyl acetate (Naumann, B 1909, 42 3790)

Barium hydrogen phosphate, BaHPO_4

Sol in 10,000 pts H_2O (Malaguti, A ch (3) 51 346)

Sol in 20,570 pts H_2O at 20° (Bischof, 1833)

Not completely soluble in water containing CO_2 , but BaCl_2 causes no ppt in $\text{Na}_2\text{HPO}_4 + \text{Aq}$ containing 7 16 g or less Na_2HPO_4 in a litre after it has been saturated with CO_2 (Setschenow, C C 1875 97)

Easily sol in $\text{H}_3\text{PO}_4 + \text{Aq}$, and dil $\text{HCl} + \text{Aq}$ $\text{HNO}_3 + \text{Aq}$ of 1 275 sp gr if not diluted has scarcely any solvent action, but more dissolves on dilution until a maximum is reached, when 10 vols of H_2O have been added (Bischof, Schw J 67 39)

Sol in 367-403 pts acetic acid (1 032 sp gr) at 22.5° (Bischof, l c)

Easily sol in H_2O containing NH_4Cl , NH_4NO_3 , or NH_4 succinate, from which solutions it is completely pptd by $\text{NiH}_2\text{OII} + \text{Aq}$ (Rose)

Insol in Na_2HPO_4 or $\text{BaCl} + \text{Aq}$ (Rose, Pogg 76 23)

More sol in BaCl_2 or $\text{NaCl} + \text{Aq}$ than in H_2O , 1 pt BaHPO_4 being sol in 4362 pts H_2O containing 1 2% NaCl and 0 8% BaCl (Ludwig Arch Pharm (2) 56 265)

Sol in $\text{Na citrate} + \text{Aq}$ (Spiller)

Barium tetrahydrogen phosphate,
 $\text{BaH}_4(\text{PO}_4)_2$

Sol in H_2O (Mitscherlich, 1821)

Decomp by much H_2O into BaHPO_4 Sol in phosphoric and certain other acids (Berzelius, A ch 2 153)

Barium pyrophosphate, $\text{Ba}_2\text{P}_2\text{O}_7 + x\text{H}_2\text{O}$

Somewhat sol in H_2O , in much $\text{H}_4\text{P}_2\text{O}_7 + \text{Aq}$, also in $\text{HCl} + \text{Aq}$ or $\text{HNO}_3 + \text{Aq}$ Insol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ or $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Schwarzenberg)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Wackenroder)

Barium hydrogen pyrophosphate, $\text{BaH}_2\text{P}_2\text{O}_7$,
 $\text{Ba} \cdot \text{P}_2\text{O}_7 + 3\text{H}_2\text{O}$

Ppt (Knorre and Oppelt, B 21 773)

Barium tetraphosphate, $\text{Ba}_3\text{P}_4\text{O}_{13}$

Insol in H_2O or acids when strongly heated
 (Fleitmann and Henneberg, A 65 331)

Barium manganic pyrophosphate,

$\text{Ba}(\text{MnP}_2\text{O}_7)_2 + 5\text{H}_2\text{O}$

Almost insol in H_2O (Rosenheim, B 1915, 48 585)

Barium potassium trimetaphosphate,

$\text{BaK}_3\text{P}_3\text{O}_9 + \text{H}_2\text{O}$

Much less sol in H_2O than $\text{NH}_4\text{BaP}_3\text{O}_9$ or NaBaP_3O_9 (Lindbom)

Sol in $\text{HCl} + \text{Aq}$ after ignition

Barium potassium orthophosphate, BaKPO_4

Insol in H_2O (Ouvrard, A ch (6) 16 297)

+ $10\text{H}_2\text{O}$ (de Schulten, C R 96 706)

Barium sodium dimetaphosphate,

$\text{BaNa}_2(\text{P O})_2 + 4\text{H}_2\text{O}$

(Glatzel, Dissert 1880)

Barium sodium trimetaphosphate, BaNaP_3O_9 ,
 + $4\text{H}_2\text{O}$

More easily sol in H_2O than $\text{Ba}_3(\text{P}_3\text{O}_9)_2$
 Sol in acids, unless ignited (Fleitmann and
 Henneberg, A 65 314)

Efflorescent Sol in $\text{HCl} + \text{Aq}$ after igni-
 tion only by long boiling When fused it is
 easily sol in $\text{HCl} + \text{Aq}$ (Lindbom, Acta
 Lund 1873 21)

Barium sodium orthophosphate, BaNaPO_4 ,
 + $10\text{H}_2\text{O}$

(de Schulten, C R 96 706)

Not attacked by cold but decomp by hot
 H_2O (Villiers, C R 104 1103)

Sl sol in H_2O (Quartucci, C A 1911
 2375)

Barium sodium pyrophosphate,

$\text{Ba}_2\text{Na}_4(\text{P O})_2$

Sol in hot HCl and HNO_3 (Lammann,
 J pr 1892, (2) 45 469)

$6\text{Ba}_2\text{P}_2\text{O}_7$, $\text{Na}_4\text{P}_2\text{O}_7 + 6\text{H}_2\text{O}$ Completely
 insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, but not insol in H_2O
 or $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in HNO_3 or HCl
 + Aq Insol in alcohol (Baer, Pogg 75
 164)

Barium uranous metaphosphate, UO_2 , BaO ,
 P_2O_5

(Colani, A ch 1907, (8) 12 142)

Barium uranyl orthophosphate,
 $\text{Ba}(\text{UO}_2)_2(\text{PO}_4)_2 + 8\text{H}_2\text{O}$

Min *Uranocircule*

Barium phosphate chloride, $3\text{Ba}_3(\text{PO}_4)_2$,
 BaCl_2

Min *Barytapatite* (Deville and Caron, A
 ch (3) 67 451)

$4\text{BaH}_2(\text{PO}_4)_2$, BaCl_2 (Frlenmeyer, J B
 1857 145)

15BaO , $6\text{P}_2\text{O}_5$, $\text{BaCl}_2 + 6\text{H}_2\text{O}$ (?) Sol in
 18,000 pts cold H_2O Much more sol in H_2O
 containing BaCl_2 , NH_4Cl , and NH_4OH
 (Ludwig Arch Pharm (2) 56 271)

Bismuth orthophosphate, basic, 2BiPO_4 ,
 $3\text{Bi}_2\text{O}_3$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ (Cavazzi,
 Gazz ch it 14 289)

Bismuth orthophosphate, BiPO_4

Insol in H_2O or $\text{HNO}_3 + \text{Aq}$ Sl sol in
 NH_4 salts + Aq (Chancel, C R 50 416)

Not decomp by H_2O Other phosphates
 of Bi are decomp by H_2O (Montmartini,
 C C 1900, II 1256)

Not hydrolyzed by hot H_2O , sl sol in BiCl
 + Aq , decomp by boiling alkali (Caven,
 J Soc Chem Ind 1897, 16 30)

More sol in $\text{HCl} + \text{Aq}$ than in $\text{HNO}_3 + \text{Aq}$
 (Rose)

Sol in $\text{UO}(\text{NO}_3)_2 + \text{Aq}$ (M'Curdy, Am J
 Sci (2) 31 282)

Insol in $\text{MNO}_3 + \text{Aq}$

Insol in Bi salts + Aq (Rose, Pogg 76
 26)

Sol in $\text{NH}_4\text{Cl} + \text{Aq}$, but insol in $\text{NH}_4\text{NO}_3 +$
 Aq (Brett, 1837)

+ $1\frac{1}{2}\text{H}_2\text{O}$ (Kuhn)

+ $3\text{H}_2\text{O}$ Ppt Decomp by H_2S or KOH
 + Aq (Vannio, J pr 1906, (2) 74 151)

Bismuth pyrophosphate, basic, 2Bi O_3 , P O_5

Insol in H_2O and $\text{HC H}_3\text{O} + \text{Aq}$ sol in
 hot HCl and $\text{HNO}_3 + \text{Aq}$ Insol in $\text{Na}_2\text{P O}_7$
 + Aq , and NH_4 citrate + Aq (Passerini,
 Cim 9 84)

Bismuth pyrophosphate, $\text{Bi}_4(\text{P O})_3$

Insol in H O or $\text{HNO}_3 + \text{Aq}$ (Chancel,
 C R 50 416)

Decomp by H_2O (Wallroth, Bull Soc (2)
 39 516)

Sol in $\text{Na}_4\text{P O}_7 + \text{Aq}$ (Stromeier)

Bismuth sodium pyrophosphate, NaBiP O
 + $3\text{H}_2\text{O}$

Insol in H_2O (Rosenheim, B 1915, 48
 583)

Boron phosphate, BPO_4

Insol in H_2O Not attacked by boiling
 alkalis (Meyer, B 22 29.9)

Bromomolybdenum phosphate

See under **Bromomolybdenum comps**

Cadmium triphosphate, $\text{Cd}_3(\text{P}_3\text{O}_{10})_2$

Insol in H_2O and acids (Gluhmann, Dissert 1899)

Cadmium tetraphosphate, $6\text{CdO}, 4\text{P}_2\text{O}_5 + 18\text{H}_2\text{O}$

Insol in acids (Gluhmann)

Cadmium metaphosphate

Verv sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Persoz, A ch 56 334)

Cadmium dimetaphosphate, $\text{Cd}(\text{PO}_3)_2 + 2\text{H}_2\text{O}$

Sol in 32 pts H_2O Scarcely attacked by acids, especially conc H_2SO_4 (Glatzel, Dissert 1880)

Cadmium tetrametaphosphate

Insol in H_2O Easily decomp by $\text{Na}_2\text{S} + \text{Aq}$ (Fleitmann, Pogg 78 358)

$\text{Cd}_2(\text{PO}_3)_4 + 10\text{H}_2\text{O}$ Not so very difficultly attacked by acids but insol after ignition (Glatzel, Dissert 1880)

Cadmium orthophosphate, $\text{Cd}_3(\text{PO}_4)_2$

Ppt Insol in H_2O Sol in Cd salts + Aq (Stromeyer)

Easily sol in NH_4 sulphate, chloride, nitrate, or succinate + Aq (Wittstein, Repert 57 32)

$\text{H}_2\text{Cd}_3(\text{PO}_4)_4 + 4\text{H}_2\text{O}$ Sol in dil $\text{H}_3\text{PO}_4 + \text{Aq}$ (de Schulten, Bull Soc (3) 1 473)

Cadmium tetrahydrogen phosphate,

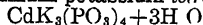
Decomp by great excess of H_2O (de Schulten)

Cadmium pyrophosphate, $\text{Cd}_2\text{P}_2\text{O}_7 + 2\text{H}_2\text{O}$

Insol in H_2O Sol in NH_4OH , $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, or acids Insol in $\text{KOH} + \text{Aq}$ Sol in $\text{SO}_2 + \text{Aq}$ (Schwarzenberg, A 65 183)

Cadmium hydrogen orthophosphate hydrate, $\text{CdHPO}_4, 2\text{N}_2\text{H}_4$

Decomp by light (Franzen, Z anorg 1908, 60 283)

Cadmium potassium tetrametaphosphate,

Sol in 135 pts H_2O Difficultly decomp by acids (Glatzel, Dissert 1880)

Cadmium potassium orthophosphate,

Insol in H_2O , sol in dil $\text{HCl} + \text{Aq}$ (Ouvrard, A ch (6) 16 321)

Cadmium potassium pyrophosphate,

Insol in H_2O , sol in dil $\text{HCl} + \text{Aq}$ (Ouvrard)

$5\text{Cd}_2\text{P}_2\text{O}_7, 4\text{K}_4\text{P}_2\text{O}_7 + 30\text{H}_2\text{O}$ Much more easily sol in H_2O than the CdNa salt (Pahl, Sv V A F 30, 7 39)

Cadmium sodium triphosphate, $\text{Na}_3\text{CdP}_3\text{O}_{10} + 12\text{H}_2\text{O}$

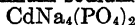
Sol in acids even after ignition (Gluhmann, Dissert 1899)

Cadmium sodium trimetaphosphate,

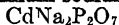
Sl sol in H_2O Insol in alcohol (Wiesler, Z anorg 1901, 28 204)

Cadmium sodium tetrametaphosphate,

Completely insol in H_2O (Glatzel, Dissert 1880)

Cadmium sodium orthophosphate,

Insol in H_2O , very sol in dil acids CdNaPO_4 As above (Ouvrard)

Cadmium sodium pyrophosphate,

Sol in dil acids, even acetic acid (Wallroth)

$+4\text{H}_2\text{O}$ Insol in H_2O (Pahl, Sv V A F 30, 7 39)

Cadmium phosphate bromide, $3\text{Cd}_3(\text{PO}_4)_2, \text{CdBr}_2$

Sol in cold very dil $\text{HNO}_3 + \text{Aq}$ (de Schulten, Bull Soc (3) 1 472)

Cadmium phosphate chloride, $3\text{Cd}_3(\text{PO}_4)_2, \text{CdCl}_2$

Sol in dil $\text{HNO}_3 + \text{Aq}$ (de Schulten)

Cæsium metaphosphate, CsPO_3

Sol in H_2O (von Berg, B 1901, 34 4185)

Cæsium orthophosphate, $\text{Cs}_3\text{PO}_4 + 5\text{H}_2\text{O}$

Deliquescent, very sol in H_2O (von Berg)

Cæsium hydrogen orthophosphate, $\text{Cs}_2\text{HPO}_4 + \text{H}_2\text{O}$

Very sol in H_2O (von Berg)

Cæsium dihydrogen orthophosphate,

Sol in H_2O , insol in alcohol (von Berg)

Cæsium pyrophosphate, $\text{Cs}_4\text{P}_2\text{O}_7$

Very sol in H_2O , very hygroscopic (von Berg)

Calcium triphosphate, $5\text{CaO}, 3\text{P}_2\text{O}_5$

Insol in H_2O (Schwarz, Z anorg 1895, 9 264)

Calcium monometaphosphate, $\text{Ca}(\text{PO}_3)_2$

Insol in H_2O and dil acids (Maddrell, A 61 61)

Not decomp by digestion with alkali carbonates + Aq (Fleitmann)

Calcium dimetaphosphate, $\text{Ca}_2(\text{P}_2\text{O}_5)_2 + 4\text{H}_2\text{O}$

Insol in H_2O Decomp by warm H_2SO_4 , but not appreciably by conc HCl or HNO_3 + Aq (Fleitmann, Pogg 78 255)

Calcium hexametaphosphate (?)

Insol in H_2O Sol in $\text{Na}_3\text{P}_6\text{O}_{18}$ + Aq and in HCl + Aq (Rose, Pogg 76 3)

$\text{Ca}_3\text{P}_6\text{O}_{18}$ Nearly insol in H_2O , sol in dil acids (Ludert, Z anorg 5 15)

Calcium orthophosphate, basic, $3\text{Ca}_3(\text{PO}_4)_2 + \text{CaO}, \text{H}_2$

(Warrington, J B 1873 253)

$4\text{CaO}, \text{P}_2\text{O}_5$ (Hilgenstock)

Calcium orthophosphates,

Equilibrium in system $\text{CaO} + \text{P}_2\text{O}_5 + \text{H}_2\text{O}$

Solubility of CaO in P_2O_5 + Aq at 25°

g CaO per l of solution	g P_2O_5 per l of solution	Solid phase
1 71	4 69	$\text{CaHPO}_4, 2\text{H}_2\text{O}$
7 48	22 39	
8 10	23 37	
11 57	36 14	
12 88	41 24	
18 77	59 35	
19 25	63 03	
23 31	75 95	
23 69	79 10	
32 41	109 8	
35 90	129 8	
39 81	139 6	
40 89	142 7	
43 82	154 6	
49 76	191 0	
55 52	216 5	
59 40	234 6	
70 31	279 7	
72 30	351 9	
69 33	361 1	
65 46	380 3	$\text{CaH}_4(\text{PO}_4)_2, \text{H}_2\text{O}$
63 53	395 1	
59 98	419 7	
59 25	424 6	
57 74	428 0	
53 59	451 7	
48 78	475 3	
44 52	505 8	
41 86	528 9	
39 89	538 3	

(Cameron and Seidell, J Am Chem Soc 1905, 27 1508)

Solubility of CaO in P_2O_5 + Aq at 25°

g CaO per l of solution	g P_2O_5 per l of solution	Solid phase
7 61	19 96	CaHPO_4
6 51	16 52	
5 01	12 82	
3 42	8 16	
2 42	5 75	
1 58	3 66	Solid phases are evidently solid solutions
0 544	1 516	
0 400	1 108	
0 291	0 773	
0 232	0 662	
0 145	0 381	$\text{Ca}_3(\text{PO}_4)_2$
0 062	0 109	
0 049	0 088	
0 034	0 015	
0 587	0 013	
0 789	0 012	Solid phase is probably a solid solution

(Cameron and Seidell, J Am Chem Soc 1905, 27 1513)

Solubility of CaO in P_2O_5 + Aq at 50.7°

100 g of the solution contain		Solid phase
g P_2O_5	g CaO	
62 01	0 336	$\text{CaH}_4\text{P}_2\text{O}_8 + \text{CaH}_4\text{P}_2\text{O}_7 \cdot \text{H}_2\text{O}$
58 08	0 635	
54 67	0 939	$\text{CaH}_4\text{P}_2\text{O}_8 \cdot \text{H}_2\text{O} + \text{CaHPO}_4$
50 25	1 428	
46 15	2 100	
41 92	2 974	
37 33	3 898	
33 18	4 880	
29 61	5 725	
15 48	3 507	
9 465	2 328	
6 157	1 563	
2 946	0 852	$\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$
2 281	0 692	
0 1521	0 0588	
0 1527	0 0596	
0 1331	0 0514	
0 0942	0 0351	
0 0309	0 0106	
0 00068	0 00071	

(Bassett, Z anorg 1908, 59 15)

dissolves 190–240 mg $\text{Ca}_3(\text{PO}_4)_2$ (Béchamp, A ch (4) 16 241)

Easily sol in HNO_3 or $\text{HCl} + \text{Aq}$

100 pts very dil $\text{HCl} + \text{Aq}$ dissolve 198–225 pts $\text{Ca}_3(\text{PO}_4)_2$ (Crum, A 63 294)

100 pts HCl of 1.153 sp gr (containing 31% HCl) dissolve at 17° when diluted with

0	1	4	7 pts H_2O
253	450	623	647 pts $\text{Ca}_3(\text{PO}_4)_2$
10	13	16	19 pts H_2O
680	719	695	697 pts $\text{Ca}_3(\text{PO}_4)_2$

(Bischof, Schw J 67 39)

Decomp by H_2SO_4

Completely decomp to CaSO_4 and H_3PO_4 by a mixture of H_2SO_4 and alcohol

Solubility in $\text{HNO}_3 + \text{Aq}$

1 pt of $\text{Ca}_3(\text{PO}_4)_2$ dissolves at 16–25–17 5° in pts $\text{HNO}_3 + \text{Aq}$ which contain pts H_2O to 1 pt HNO_3 (sp gr = 1.23)

Pts $\text{HNO}_3 + \text{Aq}$	Pts H_2O	Pts $\text{HNO}_3 + \text{Aq}$	Pts H_2O
2 72	0	30 64	10 754
4 23	0 827	26 48	13
10 25	3 309	32 14	13 236
15 45	5 791	36 06	15 718
20 34	8 273	127 81	40
20 82	10		

(Bischof, 1833)

More sol in acetic, lactic, malic, and tartaric acids than in HCl or $\text{HNO}_3 + \text{Aq}$ (Crum)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$

G H_3PO_4 in 100 cc of $\text{H}_3\text{PO}_4 + \text{Aq}$	G $\text{Ca}_3(\text{PO}_4)_2$ dissolved by 100 cc of solvent
5	3 85
10	7 28
15	9 45
20	12 50
25	13 79
30	15 10

(Causse, C R 1892, 114 414)

Very small quantities of the salts of the alkali metals increase the solubility in H_2O (Lassaigne, J chim méd (3) 3 11)

1 litre cold H_2O with 2 g NaCl dissolves 45.7 mg $\text{Ca}_3(\text{PO}_4)_2$, with 3 g NaNO_3 , 33 mg $\text{Ca}_3(\text{PO}_4)_2$ (Liebig)

1 litre H_2O containing 8.75% NaCl dissolves 317.5 mg $\text{Ca}_3(\text{PO}_4)_2$ (Lassaigne)

NH_4 salts have even more effect, especially $\text{NH}_4\text{Cl} + \text{Aq}$, which dissolves $\text{Ca}_3(\text{PO}_4)_2$ in the cold, also ammonium nitrate and succinate (Wittstein)

$(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ dissolves $\text{Ca}_3(\text{PO}_4)_2$ as easily as CaSO_4 (Liebig, A 61 128)

1 litre H_2O containing 2 g NaCl dissolves at 7 – 12.3° 45.7 mg $\text{Ca}_3(\text{PO}_4)_2$, 3 g NaNO_3 at 17.3° , 33 mg $\text{Ca}_3(\text{PO}_4)_2$, 2.2 g $(\text{NH}_4)_2\text{SO}_4$, 76.7 mg $\text{Ca}_3(\text{PO}_4)_2$ (Liebig, A 106 185)

Dry $\text{Ca}_3(\text{PO}_4)_2$ also dissolves by long boiling with solutions of ammonium chloride, nitrate, succinate (Wittstein), or sulphate (Delkeskamp)

Sol in 89,448 pts H_2O (boiled) at 7° , 19,628 pts H_2O (boiled) containing 1% NH_4Cl at 10° , 4324 pts H_2O (boiled) containing 10% NH_4Cl at 17° , 1788 pts H_2O sat with CO_2 and containing 10% NH_4Cl at 10° and 751 mm pressure, 1351 pts H_2O sat with CO_2 and containing 1% NH_4Cl at 12° and 745 mm pressure, 42,313 pts H_2O sat with CO_2 and containing CaCO_3 and 1% NH_4Cl at 16° and 746.1 mm pressure (Warrington, Chem Soc (2) 4 296)

Aqueous solutions of the following NH_4 salts dissolve the given amts of $\text{Ca}_3(\text{PO}_4)_2$, calculated for 100 pts of the corresponding acid NH_4Cl , 0.655 pt, NH_4NO_3 , 0.306 pt, $(\text{NH}_4)_2\text{SO}_4$, 1.050 pts, $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$, 0.255 pt, NH_4 tartrate, 4.56 pts, NH_4 citrate, 7.015 pts, NH_4 malate, 1.125 pts $\text{Ca}_3(\text{PO}_4)_2$ (Terrell, Bull Soc (2) 35 578)

Solubility in various salts + Aq under a CO_2 pressure of 2 atmospheres, at 14°

Salt	G salt per 100 g H_2O	G $\text{Ca}_3(\text{PO}_4)_2$ sol in 1 l of the solvent
H_2O		0 22848
NaCl	50 conc	1 3208 0 64089
$\text{MgCl}_2 + 6\text{H}_2\text{O}$	86 9 conc	1 2873 2 8923
$\text{KMgCl}_3 + 6\text{H}_2\text{O}$	79 2 conc	1 5771 1 1536
K_2SO_4 , MgSO_4 , $\text{MgCl}_2 + 6\text{H}_2\text{O}$	70 95 conc	1 7777 2 4911
NaNO_3	72 7 conc	1 5827 0 8638
K_2SO_4	74 5 conc	4 9041 4 7649
$(\text{NH}_4)_2\text{SO}_4$	56 5 conc	2 4131 5 8849
$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	137 7 conc	2 4911 3 2267
$\text{MgSO}_4 + 7\text{H}_2\text{O}$	105 3 conc	1 9728 3 6001
NH_4Cl	45 74 conc	1 3710 1 2929

(Ehlert and Hempel, Z Elektrochem 1912, 18 728)

$\text{Ca}_3(\text{PO}_4)_2$ is sol in $\text{K}_2\text{C}_2\text{O}_4 + \text{Aq}$ 100 ccm $\text{K}_2\text{C}_2\text{O}_4 + \text{Aq}$ ($1\frac{1}{2}\%$ $\text{K}_2\text{C}_2\text{O}_4$) dissolves 57.1% of the P_2O_5 from phosphorite, 71% from guano by boiling 25 min. At ord temp bone meal gives up 50–80% of its P_2O_5 to $\text{K}_2\text{C}_2\text{O}_4 + \text{Aq}$ in 36 hours (Liebig, Landw J B 1881 603). Sol in Ca succrate + Aq (Bobierre, C R 32 859).

More sol in H_2O containing starch, glue, or other animal substances than in pure H_2O (Vauquelin, Pogg 85 126).

Sol in H_2O containing organic matter, therefore when bones decay under H_2O , $\text{Ca}_3(\text{PO}_4)_2$ is dissolved in considerable quantity (Hayes, Edin Phil J 5 378).

Sol in sodium citrate + Aq (Spiller).

Solubility in NH_4 citrates + Aq.

Ammonium citrate solution of 1.09 sp gr at 30–35° dissolves precipitated $\text{Ca}_3(\text{PO}_4)_2$ completely, but not phosphorite (Fresenius).

Dried on the air, with $2\frac{1}{8}\text{H}_2\text{O}$ Sol in 40 min in diammonium citrate + Aq (sp gr = 1.09), triammonium citrate + Aq (sp gr =

1.09) dissolves 55.3% of the P_2O_5 , citric acid + Aq ($\frac{1}{4}\%$) dissolves 83.8% of the P_2O_5 (Erlenmeyer, B 14 1253).

Dried at 50°, with $1\frac{1}{8}\text{H}_2\text{O}$ Sol in 45 min in diammonium citrate + Aq (sp gr = 1.09), triammonium citrate + Aq dissolves 52.3% of the P_2O_5 (Erlenmeyer).

Ignited Diammonium citrate + Aq (sp gr 1.09) dissolves 93% of the P_2O_5 , triammonium citrate + Aq (sp gr 1.09) dissolves 32% of the P_2O_5 , citric acid ($\frac{1}{4}\%$) dissolves 53.4% of the P_2O_5 (Erlenmeyer).

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827).

Insol in alcohol and ether.

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314).

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329).

Min *Apatite*

0.002 g is sol in 1 l H_2O

0.014 " " " " 1 l H_2O sat with CO_2 (Joffe, Bull Soc 1898, (3) 19 374).

+ H_2O Solubility in H_2O , in H_2O sat with CO_2 , and in H_2O containing $\text{CO}_2 + \text{CaH}_2(\text{CO}_3)_2$
Temp 16°–20°

Solvent			In 1 l of the filtrate		
			P ₂ O ₅ mg	CaO mg	
(1)	Boiled distilled H ₂ O		0 74		
(2)	1200 cc distilled H ₂ O + 50 cc H ₂ O sat with CO ₂		6 9		
(3)	1000 cc " " + 250 cc " " " "		48 5		
(4)	1250 cc H ₂ O sat with CO ₂		91 9		
Solutions of CO ₂ + CaH ₂ (CO ₃) ₂ 1 l (filtered) contains					
(5)	{	Calcium carbonate	13 mg	0 38	100 0
		Bicarbonate	166 "		
		Carbonic acid	73 "		
		Free carbonic acid	9 "		
(6)	{	Calcium carbonate	13 "	1 1	162 3
		Bicarbonate	277 "		
		Carbonic acid	122 "		
		Free carbonic acid	49 "		
(7)	{	Calcium carbonate	13 "	0 80	218 8
		Bicarbonate	376 "		
		Carbonic acid	165 "		
		Free carbonic acid	105 "		
(8)	{	Calcium carbonate	13 "	1 77	273 3
		Bicarbonate	475 "		
		Carbonic acid	209 "		
		Free carbonic acid	206 "		
(9)	{	Calcium carbonate	13 "	1 30	312 7
		Bicarbonate	545 "		
		Carbonic acid	240 "		
		Free carbonic acid	301 "		

Calcium hydrogen phosphate, CaHPO_4 , and $+2\text{H}_2\text{O}$

Insol or nearly so in H_2O Gradually decomp by cold, more quickly by hot H_2O

1000 pts H_2O dissolve 0.135–0.152 pt $\text{CaHPO}_4 + 2\text{H}_2\text{O}$ Solution clouds up on boiling (Birnbaum)

1000 pts H_2O dissolve 0.28 pt, and if sat with CO_2 , 0.66 pt $\text{CaHPO}_4 + 2\text{H}_2\text{O}$ (Dusart and Pelouze)

When this salt dissolves in H_2O , decomp takes place and a very considerable time is necessary to establish equilibrium (Rundell, C R 1902, 134 112)

Much less decomp by H_2O than $\text{Ca}_3(\text{PO}_4)_2$ or $\text{CaH}_4(\text{PO}_4)_2$, and the decomposition of this salt in water depends only slightly upon the relative amounts of solid and solvent which are present. The decomposition is increased by the addition of CO_2 . The presence of CaSO_4 or of CaCO_3 decreased the amount of phosphoric acid which dissolved. See original paper (Cameron and Seidell, J Am Chem Soc 1904, 26 1460)

When the ratio of P_2O_5 : CaO is above 1.0 or below 1.27, H_2O dissolves 0.40–0.54 g CaO and 1.11–1.52 g P_2O_5 (see original paper) (Cameron and Bell, J Am Chem Soc 1905, 27 1512)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$

G H_3PO_4 in 100 cc $\text{H}_3\text{PO}_4 + \text{Aq}$	G CaHPO_4 dissolved by 100 cc of solvent
5	4.30
10	7.15
15	9.30
20	11.86
25	13.40
30	15.10

(Causse, C R 1892, 114 415)

1 l H_2O containing 2.2 g $(\text{NH}_4)_2\text{SO}_4$, 2 g NaCl , or 3 g NaNO_3 dissolves 79.2, 66.3, or 78.9 mg CaHPO_4 , which is present in form of CaHPO_4 (Liebig, A 106 185). Slowly but completely sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ (Kraut, Arch Pharm (2) 111 102). Easily sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Gerland, J pr (2) 4 123). Very sol in HCl or $\text{HNO}_3 + \text{Aq}$. Less sol in $\text{HC}_2\text{H}_3\text{O}_2$ (Berzelius). More sol in dil than conc $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, but 60 pts $\text{HC}_2\text{H}_3\text{O}_2$ (1 mol) dissolve at most 23.1 pts P_2O_5 (1 mol = 142 pts) from this compound. Aqueous solution of sodium acetate dissolves more easily than H_2O , and becomes turbid on boiling (Birnbaum)

Completely sol in $\text{K}_2\text{C}_2\text{O}_4 + \text{Aq}$ (Liebig, Landw J B 1881 603)

1 l of sat solution in N/200 acid K tartrate + Aq at 25° contains 0.235 g CaHPO_4

Insol in alcohol. Sol in many organic substances, as starch or gelatine + Aq

Insol in acetone (Eidmann, C C 1899, II 1014)

$+1/3\text{H}_2\text{O}$ (Vorbringer, Z anal 9 457)
 $+ \text{H}_2\text{O}$ (Gerlach, J pr (2) 4 104)
 $+2\text{H}_2\text{O}$ Min *Brushite*
 $+3\text{H}_2\text{O}$ Min *Metabrushite*
 $+5\text{H}_2\text{O}$ (Dusart, C R 66 327)

Calcium tetrahydrogen orthophosphate, $\text{CaH}_4(\text{PO}_4)_2 + \text{H}_2\text{O}$

Very deliquescent. Crystals take up 97.7 pts H_2O in 16 days, and 226 pts H_2O in 28 days from air saturated with moisture (Birnbaum, Zeit Ch (2) 7 131)

Not hygroscopic when pure (Stocklassa, B 23 626 R)

Completely sol in 100 pts H_2O , but decomp by 10–40 pts H_2O with separation of CaHPO_4 , which slowly dissolves (Erlenmeyer, J B 1873 254)

Later (B 9 1839) Erlenmeyer says $\text{CaH}_4(\text{PO}_4)_2 + \text{H}_2\text{O}$ is sol in 700 pts H_2O and decomp into CaHPO_4 by a less amount of H_2O . Wattenberg (Z anal 19 243) says that the decomposition by small amts of H_2O down to 144 pts H_2O to 1 pt salt is inappreciable

Completely sol in 200 pts H_2O if pure, and in less H_2O in presence of H_3PO_4 (Stocklassa)

Sol in 25 pts H_2O at 15°. Solution begins to decompose when warmed to 50° (Otto, C C 1887 1563)

Greatly decomp by H_2O and the resulting solution is to be regarded as a solution of the decomposition products rather than of the substance itself. The presence of an excess of CaSO_4 does not materially affect the amount of phosphoric acid entering the solution (Cameron, J Am Chem Soc 1904, 26 1462)

Violently decomp by H_2O in conc solution, only sl decomp when dissolved in 200 pts H_2O (Stocklassa, Z anorg 1892, 1 310)

Solubility of $\text{CaH}_2\text{P}_2\text{O}_8$ in $\text{H}_3\text{PO}_4 + \text{Aq}$ at pressure of 745 mm at high temp

$\frac{m}{g}$	100 g of the solution contain		Solid phase
	G P_2O_5	G CaO	
115°	43.60	5.623	$\text{CaH}_2\text{P}_2\text{O}_8, \text{H}_2\text{O} + \text{CaHPO}_4$
132°	53.43	4.327	$\text{CaH}_4\text{P}_2\text{O}_8 + \text{CaH}_2\text{P}_2\text{O}_8, \text{H}_2\text{O}$
169°	63.95	4.489	$\text{CaH}_4\text{P}_2\text{O}_8$

(Bassett, Z anorg 1908, 59 26)

Glacial $\text{HC}_2\text{H}_3\text{O}_2$ ppt it completely from aqueous solution even in presence of HNO_3 (Persoz)

Decomp by 50 pts absolute alcohol at b-pt in 1 hour, by 30 pts in 2 hours. Sol in absolute ether (Erlenmeyer, l c)

Calcium pyrophosphate, $\text{Ca}_2\text{P}_2\text{O}_7 + 4\text{H}_2\text{O}$

Somewhat sol in H_2O , completely sol in mineral acids, less sol in acetic acid, and in sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Schwarzenberg, A 65 145) Less sol in warm than in cold acetic acid (Baer, Pogg 75 155)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Wackenroder, A 41 316)

Insol in $\text{CaCl}_2 + \text{Aq}$

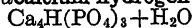
Min *Pyrophosphorite*

Calcium hydrogen pyrophosphate, $\text{CaH}_2\text{P}_2\text{O}_7 + 2\text{H}_2\text{O}$

Sol in H_2O (Pahl, B 7 478)

$2\text{CaH}_2\text{P}_2\text{O}_7, \text{Ca}_2\text{P}_2\text{O}_7 + 6\text{H}_2\text{O}$ Decomp by boiling with H_2O into—

$\text{CaH}_2\text{P}_2\text{O}_7, \text{Ca}_2\text{P}_2\text{O}_7 + 3\text{H}_2\text{O}$ Insol in hot H_2O (Knorre and Oppelt, B 21 771)

Tetracalcium hydrogen phosphate,

Ppt Insol in H_2O , but decomp by boiling therewith Sol in acids (Warrington, Chem Soc (2) 4 296)

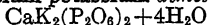
+ $2\text{H}_2\text{O}$

Calcium tetrphosphate, $\text{Ca}_3\text{P}_4\text{O}_{13}$

Insol in acids when ignited (Fleitmann and Henneberg, A 65 331)

Calcium lithium phosphate, CaLiPO_4

Insol in H_2O (Rose, Pogg 77 298)

Calcium potassium dimetaphosphate,

As BaK comp (Glatzel, Dissert 1880)

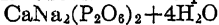
Calcium potassium orthophosphate, CaKPO_4

Insol in H_2O (Rose, Pogg 77 291)

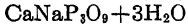
Easily sol in acids (Ouvrard, A ch (6) 16 308)

Calcium potassium pyrophosphate, $\text{CaK}_2\text{P}_2\text{O}_7$

Insol in H_2O , easily sol in dil acids (Ouvrard, C R 106 1599)

Calcium sodium dimetaphosphate,

As BaNa comp (Glatzel)

Calcium sodium trimetaphosphate,

Sl sol in H_2O (Fleitmann, A 65 315)

Easily sol in H_2O Difficultly sol in $\text{HCl} + \text{Aq}$ when heated to redness Easily sol in boiling $\text{HCl} + \text{Aq}$ after being fused (F ind-bom)

Calcium sodium orthophosphate, CaNaPO_4

Insol in H_2O (Rose, Pogg 77 292)

Easily sol in dil acids (Ouvrard, A ch (6) 16 308)

$3\text{CaO}, 3\text{Na}_2\text{O}, 2\text{P}_2\text{O}_5$ Sol in dil acids (Ouvrard, C R 1888, 106 1599)

Calcium sodium pyrophosphate, $\text{CaNa}_2\text{P}_2\text{O}_7 + 4\text{H}_2\text{O}$

Insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ Easily sol in $\text{HCl} + \text{Aq}, \text{HNO}_3 + \text{Aq}$, and also in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Baer, Pogg 75 159)

$\text{Ca}_{10}\text{Na}_{16}(\text{P}_2\text{O}_7)_5$ Sol in acids (Wallroth, Bull Soc (2) 39 316)

$3\text{CaO}, 3\text{Na}_2\text{O}, 2\text{P}_2\text{O}_5$ Easily sol in acids (Ouvrard, A ch (6) 16 307)

Calcium thorium metaphosphate, $\text{ThO}_2, \text{CaO}, \text{P}_2\text{O}_5$

(Colani, C R 1909, 149 209)

Calcium uranous metaphosphate, $\text{UO}_2, \text{CaO}, \text{P}_2\text{O}_5$

Insol in acids (Colani, A ch 1907, (8) 12 140)

Calcium uranyl phosphate, $\text{Ca}(\text{UO}_2)_2\text{H}_2(\text{PO}_4)_2 + 2, 3, \text{ or } 4\text{H}_2\text{O}$

Sol in $\text{HNO}_3 + \text{Aq}$ (Debray)

$\text{Ca}(\text{UO}_2)_2(\text{PO}_4)_2 + 8\text{H}_2\text{O}$ Min *Uranite*

Sol in $\text{HNO}_3 + \text{Aq}$
 $3\text{CaO}, 5\text{UO}_3, 2\text{P}_2\text{O}_5 + 16\text{H}_2\text{O}$ (Blinkoff, Dissert 1900)

Calcium phosphate chloride, $\text{Ca}_3(\text{PO}_4)_2, \text{CaCl}_2$

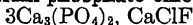
(Deville and Caron, A ch (3) 67 458)

$3\text{Ca}_3(\text{PO}_4)_2, \text{CaCl}_2$ *Chlorapatite* Insol in H_2O (Daubrée, Ann Min (4) 19 684)

$7\text{CaH}_4(\text{PO}_4)_2, \text{CaCl}_2 + 14\text{H}_2\text{O}$ Sol in $\text{HCl} + \text{Aq}$

$4\text{CaH}_4(\text{PO}_4)_2, \text{CaCl}_2 + 8\text{H}_2\text{O}$

$\text{CaH}_4(\text{PO}_4)_2, \text{CaCl}_2 + 2\text{H}_2\text{O}$ Partly sol in H_2O with decomp Also with $8\text{H}_2\text{O}$ (Erlenmeyer, J B 1857 145)

Calcium phosphate chloride fluoride,

Min *Apatite* Boiling H_2O dissolves out CaCl_2 , dil mineral acids dissolve easily, acetic acid with more difficulty Easily soluble in molten NaCl , crystallizing on cooling (Forchhammer)

Calcium phosphate silicate, $\text{Ca}_3(\text{PO}_4)_2, \text{Ca}_3\text{SiO}_4$

Insol in H_2O , decomp by $\text{HCl} + \text{Aq}$ (Carnot and Richard, C R 97 316)

$4\text{Ca}_3(\text{PO}_4)_2, \text{Ca}_3\text{SiO}_5$ (Bucking and Linck, C C 1887 562)

$4\text{Ca}_3(\text{PO}_4)_2, 3\text{Ca}_3\text{SiO}_5$ (B and I)

$\text{Ca}(\text{PO}_3)_2, \text{CaSiO}_3$ (Stead and Ridsdatc, Chem Soc 51 601)

Calcium dihydrogen phosphate sulphite, $\text{CaH}_2(\text{PO}_4)_2, \text{CaSO}_3 + \text{H}_2\text{O}$

Not decomp by cold, slowly by boiling H_2O Slightly sol in $\text{NH}_4\text{OH} + \text{Aq}$ Sol in mineral acids Insol in cold, slowly sol in boiling acetic acid More sol in a solution of oxalic acid (Gerland, C N 20 268)

Cerous metaphosphate, $\text{Ce}(\text{PO}_3)_3$

(Rammelsberg)
 $\text{Ce}_2\text{O}_3, 5\text{P}_2\text{O}_5$ Insol in H_2O or acids
 (Johnsson, B 22 976)

Cerous orthophosphate, CePO_4

Insol in H_2O Easily sol in acids
 (Grandeau, A ch (6) 8 193)
 Insol in acids (Hartley, Proc Roy Soc 41 202)
 $+2\text{H}_2\text{O}$ Insol in H_2O Sol in acids
 (John)
 Insol in $\text{H}_3\text{PO}_4 + \text{Aq}$, sl sol in HCl or
 $\text{HNO}_3 + \text{Aq}$ (Hisinger)
 Insol in $\text{HNO}_3 + \text{Aq}$ (Boussingault, A ch (5) 5 178)
 Min *Cryptolite* Completely decomp by
 H_2SO_4 when finely powdered Insol in dil
 $\text{HNO}_3 + \text{Aq}$

Ceric orthophosphate, $4\text{CeO}_2, 6\text{P}_2\text{O}_5 + 26\text{H}_2\text{O}$
Ppt (Hartley, Proc Roy Soc 41 202)**Cerous pyrophosphate, $\text{Ce}_2\text{H}_4(\text{P}_2\text{O}_7)_6 + 6\text{H}_2\text{O}$**

Sol in cerous nitrate + Aq
 $\text{Ce}_4(\text{P}_2\text{O}_7)_3 + 12\text{H}_2\text{O}$ Sol in excess of
 sodium pyrophosphate + Aq Easily sol in
 HCl (Rosenheim, B 1915, 48 592)

Cerous lanthanum thorium phosphate,
(Ce, La, Th) $_2(\text{PO}_4)_2$

Min *Monazite* Sol in $\text{HCl} + \text{Aq}$ with
 white residue

Cerous potassium orthophosphate, $2\text{Ce}_2\text{O}_3, 3\text{K}_2\text{O}, 3\text{P}_2\text{O}_5 = 2\text{CePO}_4, \text{K}_3\text{PO}_4$

Insol in H_2O , sol in acids (Ouvrard, C R 107 37)

Cerous sodium orthophosphate, $\text{Ce}_2\text{O}_3, 3\text{Na}_2\text{O}, 2\text{P}_2\text{O}_5 = \text{CePO}_4, \text{Na}_3\text{PO}_4$

Insol in H_2O (Ouvrard, C R 107 37)

Cerous sodium pyrophosphate, CeNaP_2O_7

Insol in acetic, and cold dil mineral acids
 Sol in warm acids (Wallroth)

Chromous phosphate, $\text{Cr}_3(\text{PO}_4)_2$

Insol in H_2O Easily sol in citric, tartaric
 and acetic acids Sl sol in $\text{H}_2\text{CO}_3 + \text{Aq}$
 (Moissan, A ch 1882, (5) 25 415)
 $+ \text{H}_2\text{O}$ Precipitate Easily sol in acids
 (Mobeig, Moissan, A ch (5) 21 199)

Chromic metaphosphate, $\text{Cr}_2(\text{PO}_3)_6$

Insol in H_2O or conc acids (Maddrell, A 61 53)

Chromic orthophosphate, CrPO_4

Hydrolyzed by hot H_2O Somewhat sol
 in $\text{NH}_4\text{OH} + \text{Aq}$ and in $\text{Cr}_2(\text{SO}_4)_3 + \text{Aq}$
 (Caven, J Soc Chem Ind 1897, 16 29)
 Insol in methyl acetate (Naumann, B

1909, 42 3790), ethyl acetate (Naumann,
 B 1910, 43 314)

Chromic phosphate, $\text{Cr}_2(\text{PO}_4)_3 + 12\text{H}_2\text{O}$

Violet modification Precipitate (Ram-
 melsberg, Pogg 68 383)
 $+ 6\text{H}_2\text{O}$ *Green modification* Very sl
 sol in H_2O and still less in NH_4NO_3 or
 $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Carnot, C R 94 1313)
 Insol in acetic, but easily sol in mineral
 acids Easily sol in cold KOH or $\text{NaOH} +$
 Aq , from which it is separated on boiling
 (Dowling and Plunkett, Chem Gaz 1858
 220)

Chromic hydrogen phosphate, $\text{Cr}_2\text{H}_6(\text{PO}_4)_4 + 16\text{H}_2\text{O}$

Sol in H_2O (Haushofer)

Chromic pyrophosphate, $\text{Cr}_4(\text{P}_2\text{O}_7)_3$

Anhydrous Insol in H_2O or acids (Ouv-
 rard, A ch (6) 16 344)
 $+ 7\text{H}_2\text{O}$ Precipitate Sol in strong
 mineral acids, $\text{SO}_2 + \text{Aq}$, $\text{KOH} + \text{Aq}$, and
 $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Schwarzenberg, A 65 149)
 Insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Stromeyer)

Chromic potassium phosphate, $\text{Cr}_2\text{O}_3, \text{K}_2\text{O}, 2\text{P}_2\text{O}_5$

Insol in H_2O and in acids (Ouvrard, A
 ch (6) 16 289)

Chromic potassium pyrophosphate,

$\text{K}(\text{CrP}_2\text{O}_7) + 5\text{H}_2\text{O}$
 Sl sol in cold H_2O Decomp by boiling
 H_2O (Rosenheim, B 1915, 48 586)
 $\text{Cr}_2\text{K}_2\text{H}_4(\text{P}_2\text{O}_7)_3$ Insol in H_2O , acids, or
 alkalis Sl decomp by boiling conc H_2SO_4
 (Schjerning, J pt (2) 45 515)

Chromic silver phosphate, $2\text{Cr}_2\text{O}_3, 2\text{Ag}_2\text{O}, 5\text{P}_2\text{O}_5$

(Hautefeuille and Murgottet, C R 96
 1142)

Chromic sodium orthophosphate, $\text{Na}_2\text{HPO}_4, 2\text{CrPO}_4 + 5\text{H}_2\text{O}$

Decomp by H_2O (Cohen, J Am Chem
 Soc 1907, 29 1197)

Chromic sodium pyrophosphate,

$\text{Cr}_2\text{Na}(\text{P}_2\text{O}_7)_2$
 Insol in acids (Wallroth, Bull Soc (2)
 39 316)
 $+ 10\text{H}_2\text{O}$, and $16\text{H}_2\text{O}$ Sl sol in cold H_2O
 Decomp by boiling H_2O (Rosenheim, B
 1915, 48 586)

Cobaltous monometaphosphate, $\text{Co}(\text{PO}_3)_2(?)$

Insol in H_2O and dil acids Sl in conc
 $\text{HCl} + \text{Aq}$ (Maddrell, A 58 61)

Cobaltous dimetaphosphate, $\text{Co}_2(\text{P}_2\text{O}_5)_2$

Insol in cold conc H_2SO_4 , sl sol on warming, but sol in H_2O after treating with H_2SO_4 . Sol in conc $\text{NH}_4\text{OH} + \text{Aq}$. Scarcely attacked by boiling $\text{Na}_2\text{S} + \text{Aq}$ (Fleitmann)

Cobaltous hexametaphosphate (?)

Ppt Sol in sodium hexametaphosphate + Aq (Rose, Pogg 76 4)

Cobaltous orthophosphate, $\text{Co}_3(\text{PO}_4)_2 + x\text{H}_2\text{O}$

Sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ or $\text{NH}_4\text{OH} + \text{Aq}$, sl sol in NH_4Cl or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Salvetat, C R 48 295) Sol in Co salts + Aq + $2\text{H}_2\text{O}$ (Debray, A ch (3) 61 438) + $8\text{H}_2\text{O}$ (Revnoso, C R 34 795)

Cobaltous hydrogen orthophosphate,

$\text{CoHPO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$
Ppt (Debray)
+ $2\frac{1}{2}\text{H}_2\text{O}$ Ppt Insol in H_2O Sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Bodeker, A 94 357)

Cobaltous tetrahydrogen orthophosphate, $\text{CoH}_4(\text{PO}_4)_2$

Sol in H_2O (Reynoso)

Cobaltous pyrophosphate

Ppt Sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Stromeyer)
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Schwarzenberg)

Cobaltous pyrometaphosphate, $3\text{CoO}, 2\text{P}_2\text{O}_5$

(Braun)
 $6\text{CoO}, 5\text{P}_2\text{O}_5$ (Braun)

Cobaltous potassium phosphate, CoKPO_4

Insol in H_2O , easily sol in dil acids (Ouvrard, C R 106 1729)
 $3\text{CoO}, 3\text{K}_2\text{O}, 2\text{P}_2\text{O}_5$ As above

Cobaltous sodium triphosphate, $\text{Na}_2\text{Co}_2\text{P}_3\text{O}_{10}$

(Schwarz, Z anorg 1895, 9 260)
 $\text{Na}_2\text{CoP}_3\text{O}_{10} + 12\text{H}_2\text{O}$ Very sol in H_2O , decomp in aq solution Sol in acids (Schwarz, Z anorg 1895, 9 258)

Cobaltous sodium metaphosphate,

$\text{Co}_3\text{Na}_2(\text{PO}_3)_3$
Insol in H_2O or acids, even conc H_2SO_4 (Watts' Dict)

Cobaltous sodium monometaphosphate,

$6\text{Co}(\text{PO}_3)_2, 2\text{NaPO}_3$
Insol in H_2O and dil acids Sol in conc H_2SO_4 (Maddrell, A 61 57)

Cobaltous sodium trimetaphosphate,

$\text{CoNa}_3(\text{PO}_3)_3 + 8\text{H}_2\text{O}$
Sol in H_2O (Fleitmann and Henneberg, A 65 315)

Cobaltous sodium orthophosphate, CoNaPO_4

Insol in H_2O (Ouvrard, C R 106 1729)
 $\text{Co}_3(\text{PO}_4)_2, 2\text{Na}_2\text{HPO}_4 + 8\text{H}_2\text{O}$ (Debray, J Pharm (3) 46 119)

Cobaltous sodium pyrophosphate,

$\text{Co}_{10}\text{Na}_{18}(\text{P}_2\text{O}_7)_3$
Insol in H_2O Sol in acids (Wallroth)
+ $x\text{H}_2\text{O}$ Sol in H_2O (Stromeyer)

Cobaltous zinc phosphate, $\text{Co}_3(\text{PO}_4)_2, 3\text{Zn}_3(\text{PO}_4)_2 + 12\text{H}_2\text{O}$

Ppt Sol in acids (Gentele)
 $\text{CoZn}_2(\text{PO}_4)_2 + 6\text{H}_2\text{O}$ Insol in H_2O

Columbium phosphate (?)

Insol in H_2O (Blomstrand)

Cupric dimetaphosphate, $\text{Cu}_2(\text{P}_2\text{O}_5)_2$

Insol in H_2O Sol in conc H_2SO_4 (Maddrell, A 61 62) Insol in most conc acids and in alkalies, except hot $\text{NH}_4\text{OH} + \text{Aq}$ or conc H_2SO_4 , in which it is moderately sol. Not decomp by H_2S , but by $(\text{NH}_4)_2\text{S} + \text{Aq}$, less easily by Na_2S , and $\text{K}_2\text{S} + \text{Aq}$ (Fleitmann, Pogg 78 242)
+ $8\text{H}_2\text{O}$ Completely insol in H_2O (Fleitmann)

Cupric hexametaphosphate (?)

Sol in $\text{Na}_4\text{P}_6\text{O}_{18} + \text{Aq}$ or $\text{CuCl}_2 + \text{Aq}$ (Rose, Pogg 76 5)
 $\text{Cu}_2\text{P}_6\text{O}_{18}$ Easily sol in H_2O or acids, especially when freshly pptd (Ludert, Z anorg 5 15)

Cupric orthophosphate, basic, $6\text{CuO} \cdot \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$

Min *Phosphocalcite*
 $5\text{CuO}, \text{P}_2\text{O}_5 + 2\text{H}_2\text{O}$ Min *Dihydrate*
+ $3\text{H}_2\text{O}$ Min *Ehrlite* Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, and $\text{HNO}_3 + \text{Aq}$
 $4\text{CuO}, \text{P}_2\text{O}_5 + \text{H}_2\text{O}$ Slowly sol in NH_4OH or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, insol in cold $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Steinschneider, C C 1891, II 51)
Sl sol in $\text{CuCl}_2 + \text{Aq}$ and $\text{CuSO}_4 + \text{Aq}$
Decomp by boiling H_2O and boiling Aq potash (Caven, J Soc Chem Ind 1897, 16 29)

Min *Labethenite* Sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$
+ $2\text{H}_2\text{O}$ Min *Pseudolabethenite* Sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$
+ $3\text{H}_2\text{O}$ Min *Taqbite* Sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$

Cupric triphosphate, $5\text{CuO}, 3\text{P}_2\text{O}_7 + 13\text{H}_2\text{O}$

Sol in H_2O Sol in HNO_3 (Schwarz, Z anorg 1895, 9 262)

Cupric dimetaphosphate, $\text{CuP}_2\text{O}_6 + 4\text{H}_2\text{O}$

Sol in 78 pts H_2O Easily decomp by hot conc H_2SO_4 (Glatzel, Dissert 1880)

Cupric trimetaphosphate, $\text{Cu}_3(\text{P}_3\text{O}_9)_2 + 9\text{H}_2\text{O}$

Verv sl sol in H_2O (0.04 g in 1 l at 20°)
(Tammann, J pr 1892, (2) 45 425)

Cupric tetrametaphosphate, $\text{Cu}_2\text{P}_4\text{O}_{12}$

Insol in H_2O and in HCl Sl sol in boiling HNO_3 Very sol in boiling conc H_2SO_4
(Glatzel)

+ $8\text{H}_2\text{O}$ Nearly insol in H_2O Slowly attacked by acids except conc H_2SO_4
(Glatzel)

Cupric orthophosphate, $\text{Cu}_3(\text{PO}_4)_2 + 3\text{H}_2\text{O}$

Insol in H_2O , easily sol in acids, even H_3PO_4 , $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_2\text{SO}_3 + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Sl sol in NH_4 salts + Aq
Sl sol in Cu salts + Aq (Rose, Pogg 76 25)

Sol in cold $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Steinschneider, C C 1891, II, 51)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 827)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Cupric hydrogen phosphate, $\text{CuHPO}_4 + 1\frac{1}{2}\text{H}_2\text{O} (?)$

Insol in H_2O , sol in $\text{H}_3\text{PO}_4 + \text{Aq}$, and $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Insol in NH_4Cl , and $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett, Phil Mag (3) 10 98)

Cupric pyrophosphate, basic, $\text{Cu}_2\text{P}_2\text{O}_7, 2\text{CuO}, \text{H}_2\text{O} + 3\text{H}_2\text{O}$

Insol in H_2O (Pahl, J B 1873 229)

Cupric pyrophosphate, $\text{Cu}_2\text{P}_2\text{O}_7$

Anhydrous Insol in H_2O , and very sl sol in conc acids (Fleitmann, Pogg 78 244)

As insol as Cu metaphosphate, but decomp by H_2S (Rose, Pogg 76 14)

+ $2\text{H}_2\text{O}$ Sol in mineral acids, and $\text{NH}_4\text{OH} + \text{Aq}$, also in $\text{Na}_4\text{F}_2\text{O}_7 + \text{Aq}$ (Schwarzenberg, A 65 156)

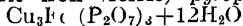
Sol in cold $\text{H}_2\text{SO}_3 + \text{Aq}$ without decomp, crystallizing out on boiling

Decomp by boiling $\text{KOH} + \text{Aq}$

Sol in large excess of $\text{CuSO}_4 + \text{Aq}$

+ $2\frac{1}{2}\text{H}_2\text{O}$ (Pahl, Sv V A F 30, 7 40)

+ $5\text{H}_2\text{O}$ Verv sl sol in H_2O
Sol in dil acids (Wiesler, Z anorg 1901, 28 202)

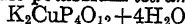
Cupric iron (ferric) pyrophosphate,

Ppt (Pascal, C R 1908, 146 233)

Cupric potassium phosphate, $4\text{CuO}, \text{K}_2\text{O}, 3\text{P}_2\text{O}_5$

Insol in H_2O (Ouvrard, C R 111 177)

CuKPO_4 As above

Cupric potassium tetrametaphosphate,

Sol in 58 pts H_2O Easily attacked by acids (Glatzel, Dissert 1880)

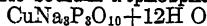
Cupric potassium pyrophosphate, $\text{CuK}_2\text{P}_2\text{O}_7$

Extremely easily sol in H_2O (Persoz, A ch (3) 20 315)

$\text{Cu}_2\text{P}_2\text{O}_7, 3\text{K}_4\text{P}_2\text{O}_7 + 4\text{H}_2\text{O}$ Insol in H_2O
(Pahl, Sv V A F 30, 7 44)

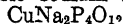
Cupric sodium phosphate, $\text{Cu}_2\text{Na}_6(\text{PO}_4)_4$

Insol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in conc acids (Wallroth, Bull Soc (2) 39 316)

Cupric sodium triphosphate,

Sl sol in H_2O , very unstable

Easily sol in acids (Stange, Z anorg 1896, 12 458)

Cupric sodium tetrametaphosphate,

As insol in H_2O as Cu dimetaphosphate
Difficultly decomp by digestion with $\text{Na}_2\text{S} + \text{Aq}$ (Fleitmann, Pogg 78 355)

+ $4\text{H}_2\text{O}$ Sol in 45 pts H_2O (Glatzel, Dissert 1880)

Cupric sodium orthophosphate, $3\text{Cu}_3(\text{PO}_4)_2, \text{Na}_4\text{H}_2\text{P}_4\text{O}_{12}$

Decomp by H_2O to $4\text{CuO}, \text{P}_2\text{O}_5$ (Steinschneider, C C 1891, II 52)

$2\text{Cu}_3(\text{PO}_4)_2, \text{Na}_4\text{HPO}_4$ Decomp by H_2O into—

$3\text{Cu}_3(\text{PO}_4)_2, \text{Na}_4\text{HPO}_4$ Decomp by H_2O (S)

$\text{Cu}_4(\text{PO}_4)_2, \text{Na}_4\text{H}_2\text{P}_4\text{O}_{12}$ Decomp by H_2O (S)

$6\text{Cu}_3(\text{PO}_4)_2, 2\text{Na}_3\text{PO}_4$ Decomp by H_2O (S)

Cupric sodium pyrophosphate, $\text{CuNa}_2\text{P}_2\text{O}_7$

Insol in H_2O (Fleitmann and Henneberg, A 65 387)

+ $\frac{2}{3}\text{H}_2\text{O}$ (F and H) Much more sol than the next salt (Pahl)

+ $6\text{H}_2\text{O}$ (Persoz, A ch (3) 20 315)

$\text{CuP}_2\text{O}_7, \text{CuNa}_2\text{P}_2\text{O}_7 + 3\frac{1}{2}\text{H}_2\text{O}$ Verv efflorescent, insol in H_2O (F and H)

+ $10\frac{1}{2}\text{H}_2\text{O}$ (Pahl, Sv V A F 30, 7 42)

$\text{CuNa}_2\text{P}_2\text{O}_7, \text{Na}_4\text{P}_2\text{O}_7$ Sol in H_2O (F and H)

+ $2\text{H}_2\text{O}$ (F and H)

+ 12, and $16\text{H}_2\text{O}$ Very efflorescent, and sol in H_2O (Pahl)

$\text{Cu}_3\text{Na}_2\text{P}_4\text{O}_{14} + 10\text{H}_2\text{O}$ Insol in H_2O , sol in HCl and HNO_3 even after heating

(Stange, Z anorg 1896, 12 456)

Cupric uranyl phosphate, $(\text{UO}_2)_2\text{Cu}(\text{PO}_4)_2 + 8\text{H}_2\text{O}$

Insol in H_2O , easily sol in acids (Debray)

Min *Chalcolite* Sol in $\text{HNO}_3 + \text{Aq}$

Cupric orthophosphate ammonia, $\text{Cu}_3(\text{PO}_4)_2 \cdot 4\text{NH}_3$

Sl sol in H_2O Easily sol in H_2O containing NH_4OH (Schiff, A 123 41)

2CuO , $3\text{P}_2\text{O}_5$, $20\text{NH}_3 + 21\text{H}_2\text{O}$ Easily sol in cold H_2O , with subsequent decomp (Metzner, A 149 66)

2CuO , P_2O_5 , 6NH_3 (Maumené)

Cupric pyrophosphate ammonia, 8CuO , $3\text{P}_2\text{O}_5$, $4\text{NH}_3 + 4\text{H}_2\text{O}$

Sl sol in H_2O (Schwarzenberg, A 65 133)

$\text{Cu}_2\text{P}_2\text{O}_7$, $4\text{NH}_3 + \text{H}_2\text{O}$ Sl sol in H_2O (Schiff, A 123 1)

Didymium metaphosphate, $\text{D}_1(\text{PO}_3)_3$

Precipitate (Smith)

D_1O_3 , $5\text{P}_2\text{O}_5$ Insol in H_2O (Cleve)

Didymium phosphate, $2\text{D}_1\text{O}_3$, $3\text{P}_2\text{O}_5$

Insol in H_2O (Ouvrard, C R 107 37)

Didymium orthophosphate, D_1PO_4

Insol in H_2O Very sl sol in dil, easily sol in conc acids (Marignac) Insol in H_2O (Wallroth, Bull Soc (2) 39 316)

$+\text{H}_2\text{O}$ (Frerichs and Smith, A 191 355)

Didymium trihydrogen phosphate,

$\text{D}_1\text{H}_3(\text{PO}_4)_3$

Precipitate (Frerichs and Smith)

Existence is doubtful (Cleve, B 12 910)

Didymium hexahydrogen phosphate,

$\text{D}_1\text{H}_6(\text{PO}_4)_2 + \text{H}_2\text{O}$

Precipitate (Hermann)

Didymium pyrophosphate, $\text{D}_1(\text{P}_2\text{O}_7)_3 + 6\text{H}_2\text{O}$

Precipitate (Cleve)

Didymium hydrogen pyrophosphate,

$\text{D}_1\text{H}_6(\text{P}_2\text{O}_7)_3$

Precipitate Sol in disodium pyrophosphate + Aq (Frerichs and Smith, A 191 355)

Does not exist (Cleve)

Didymium potassium phosphate, $2\text{D}_1\text{O}_3$,

$3\text{K}_2\text{O}$, $3\text{P}_2\text{O}_5 = 2\text{D}_1\text{PO}_4$, K_3PO_4

Insol in H_2O (Ouvrard, C R 107 37)

Didymium sodium orthophosphate, D_1O_3 ,

$3\text{Na}_2\text{O}$, $2\text{P}_2\text{O}_5 = \text{D}_1\text{PO}_4$, Na_3PO_4

Insol in H_2O (Ouvrard)

Didymium sodium pyrophosphate, D_1O_3 ,

Na_2O , $2\text{P}_2\text{O}_5 = \text{D}_1\text{NaP}_2\text{O}_7$

Insol in H_2O (Ouvrard C R 107 37)

Dysprosium orthophosphate, $\text{DyPO}_4 + 5\text{H}_2\text{O}$

Nearly insol in H_2O

Easily sol in dil acids or acetic acid (Jantsch, B 1911, 44 1276)

Erbium phosphate, $\text{ErPO}_4 + \text{H}_2\text{O}$

Precipitate

Erbium pyrophosphate, $\text{ErHP}_2\text{O}_7 + 3\frac{1}{2}\text{H}_2\text{O}$

Scarcely sol in boiling H_2O Slowly sol in acids

Erbium sodium pyrophosphate, ErNaP_2O_7

Precipitate (Wallroth)

Glucinum metaphosphate, $\text{Gl}(\text{PO}_3)_2$

Insol in H_2O and acids (Bleyer, Z anorg 1912, 79 274)

Glucinum orthophosphate, basic

$2\text{Gl}_3\text{P}_2\text{O}_8$, $\text{GlO} + 13\text{H}_2\text{O}$

Ppt (Bleyer, Z anorg 1912, 79 268)

Glucinum orthophosphate, $\text{Gl}_3(\text{PO}_4) + 6\text{H}_2\text{O}$

Precipitate Insol in H_2O Sol in acids (Atterberg, Sv V A Handl 12, 5 33)

1 l 2% $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ dissolves 0.55 g of the anhydrous salt, 1 l 10% $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ dissolves 1.725 g (Sestini, Gazz ch it 20 313)

$+7\text{H}_2\text{O}$ (Atterberg)

Glucinum hydrogen orthophosphate, $\text{GlHPO}_4 + 3\text{H}_2\text{O}$

$\text{GlH}_4(\text{PO}_4)_2$ hygroscopic (Bleyer, Z anorg 1912, 79 266)

Precipitated by alcohol (Atterberg)

Glucinum phosphate, 5GlO , $2\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$

Ppt Sol in H_2O with decomp (Scheffer) 3GlO , P_2O_5 , $3\text{H}_2\text{O} + \text{H}_2\text{O}$ (Sestini, Gazz ch it 20 313)

Glucinum pyrophosphate, $\text{Gl}_2\text{P}_2\text{O}_7 + 5\text{H}_2\text{O}$

Ppt (Scheffer)

St $\backslash$ $\text{P}_2\text{O}_7 + \text{Aq}$ (Stromeyer)

Glucinum potassium phosphate, GlKPO_4

Insol in H_2O (Ouvrard, C R 110 1333)

Glucinum sodium phosphate, GlNaPO_4

Sl sol in cold, easily sol in hot acids (Wallroth) Insol in acetic acid

Min *Beryllonite*

GlO , $2\text{Na}_2\text{O}$, P_2O_5 Insol in H_2O (Ouvrard, C R 110 1333)

Gold (Auric) sodium pyrophosphate (?),

$\text{Au}_4(\text{P}_2\text{O}_7)_3$, $2\text{Na}_4\text{P}_2\text{O}_7 + \text{H}_2\text{O}$

Sol in H_2O (Persoz)

Gold sodium pyrophosphate, ammonia,
 $14\text{Au}_2\text{O}_3, 6\text{P}_2\text{O}_5, 3\text{Na}_2\text{O}, 14\text{NH}_3 + 24\text{H}_2\text{O}$
 Insol in H_2O (Gibbs, Am Ch J 1895,
 17 172)

Iron (ferrous) trimetaphosphate, $\text{Fe}(\text{P}_3\text{O}_9)_3 + 12\text{H}_2\text{O}$

Rather sl sol in cold, more easily in hot H_2O . After ignition sol in $\text{HCl} + \text{Aq}$ only after long boiling (Lindbom, Acta Lund 1873 17)

Ferrous hexametaphosphate, $\text{Fe}_3\text{P}_6\text{O}_{18}$

When freshly pptd is sol in H_2O , and very sol in least traces of acids, or $\text{Na}_6\text{P}_6\text{O}_{18} + \text{Aq}$ (Ludert, Z anorg 5 15)

Ferrous phosphate, basic, $7\text{FeO}, 2\text{P}_2\text{O}_5 + 9\text{H}_2\text{O}$

Min *Ludlamite* Sol in dil H_2SO_4 or $\text{HCl} + \text{Aq}$ Decomp by boiling KOH or $\text{NaOH} + \text{Aq}$

Ferrous orthophosphate, $\text{Fe}_2(\text{PO}_4)_3$

Insol in H_2O , sol in acids
 Sol in 1000 pts H_2O containing more than 1 vol CO_2 (Pierre)

Sol in an excess of ferrous salts + Aq
 Sol in 560 pts H_2O containing $\frac{1}{500}$ pt $\text{HC}_2\text{H}_3\text{O}_2$ Sol in 1666 pts H_2O containing 150 pts $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ (Pierre, A ch (3) 36 78)

Sol in NH_4 salts + Aq
 Sol in $\text{NH}_4\text{OH} + \text{Aq}$ Not pptd in presence of Na citrate

Insol in acetone (Naumann, B 1904, 37 4329)

+ H_2O (Debray, A ch (3) 61 437)
 + $8\text{H}_2\text{O}$ Min *Vivianite* Easily sol in HCl or $\text{HNO}_3 + \text{Aq}$ Boiling $\text{KOH} + \text{Aq}$ dissolves out phosphoric acid Sol in cold citric acid + Aq (Bolton, C N 37 14)

Insol in H_2O Sol in acids (Evans, C C 1897, I 580)

Ferrous hydrogen orthophosphate, $\text{FeHPO}_4 + \text{H}_2\text{O}$

Ppt (Debray, A ch (3) 61 437)
 Is impure $\text{Fe}_3(\text{PO}_4)_2$ (Erlenmeyer and Heinrichs, A 194 176)

Ferrous tetrahydrogen orthophosphate, $\text{FeH}_4(\text{PO}_4)_2 + \text{H}_2\text{O}$

Easily sol in H_2O Not changed by alcohol (Erlenmeyer and Heinrichs, A 194 176)

Ferrous pyrophosphate

Ppt Sol in an excess of $\text{Na}_4\text{P}_2\text{O}_7$ or $\text{FeSO}_4 + \text{Aq}$ (Schwarzenberg, A 65 153)

Ferric metaphosphate, $\text{Fe}_3(\text{PO}_3)_3$ or $\text{Fe}(\text{PO}_3)_3$

Insol in H_2O or dil acids Sol in conc H_2SO_4 (Maddrell, Phil Mag (3) 30 322)

Iron (ferric) orthophosphate, basic, $2\text{Fe}_2\text{O}_3, \text{P}_2\text{O}_5 + x\text{H}_2\text{O}$

Insol in NH_4 citrate, sol in NH_4 tartrate + Aq (Wittstein)

+ $3\text{H}_2\text{O}$ Min *Kraurite* Easily sol in $\text{HCl} + \text{Aq}$

+ $4\text{H}_2\text{O}$ Ppt (Millot, C R 82 89)

+ $5\text{H}_2\text{O}$ Min *Dufrenoyte*

+ $12\text{H}_2\text{O}$ Min *Cacoxene* Sol in $\text{HCl} + \text{Aq}$

+ 18, or $24\text{H}_2\text{O}$ Min *Delvauxite*

$5\text{Fe}_2\text{O}_3, 3\text{P}_2\text{O}_5 + 14\text{H}_2\text{O}$ Min *Beraunite*

Sol in $\text{HCl} + \text{Aq}$

$3\text{Fe}_2\text{O}_3, 2\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$ Min *Eleonorite*

Sol in $\text{HCl} + \text{Aq}$

Ferric orthophosphate, $\text{Fe}_2(\text{PO}_4)_3 + x\text{H}_2\text{O}$, or $2\text{Fe}_2\text{O}_3, 3\text{P}_2\text{O}_5 + x\text{H}_2\text{O}$

+ 4, or $8\text{H}_2\text{O}$ (Pptd ferric phosphate)

Insol in H_2O Sol in 1500 pts boiling H_2O (Bergmann, 1815)

Sol in pure H_2O when all traces of soluble salts are absent (Freseunius) Verv sl sol in, but decomp by H_2O (Lachowicz, W A B 101, 2b 374) For an extended discussion of solubility in and decomposition by H_2O and effect of salts see Cameron and Hurst, (J Am Chem Soc 1904, 26 888)

Easily sol in dil mineral acids, excepting $\text{H}_3\text{PO}_4 + \text{Aq}$ Insol in cold $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Wittstein) 100 cem cold H_2O containing 10% $\text{HC}_2\text{H}_3\text{O}_2$ dissolve 0.007 g salt (Sestini, Gazz ch it 5 252) When freshly pptd easily sol in $\text{H}_2\text{SO}_4 + \text{Aq}$, or $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Berthier) Easily sol in tartaric or citric acid + Aq , also in NH_4 salts of those acids, and Na citrate + Aq (Heydenreich, C N 4 158) See below

Sol in 12,500 pts H_2O sat with CO (Pierre, A ch (3) 36 78)

Insol in NH_4 salts + Aq (Wittstein) Sol in $\text{NH}_4\text{OH} + \text{Aq}$ in presence of Na_2HPO_4 insol in hot $\text{Na}_2\text{HPO}_4 + \text{Aq}$, sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Berzelius) NH_4OH , KOH , or $\text{NaOH} + \text{Aq}$ dissolve out H_3PO_4

Sol in ferric salts + Aq , even ferric acetate, but insol in ferrous acetate + Aq

Partially sol in large amt of $\text{Na CO}_3 + \text{Aq}$ Not pptd in presence of Na citrate (Spiller)

Arth (Bull Soc (3) 2 324) obtained a modification of $\text{Fe}(\text{PO}_4)_3$ insol in $\text{HNO}_3 + \text{Aq}$, but sol in hot conc $\text{HCl} + \text{Aq}$

+ $4\text{H}_2\text{O}$ Min *Strengite* Easily sol in $\text{HCl} + \text{Aq}$, insol in $\text{HNO}_3 + \text{Aq}$

+ $5\text{H}_2\text{O}$ Only sl sol in H_2O Slowly sol in HNO_3 , easily sol in HCl (Weinland, Z anorg 1913, 84 361)

Diammonium citrate + Aq dissolves 4.8% of the P_2O_5 , triammonium citrate, 5.8% P_2O_5 , and with an excess of NH_4OH , 21.2% P_2O_5 is dissolved (Erlenmeyer, B 14 1253)

+ $9\text{H}_2\text{O}$ Dissolves in 35 min in diammonium citrate + Aq (sp gr 1.09) in 55 min in triammonium citrate + Aq (sp gr 1.09), citric acid + Aq ($\frac{1}{4}\%$ citric acid) dissolves 17.5% of the P_2O_5 (Erlenmeyer, l c)

Iron (ferric) phosphate, acid, $8\text{Fe}_2\text{O}_3, 9\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$

Insol in H_2O (Rumpler, Z anal 12 151)
 $6\text{Fe}_2\text{O}_3, 7\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$
 $4\text{Fe}_2\text{O}_3, 5\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$
 $2\text{Fe}_2\text{O}_3, 3\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$ Ppt Decomp by
 H_2O finally into $\text{Fe}_2(\text{PO}_4)_2$ (Erlenmeyer and
 Heinrich, A 194 176)

$8\text{Fe}_2\text{O}_3, 11\text{P}_2\text{O}_5 + 9\text{H}_2\text{O}$ As above (E and H)

$4\text{Fe}_2\text{O}_3, 7\text{P}_2\text{O}_5 + 9\text{H}_2\text{O}$ As above (E and H)

$\text{Fe}_2\text{O}_3, 2\text{P}_2\text{O}_5 + 8\text{H}_2\text{O}$ Insol in H_2O or
 HCl , sol in NH_4 citrate, alkali
 hydrates, or carbonates + Aq (Winkler)
 Slowly decomp by H_2O (E and H)

+ $10\text{H}_2\text{O}$ (Waite, C N 36 132)
 $2\text{Fe}_2\text{O}_3, 5\text{P}_2\text{O}_5 + 17\text{H}_2\text{O}$

$\text{Fe}_2\text{O}_3, 3\text{P}_2\text{O}_5 + 6\text{H}_2\text{O} = \text{FeH}_2(\text{PO}_4)_2$ Delu-
 quescent Insol in H_2O , but decomp into
 $\text{Fe}_2(\text{PO}_4)_2$ (E and H)

+ $4\text{H}_2\text{O}$ (Hautefeuille and Margottet,
 C R 106 135)

Ferric pyrophosphate, $\text{Fe}_4(\text{P}_2\text{O}_7)_3$

Two modifications — (a) Sol in acids,
 $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, $\text{FeCl}_3 + \text{Aq}$, $\text{NH}_4\text{OH} + \text{Aq}$, and
 in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$

Insol in acetic, sulphurous acid, or NH_4Cl
 + Aq Sol in NH_4 citrate + Aq (Schwarzen-
 berg, A 65 153)

(b) Insol in dil acids, $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, FeCl_3
 + Aq Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Gladstone,
 Chem Soc (2) 5 435)

Solubility of $\text{Fe}_4(\text{P}_2\text{O}_7)_3$ in $\text{NH}_4\text{OH} + \text{Aq}$ at 0°

100 g sat solution contain		100 g sat solution contain	
G NH_3	G $\text{Fe}_4(\text{P}_2\text{O}_7)_3$	G NH_3	G $\text{Fe}_4(\text{P}_2\text{O}_7)_3$
0 884	5 606	5 92	14 71
1 59	9 75	8 26	13 89
3 71	14 85	10 55	7 40
4 72	15 94	15 96	2 52
5 93	13 92	18 83	0 445
7 91	14 61		

(Pascal, A ch 1909, (8) 16 374)

Insol in acetone (Krug and M'F'roy, J
 Anal Appl Ch 6 184)

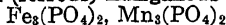
Insol in liquid NH_3 (Franklin, Am Ch
 J 1598, 20 828)

Ferroferric orthophosphate, $2\text{Fe}_3(\text{PO}_4)_2, 3(\text{Fe}_2\text{O}_3, 2\text{P}_2\text{O}_5) + 16\text{H}_2\text{O}$

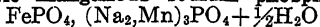
Ppt Sol in $\text{HCl} + \text{Aq}$ Ppt in H_2O
 $4\text{Fe}_2\text{O}_3, 6\text{FeO}, 5\text{P}_2\text{O}_5 + 40\text{H}_2\text{O}$ Sol in 40
 min in diammonium citrate + Aq (sp gr =
 1.09), triammonium citrate + Aq (sp gr =
 1.09) dissolves 55.7% of the P_2O_5 (Erlen-
 meyer, B 14 1253)

Ferroferric lithium phosphate, $\text{Li}_3\text{PO}_4, \text{Fe}_3(\text{PO}_4)_2$

Min *Triphylite* Easily sol in acids, not
 wholly decomp by $\text{KOH} + \text{Aq}$

Iron (ferrous) manganous phosphate,

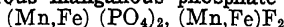
Min *Triphite* Easily sol in $\text{HCl} + \text{Aq}$
 $5(\text{Mn}, \text{Fe})\text{O}, 2\text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$ Min *Hur-*
evulite Sol in acids

Ferric manganous sodium phosphate,

Min — (?)

Ferrous manganous phosphate chloride,

(Deville and Caron)

Ferrous manganous phosphate fluoride,

Min *Triphite, Zurelesite* Sol in $\text{HCl} + \text{Aq}$
 $3(\text{Mn}, \text{Fe})_3(\text{PO}_4)_2, \text{MnF}_2$ (Deville and
 Caron, C R 47 985)

Ferric potassium phosphate, $2\text{Fe}_2\text{O}_3, 3\text{K}_2\text{O}, 3\text{P}_2\text{O}_5$

Not attacked by boiling H_2O (Ouvrard,
 A ch (6) 16 289)

$\text{Fe}_2\text{O}_3, \text{K}_2\text{O}, 2\text{P}_2\text{O}_5$ Insol in H_2O , verv sl
 attacked by acids (Ouvrard)

Ferric silver metaphosphate, $2\text{Fe}_2\text{O}_3, 2\text{Ag}_2\text{O}, 5\text{P}_2\text{O}_5$

(Hautefeuille and Margottet, C R 96
 1142)

Ferric silver pyrophosphate, $\text{Fe}_2\text{Ag}_6(\text{P}_2\text{O}_7)_3 + 4\text{H}_2\text{O}$

Ppt (Pascal, C R 1908, 146 232)

Ferric sodium phosphate, $2\text{Fe}_2\text{O}_3, 3\text{Na}_2\text{O}, 3\text{P}_2\text{O}_5$

Decomp by H_2O (Ouvrard)

Ferrous sodium triphosphate, $\text{Fe}(\text{Na}_2\text{P}_3\text{O}_{10}) + 11\frac{1}{2}\text{H}_2\text{O}$

Stable dry, sol in HNO_3 , decomp in con-
 tact with H_2O (Stange, Z anorg 1596, 12
 451)

Ferric sodium hydrogen orthophosphate, $\text{Fe}(\text{PO}_4)\text{H}_2\text{N} + \text{H}_2\text{O}$

Difficultly sol in H_2O Slowly decomp by
 boiling with H_2O Sol in dil HCl and dil
 HNO_3 Decomp by alkalis and alkali car-
 bonates (Weinland / anorg 1913, 84 354)

$\text{Fe}(\text{PO}_4)\text{H}_2\text{N} + \text{H}_2\text{O}$ Difficultly sol in
 H_2O Decomp by boiling with H_2O Sol in
 dil HCl and in dil HNO_3 Decomp by al-
 kalies and alkali carbonates (Weinland, Z
 anorg 1913, 84 358)

Ferric sodium pyrophosphate, $\text{Fe}_4(\text{P}_2\text{O}_7)_3, 2\text{Na}_4\text{P}_2\text{O}_7 + 7\text{H}_2\text{O}$

Slowly but completely sol in H_2O Pptd
 by alcohol (Milek, J B 1865 263)

Very sol in H_2O (Fleitmann and Henne-
 berg)

+5, and $6\text{H}_2\text{O}$ Easily sol in H_2O , especially if warm (Pahl, J B 1873 229)

FeNaP_2O_7 Insol in H_2O , dil HCl, or HNO_3 +Aq, sl sol in conc HCl+Aq, decomp by conc hot H_2SO_4 without solution (Jorgensen, J pr (2) 16 342)

Insol in acetone (Naumann, B 1904, 37 4329)

$\text{Na}_2\text{Fe}_2(\text{P}_2\text{O}_7)_3+9\text{H}_2\text{O}$ Decomp by H_2O (Rosenheim, B 1915, 48 586)

$\text{Fe}_4(\text{P}_2\text{O}_7)_3, 5\text{Na}_4\text{P}_2\text{O}_7+7\text{H}_2\text{O}$ (Pahl, J B 1873 229)

Iron (ferric) phosphate sulphate, $3\text{Fe}_2(\text{PO}_4)_3, 2\text{Fe}_2(\text{SO}_4)_3, 2\text{Fe}_2\text{O}_3\text{H}_6$

Min *Dyaochite*

Lanthanum metaphosphate, $\text{La}_2(\text{PO}_3)_6$

Precipitate (Frerichs and Smith)

$\text{La}_2\text{O}_3, 5\text{P}_2\text{O}_5$ Insol in H_2O , dil, or conc acids (Johnsson, B 22 976)

Lanthanum orthophosphate, LaPO_4

Precipitate (Hermann)

Insol in H_2O and acids (Ouvrard, C R 107 37)

Lanthanum hydrogen phosphate,

$\text{La}_2\text{H}_3(\text{PO}_4)_3$

Precipitate (Frerichs, B 7 799)

Existence is doubtful (Cleve, B 11 910)

Lanthanum phosphate, acid, $\text{La}_2\text{O}_3, 2\text{P O}_5$

Precipitate (Hermann)

Lanthanum pyrophosphate, $\text{LaHP}_2\text{O}_7+3\text{H}_2\text{O}$ (Cleve)

$\text{La}_2\text{H}_6(\text{P}_2\text{O}_7)_3$ Precipitate (Frerichs and Smith)

Does not exist (Cleve)

Lanthanum potassium orthophosphate,

$2\text{La}_2\text{O}_3, 3\text{K}_2\text{O}, 3\text{P O}_5=2\text{LaPO}_4, \text{K}_3\text{PO}_4$

Insol in H_2O (Ouvrard, C R 107 37)

Lanthanum sodium orthophosphate, $\text{La}_2\text{O}_3, 3\text{Na O}, 2\text{P}_2\text{O}$

Insol in H_2O (Ouvrard)

Lanthanum sodium pyrophosphate,

$\text{La}_2\text{NaP}_2\text{O}_7$

Insol in H_2O , and dil cold mineral acids
Sol in warm dil acids (Wallroth)

Lead dimetaphosphate, PbP_2O_6

Ppt Almost insol in H_2O Sol in HNO_3 +Aq (Fleitmann, Pogg 78 253)

Lead trimetaphosphate, $\text{Pb}_3(\text{P}_3\text{O}_9)_2+3\text{H}_2\text{O}$

Nearly insol in H_2O Less sol in H_2O than the corresponding Ag salt (Fleitmann and Henneberg, A 65 304)

Most insol of the *trimetaphosphates* (Lundbom, Acta Lund 1873 12)

Anhydrous salt is insol in H_2O , easily sol in HNO_3 +Aq (Lundbom)

Lead tetrametaphosphate, $\text{Pb}_4\text{P}_4\text{O}_{12}$

Insol in H_2O

More easily decomp by acids than the other insol metaphosphates Easily decomp by alkali hydrosulphides+Aq in the cold (Fleitmann, Pogg 78 353)

Lead hexametaphosphate, $\text{Pb}_6\text{P}_6\text{O}_{18}$

Nearly insol in H_2O , sol in acids (Lüdt, Z anorg 5 15)

Lead orthophosphate, basic, $4\text{PbO}, \text{P}_2\text{O}_5$

(Gerhardt, A 72 85)

Lead orthophosphate, $\text{Pb}_3(\text{PO}_4)_2$

Insol in H_2O , sol in HNO_3 +Aq Insol in $\text{HC}_2\text{H}_3\text{O}_2$ +Aq

Sl sol in H_2O 1.35×10^{-4} g is contained in 1 litre of sat solution at 20° (Böttger, Z phys Ch 1903, 46 604)

Not hydrolyzed by boiling H_2O Sol in boiling KOH +Aq insol in NH_4OH +Aq Insol in $\text{Pb}(\text{NO}_3)_2$ +Aq (Caven, J Soc Chem Ind 1897, 16 30)

Sol in 782.9 pts $\text{HC}_2\text{H}_3\text{O}_2$ +Aq containing 38.94 pts pure $\text{HC}_2\text{H}_3\text{O}_2$ (Bertrand, Monit Scient (3) 10 477)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Lead hydrogen phosphate, PbHPO_4

Insol in H_2O Decomp by H_2SO_4 , or HCl +Aq Sol in HNO_3 , or in KOH or NaOH +Aq Insol in $\text{HC}_2\text{H}_3\text{O}_2$ +Aq Sol in cold NH_4Cl +Aq (Brett) from which it can be completely precipitated by a great excess of NH_4OH +Aq

More sol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ +Aq at $18.8-25^\circ$ than in pure H_2O (Wappen)

Sol in sat NaCl +Aq, but less than PbSO_4 (Bequerel, C R 20 1524)

Insol in Pb salts+Aq

Not pptd in presence of Na citrate (Spiller)

Lead pyrophosphate, $\text{Pb}_2\text{P}_2\text{O}_7+\text{H}_2\text{O}$

Insol in H_2O Sol in HNO_3 , or KOH +Aq Insol in NH_4OH +Aq, $\text{HC}_2\text{H}_3\text{O}_2$, or SO_2 +Aq (Schwarzenberg, A 65 133) Sol in $\text{Na}_2\text{P}_2\text{O}_7$ +Aq (Stromeyer)

Insol in acetone (Naumann, B 1904, 37 4329)

Lead potassium phosphate, PbKPO_4

Decomp by hot H_2O (Ouvrard, C R 110 1333)

Lead sodium phosphate, PbNaPO_4

Very sol in dil acids (Ouvrard, C R 110 1333)

$10\text{PbO}, 8\text{Na}_2\text{O}, 9\text{P}_2\text{O}_5$ (Ouvrard)

Lead sodium pyrophosphate, $\text{PbNa}_2\text{P}_2\text{O}_7$

Insol in hot H_2O (Gerhardt, A ch (3) 22 506)

Lead triphosphate sodium pyrophosphate, $\text{Pb}_3\text{Na}_4\text{P}_5\text{O}_{27} + 10\text{H}_2\text{O}$

Sol in HNO_3 after melting (Stange, Z anorg 1896, 12 459)

Lead phosphate chloride, 2PbHPO_4 , PbCl_2

Insol in boiling H_2O , sol in dil HNO_3 + Aq (Gerhardt, A ch (3) 22 505)
 $2\text{Pb}_3(\text{PO}_4)_2$, PbCl_2 Ppt (Heintz, Pogg 73 119)

 $3\text{Pb}_3(\text{PO}_4)_2$, PbCl_2 , Min *Pyromorphite*

Sol in HNO_3 , and $\text{KOH} + \text{Aq}$
 Sl sol in cold citric acid + Aq (Bolton, C N 37 14)

+ H_2O Insol in H_2O Sol in dil HNO_3 + Aq (Heintz)

Lithium metaphosphate, LiPO_3

Insol in boiling H_2O Scarcely sol in acetic acid Easily sol in mineral acids (Mering, Z anal 1879, 18 565)

Lithium tetrametaphosphate, $\text{Li}_4\text{P}_4\text{O}_{12} + 4\text{H}_2\text{O}$

Very sol in H_2O (Warschauer, Z anorg 1903, 36 180)

Lithium orthophosphate, Li_3PO_4

Very slightly sol in H_2O
 Sol in 2539 pts pure H_2O and 3920 pts ammoniacal H_2O , much more readily in H_2O containing NH_4 salts Easily sol in $\text{HCl} + \text{Aq}$ or $\text{HNO}_3 + \text{Aq}$ (Mayer, A 98 193)
 Easily sol in carbonic acid water (Troost)
 Sol in dil acids or acetic acid (de Schulten, Bull Soc (3) 1 479)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in acetone (Naumann, B 1904, 37 4329; Eidmann, C C 1899, II 1014)

+ $\frac{1}{2}\text{H}_2\text{O}$, or H_2O

Lithium hydrogen phosphate, Li_2HPO_4

Nearly insol in H_2O (Gmelin) Sol in 933 pts H_2O at 12° (Rammelsberg)
 $\text{Li}_3\text{H}(\text{PO}_4)_2 + \text{H}_2\text{O}$ Sol in 200 pts H_2O (Rammelsberg)

Lithium dihydrogen phosphate, LiH_2PO_4

Deliquescent, and very sol in H_2O (Rammelsberg)

Heptalithium dihydrogen phosphate, $\text{Li}_7\text{H}_2(\text{PO}_4)_3$

+ $1\text{H}_2\text{O}$, or $2\text{H}_2\text{O}$ Sol in H_2O (Rammelsberg)

Lithium pentahydrogen phosphate, $\text{LiH}_5(\text{PO}_4)_2 + \text{H}_2\text{O}$

Deliquescent, and sol in H_2O

Lithium pyrophosphate, $\text{Li}_4\text{P}_2\text{O}_7 + 2\text{H}_2\text{O}$

(Rammelsberg, B A B 1883 21)

Lithium manganous phosphate, Li_3PO_4 , $\text{Mn}_3(\text{PO}_4)_2$

Min *Lithiophyllite*

Lithium potassium metaphosphate, Li_2O , $2\text{K}_2\text{O}$, $3\text{P}_2\text{O}_5 + 4\text{H}_2\text{O}$

As NH_4 comp (Tammann, J pr 1892, (2) 45 443)

Lithium potassium pyrophosphate, $\text{Li}_3\text{KP}_2\text{O}_7$

(Kraut, A 1876, 182 170)

Lithium sodium phosphate, $3\text{Li}_2\text{O}$, Na_2O , P_2O_5

Insol in H_2O Sol in dil acids (Ouvrard, C R 110 1333)

$2\text{Li}_2\text{O}$, Na_2O , $2\text{P}_2\text{O}_5$ As above (Ouvrard)

Lithium sodium pyrophosphate, Li_2O , Na_2O , P_2O_5

$5\text{Li}_2\text{O}$, Na_2O , $3\text{P}_2\text{O}_5$
 $4\text{Li}_2\text{O}$, $6\text{Na}_2\text{O}$, $5\text{P}_2\text{O}_5$ (Kraut, A 1876, 182 168)

Magnesium metaphosphate, $\text{Mg}(\text{PO}_3)_2$

Insol in H_2O or dil acids, but sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Maddrell, A 61 62)

Not decomposed by very long digestion with alkali carbonates, or orthophosphates + Aq (Fleitmann)

Magnesium dimetaphosphate, $\text{Mg}_2(\text{P}_2\text{O}_5)_2 + 9\text{H}_2\text{O}$

Insol in H_2O , decomposed by acids (Fleitmann, Pogg 78 259)

Magnesium trimetaphosphate, $\text{Mg}_3(\text{P}_3\text{O}_9)_2$

Sl sol in cold H_2O , more easily in hot H_2O
 When ignited, insol in boiling $\text{HCl} + \text{Aq}$ (Lindbom)

Cryst with 12, or $15\text{H}_2\text{O}$

Magnesium tetrametaphosphate, $\text{Mg}_4\text{P}_4\text{O}_{12}$

Insol in H_2O , somewhat sol in $\text{HCl} + \text{Aq}$
 More easily sol in $\text{HNO}_3 + \text{Aq}$, especially easily sol in conc H_2SO_4 (Glatzel, Dissert 1880)

+ $10\text{H}_2\text{O}$ Sol in 70 pts H_2O (Glatzel)

Magnesium orthophosphate, $\text{Mg}_3(\text{PO}_4)_2$, and +5, or $7\text{H}_2\text{O}$

1 litre H_2O dissolves 0.1 g ignited $\text{Mg}_3(\text{PO}_4)_2$ in 7 days, but 0.205 g if freshly precipitated (Volcker, J B 1862 131)

1 l H_2O with 2 g NaCl dissolves 75.8 mg, 1 l H_2O with 3 g NaNO_3 dissolves 61.9 mg $\text{Mg}_3(\text{PO}_4)_2$ (Liebig, A 106 185)

Easily sol in acids, except in acetic acid (Schaffner, A 50 145)

Easily sol in H_2O in presence of alkali salts

+6½H₂O Sol in 30 min in diammonium citrate+ Aq (sp gr = 1.09), triammonium citrate+ Aq (sp gr = 1.09) dissolves 37.5% of the P₂O₅ (Erlenmeyer, B 14 1253)

+20H₂O Sol in 10 min in diammonium citrate+ Aq (sp gr = 1.09), triammonium citrate+ Aq (sp gr = 1.09) dissolves 23.2% of the P₂O₅, sol in 15 min in ¼% citric acid + Aq (Erlenmeyer, l c)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 828)

Magnesium hydrogen phosphate, MgHPO₄ + 7H₂O

Sol in 322 pts cold H₂O in several days. If heated to 40° becomes milky, and separates a precipitate out at 100° of same salt, so that solution at 100° contains only 1 pt salt in 498 pts H₂O. Much more sol in H₂O containing traces of acids, even dil oxalic or acetic acids (Graham, Phil Mag Ann 2 20). Easily sol in H₂SO₃+ Aq (Gerland, J pr (2) 4 127)

Sol in aqueous solution of Mg salts, but insol in Na₂HPO₄+ Aq (Rose). Sol in sodium citrate+ Aq (Spiller). When freshly precipitated it is sol in hot NH₄Cl+ Aq, and NH₄OH+ Aq does not completely reprecipitate it, less sol in NH₄NO₃+ Aq (Brett, Phil Mag (3) 10 96). Insol in alcohol (Berzelius)

For solubility in H₃PO₄, see under MgO

+½H₂O (Debray)

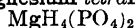
+H₂O Easily sol in dil acids (de Schulten, C R 100 263)

+3H₂O Sl sol in H₂O, easily in acids (Stoklasa, Z anorg 3 67)

+4½H₂O (Bergmann)

+6H₂O (Debray)

Magnesium tetrahydrogen phosphate,



Not hygroscopic. Sol in 5 pts H₂O without decomp (Stoklasa, Z anorg 3 67)

+2H₂O Not hygroscopic. Sol in H₂O without decomp (Stoklasa, Z anorg 1 307)

Decomp by alcohol into MgHPO₄+3H₂O

Magnesium pyrophosphate, Mg₂P₂O₇

Nearly insol in H₂O, readily sol in HCl or HNO₃+ Aq (Presenius)

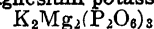
+3H₂O Sl sol in H₂O, easily in HCl or HNO₃+ Aq, sol in H₂SO₃+ Aq, and Na₄P₂O₇+ Aq (Schwarzenberg)

Sol in MgSO₄+ Aq, and (NH₄)₂CO₃+ Aq

Magnesium tetraphosphate, Mg₃P₄O₁₃

Insol in H₂O (Fleitmann and Henneberg, A 65 331)

Magnesium potassium dimetaphosphate,



Verv sol in dil acids (Ouvrard, C R 1888, 106 1729)

+4H₂O Sol in 10.2 pts H₂O (Glatzel)

Magnesium potassium orthophosphate, MgKPO₄

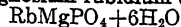
Sl sol in H₂O. Decomp bv H₂O. Easily sol in acids

+6H₂O

2MgO, K₂O, 3P₂O₅ Insol in H₂O, sol in dil HCl+ Aq (Ouvrard, C R 106 1729)

Mg₂HK(PO₄)₂+15H₂O (Haushofer)

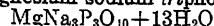
Magnesium rubidium orthophosphate,



Easily sol in warm dil HCl+ Aq

Not decomp by boiling H₂O (Erdmann, A 1897, 294 73)

Magnesium sodium triphosphate,

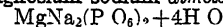


Decomp in the air (Stange, Z anorg 1896, 12 454)

Magnesium sodium metaphosphate, 3MgO, Na₂O, 4P₂O₅

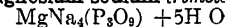
Insol in H₂O or H₃PO₄+ Aq. Scarcely sol in HCl+ Aq, or aqua regia. Not decomp by (NH₄)₂CO₃+ Aq. Sol in conc H₂SO₄ (Maddrell, A 61 53)

Magnesium sodium dimetaphosphate,



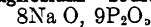
Sol in 25 pts H₂O (Glatzel, Dissert 1880)

Magnesium sodium trimetaphosphate,



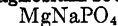
Sl sol in H₂O. After ignition is insol in H₂O (Lindbom)

Magnesium sodium phosphate, 10MgO,



Insol in H₂O, easily sol in dil acids (Ouvrard, C R 106 1729)

Magnesium sodium orthophosphate,



Insol in H₂O (Rose)

+9H₂O (Schoecker and Violet, A 140 232)

MgO, 2Na₂O, P₂O₅ Insol in H₂O (Ouvrard)

3MgO, 3Na₂O, 2P₂O₅ Insol in H₂O (Ouvrard)

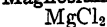
Magnesium sodium pyrophosphate, basic (?)

Precipitate, sl sol in H₂O. Easily in HCl+ Aq, HNO₃+ Aq, and Na₂PO₄+ Aq (Baer, Pogg 75 168)

Sol in (NH₄)₂CO₃+ Aq, and in MgSO₄+ Aq

Insol in alcohol

Magnesium phosphate chloride, Mg₃(PO₄)₂ · MgCl₂



(Deville and Caron, A ch (3) 67 455)

Magnesium pyrophosphate nitrogen dioxide,
 $\text{Mg}_2\text{P}_2\text{O}_7, \text{H}_2\text{O}, \text{NO}_2$

Scarcely sol in water (Luck, Z anal 13 255)

Magnesium phosphate fluoride, $\text{Mg}_3(\text{PO}_4)_2$,
 MgF_2

Min *Wagnerite* Slowly sol in hot HNO_3 , and H_2SO_4

Magnesium phosphate calcium fluoride,
 $2\text{Mg}_3(\text{PO}_4)_2, \text{CaF}_2$

Min *Kjerulfite*

Manganous dimetaphosphate, $\text{Mn}_2(\text{P}_2\text{O}_6)_2$

Anhydrous Insol in H_2O and dil acids (Fleitmann) Sol in conc H_2SO_4 (Madrell) Scarcely attacked by warm $\text{Na}_2\text{S} + \text{Aq}$, and not much more by $(\text{NH}_4)_2\text{S} + \text{Aq}$ Decomp by $\text{Na}_2\text{CO}_3 + \text{Aq} + 8\text{H}_2\text{O}$ Insol in H_2O and dil acids (Fleitmann, Pogg 78 257)

Manganous trimetaphosphate, $\text{Mn}_3(\text{P}_3\text{O}_9)_2 + 11\text{H}_2\text{O}$

Difficultly sol in cold or warm H_2O More easily sol in cold, very easily in warm $\text{HCl} + \text{Aq}$ When ignited, is insol in acids, even aqua regia (Lindbom)

Manganous hexametaphosphate

Sol in sodium hexametaphosphate + Aq (Rose, Pogg 76 4)

$\text{Mn}_3\text{P}_6\text{O}_{18}$ Nearly insol in H_2O , easily sol in acids (Ludert, Z anorg 5 15)

Manganic metaphosphate, $\text{Mn}(\text{PO}_3)_3$

Insol in H_2O or acids, decomp by alkalis (Schjerming, J pr (2) 45 515)

Insol in H_2O , sol in HCl , decomp by alkalis + Aq (Barbier, C R 1902, 135 1055)

+ H_2O Insol in H_2O or acids, except $\text{HCl} + \text{Aq}$ Sl decomp by boiling with H_2SO_4 (Hermann, Pogg 74 303)

Manganous tetrametaphosphate, $\text{Mn}(\text{PO}_3)_4$
Not attacked by acids (Glatzel, Dissert 1880)

+ $10\text{H}_2\text{O}$ Sol only in boiling conc H_2SO_4 (Glatzel)

Manganous dekametaphosphate,

$5\text{MnO}, 5\text{P}_2\text{O}_5 + 12\text{H}_2\text{O}$

Ppt (Tammann, J pr 1892, (2) 45 450)

Manganous orthophosphate, $\text{Mn}_3(\text{PO}_4)_2$

+ H_2O (Debray)

+ $3\text{H}_2\text{O}$ Sol in 20 min in diamonium citrate + Aq (sp gr = 1.09), triammonium citrate + Aq (sp gr = 1.09) dissolves 30.2% of the P_2O_5 (Erlenmeyer, B 14 1253)

+ $4\frac{1}{2} - 5\frac{1}{2}\text{H}_2\text{O}$ Efflorescent (Erlenmeyer and Heinrich, A 190 208)

+ $7\text{H}_2\text{O}$ Very sl sol in H_2O (Berzelius) Easily sol in mineral acids, sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$

Easily sol in $\text{SO}_2 + \text{Aq}$ (Gerland, J pr (2) 4 97)

Somewhat sol in boiling $(\text{NH}_4)\text{CO}_3 + \text{Aq}$, but deposited on cooling (Berzelius)

Partly sol in cold NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Sol in cold or hot solutions of ammonium sulphate or succinate (Wittstein)

Sl sol in Mn salts + Aq (Rose, Pogg 76 25)

Insol in alcohol

Sol in 10 min in diammonium citrate + Aq (sp gr = 1.09), triammonium citrate + Aq (sp gr = 1.09) dissolves 53% of the P_2O_5 (Frlenmeyer, B 14 1253)

Manganous dihydrogen orthophosphate,
 $\text{MnHPO}_4 + 3\text{H}_2\text{O}$

Sl sol in H_2O Solution decomp at 100° (Debray) Slowly decomp by cold H_2O into $\text{Mn}_3(\text{PO}_4)_2$ (Erlenmeyer and Heinrich, A 190 208)

Easily sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Gerland)

Sl sol in $\text{HC}_2\text{H}_3\text{O}_2$, easily in conc mineral acids (Heintz) Sol in $(\text{NH}_4)\text{CO}_3 + \text{Aq}$, from which it is reppt on boiling Decomp by boiling $\text{KOH} + \text{Aq}$

Insol in alcohol

$\text{Mn}_3(\text{PO}_4)_2, 2\text{MnHPO}_4 + 4\text{H}_2\text{O}$ (de Schulten, C C 1905, I 188)

Manganous tetrahydrogen phosphate,
 $\text{MnH}_4(\text{PO}_4)_2 + 2\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O , with decomp to MnHPO_4 (Erlenmeyer and Heinrich, A 190 208)

Not decomp by H_2O (Otto, C C 1887 1563)

H_2O decomp it into MnHPO_4 and H_3PO_4 containing some dissolved salt The less H_2O used, the more MnHPO_4 separates The acid filtrate separates MnHPO_4 on boiling At 0° the decomp increases in proportion to the amt of salt, but 1 g of the salt is unchanged in 100 g H_2O With less than 20 g of salt to 100 g H_2O the decomp is analogous to that of $\text{CaH}_4(\text{PO}_4)_2$, but with larger amts of salt it is the opposite ss with increasing amts of the C R 1899, 129 412)

Alcohol dissolves out H_3PO_4 (Heintz)

Pentamanganous dihydrogen phosphate,
 $\text{Mn}_5\text{H}_2(\text{PO}_4)_4 + 4\text{H}_2\text{O}$

Not decomp by boiling H_2O (Frlenmeyer and Heinrich, A 190 208)

Manganic orthophosphate, basic, $\text{Mn}_2\text{P}_2\text{O}_7 + \text{H}_2\text{O}$

Sl sol in H_2O

Manganic orthophosphate, $\text{MnPO}_4 + \text{H}_2\text{O}$

Sol in acids (Christensen, J pr (2) 28 1)

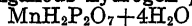
Manganous pyrophosphate, $\text{Mn}_2\text{P}_2\text{O}_7$

Anhydrous (Lewis, Sill Am J (3) 14 281)

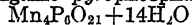
+ H_2O
+ $3\text{H}_2\text{O}$ Insol in H_2O Insol in $\text{MnSO}_4 + \text{Aq}$, but sol in $\text{Na}_2\text{F}_2\text{O}_7 + \text{Aq}$ (Rose)

Difficultly sol in $\text{Na}_2\text{P}_2\text{O}_7 + \text{Aq}$, but easily sol in $\text{K}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Pahl) Decomp by $\text{KOH} + \text{Aq}$ Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Schwarzenberg)

Insol in acetone (Naumann, B 1904, 37 4329)

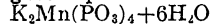
Manganous hydrogen pyrophosphate,

Sol in H_2O (Pahl)

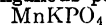
Manganic pyrophosphate,

Sol in H_2SO_4 , and H_3PO_4 (Auger, C R 1901, 133 95)

MnHP_2O_7 Insol in H_2O , very sl attacked by dil $\text{HCl} + \text{Aq}$, easily by conc Sol in conc H_2SO_4 (Schjerning, J pr (2) 45 515)

Manganous potassium dimetaphosphate,

Sol in 95 pts H_2O When ignited is not attacked by acids (Glatzel, Dissert 1880)

Manganous potassium orthophosphate,

Insol in H_2O , easily sol in dil acids (Ouvrard)

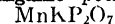
Manganic potassium pyrophosphate,

+ $5\text{H}_2\text{O}$ Sl sol in cold H_2O
+ $3\text{H}_2\text{O}$ Sl sol in cold H_2O (Rosenheim B 1915, 48 584)

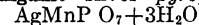
Manganous potassium phosphate, $\text{MnK}_2\text{P}_2\text{O}_7$

Insol in H_2O , sol in dil acids (Ouvrard, C R 106 1729)

+ $8\text{H}_2\text{O}$ Sl sol in H_2O (Pahl)
 $\text{Mn}_2\text{P}_2\text{O}_7, 2\text{K}_2\text{P}_2\text{O}_7 + 10\text{H}_2\text{O}$ Difficultly sol in H_2O (Pahl)

Manganic potassium pyrophosphate,

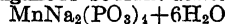
Insol in H_2O Decomp by acids and bases (Schjerning)

Manganic silver pyrophosphate,

Almost insol in H_2O (Rosenheim, B 1915, 48 585)

Manganous sodium triphosphate,

Sl sol in H_2O , the melt obtained by heating the salt is readily sol in H_2SO_4 (Stange, Z anorg 1896, 12 455)

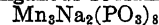
Manganous sodium dimetaphosphate,

Easily sol in boiling H_2SO_4 , but not attacked by acids after boiling (Glatzel, Dissert 1880)

Manganous sodium trimetaphosphate,

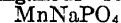
Sol in H_2O (Fleitmann and Henneberg)

$\text{MnNa}(\text{PO}_3)_3$ Insol in H_2O , dil acids, or alkalies (Schjerning, J pr (2) 45 515)

Manganous sodium octometaphosphate,

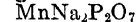
Insol in acids except conc H_2SO_4 (Tammann, J pr 1892, (2) 45 469)

+ $5\text{H}_2\text{O}$ Almost insol in cold H_2O
Decomp by boiling H_2O with separation of Mn_2O_3 (Rosenheim, B 1915, 48 584)

Manganous sodium orthophosphate,

Insol in H_2O (Ouvrard, C R 106 1729)

$\text{MnO}, 2\text{Na}_2\text{O}, \text{P}_2\text{O}_5$ As above

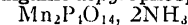
Manganous sodium pyrophosphate,

Insol in H_2O , easily sol in dil acids (Wallroth)

+ $4\frac{1}{2}\text{H}_2\text{O}$ Very sl sol in H_2O (Pahl)
 $3\text{Mn}_2\text{P}_2\text{O}_7, 2\text{Na}_4\text{P}_2\text{O}_7 + 24\text{H}_2\text{O}$ Very sl sol in H_2O (Pahl)

Manganic sodium pyrophosphate, MnNaP_2O_7 

(Christensen, J pr (2) 28 1)

Manganic dipyrophosphate ammonia,

Insol in H_2O

Decomp by HCl and by alkalies (Birch, C R 1902, 135 1109)

Manganous phosphate chloride, $\text{Mn}_3(\text{PO}_4)_3$ 

Insol in H_2O (Deville and Caron, A ch (3) 67 459)

$3\text{Mn}_2(\text{PO}_4)_3, \text{MnCl}_2$ Insol in H_2O (Deville and Caron)

Mercurous hexametaphosphate (?)

Ppt Sol in sodium hexametaphosphate + Aq (Rose)

$\text{Hg}_6\text{P}_6\text{O}_{18}$ Insol in H_2O , very sl sol in acids (Ludert, Z anorg 5 15)

Moderately sol in H_2O when freshly pptd
More sol in acids than the mercurous salt (Ludert)

Mercurous or hophosphate, $(\text{Hg}_2)_2(\text{PO}_4)_2$

Ppt Decomp by boiling with H_2O (Gerhardt)

Sol in $\text{HNO}_3 + \text{Aq}$ Sol in $\text{Hg}_2(\text{NO}_3)_2 + \text{Aq}$ Insol in $\text{H}_3\text{PO}_4 + \text{Aq}$

Mercuric orthophosphate, $\text{Hg}_2(\text{PO}_4)_2$

Insol in H_2O Sl sol in hot H_2O , crystallizing out on cooling (Haack, A 262 185) Slowly sol in cold dil., quickly in hot dil or cold conc $\text{HCl} + \text{Aq}$ Less easily sol in $\text{HNO}_3 + \text{Aq}$ Sol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Berzelius) Insol in $\text{H}_3\text{PO}_4 + \text{Aq}$ (Haack) Decomp by $\text{NaCl} + \text{Aq}$ into insol HgCl_2 , $3\text{Hg}_2\text{O}$, but sol in $\text{NaCl} + \text{Aq}$, containing HNO_3 (Haack)

Sol in 6 pts NH_4Cl in aqueous solution by heating (Trommsdorff)

Sol in $(\text{NH}_4)_2\text{CO}_3$, $(\text{NH}_4)_2\text{SO}_4$, or $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Wittstein)

Insol in alcohol

Mercuriomercuric orthophosphate, $7\text{Hg}_2\text{O}$,

$14\text{Hg}_2\text{O}$, $2\text{P}_2\text{O}_5 + 20\text{H}_2\text{O}$

(Brooks, Pogg 66 63)

Mercurous pyrophosphate, $\text{Hg}_2\text{P}_2\text{O}_7 + \text{H}_2\text{O}$

Sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, when recently pptd Insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, when heated to 100° Sol in $\text{HNO}_3 + \text{Aq}$ Decomp by $\text{HCl} + \text{Aq}$ (Schwarzenberg, A 65 133)

Mercuric pyrophosphate, $\text{Hg}_2\text{P}_2\text{O}_7$

Sol in acids, insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, after being heated to 100° Sol in $\text{NaCl} + \text{Aq}$, quickly decomp by $\text{NaOH} + \text{Aq}$, and $\text{Na}_2\text{HPO}_4 + \text{Aq}$

Sol in 6 pts $\text{NH}_4\text{Cl} + \text{Aq}$ (Trommsdorff)

Sol in NH_4NO_3 , $(\text{NH}_4)_2\text{SO}_4$, and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, also in $\text{KI} + \text{Aq}$

Mercurous silver orthophosphate, AgHg_2PO_4

Sol in HNO_3 (Jacobsen, Bull Soc 1909, (4) 5 949)

Molybdenum phosphate, $\text{Mo}_2(\text{PO}_4)_2$ (?)

Insol in H_2O Sol in $\text{MoCl} + \text{Aq}$

Molybdenum sodium pyrophosphate,

$\text{Na}(\text{MoP}_2\text{O}_7) + 12\text{H}_2\text{O}$

Ppt (Rosenheim, B 1915, 48 589)

Nickel dimetaphosphate, NiP_2O_6

Insol in H_2O or dil acids Sol in conc H_2SO_4 Not decomp by boiling alkali carbonates or sulphides + Aq (Maddrell, A 61 58)

+ $4\text{H}_2\text{O}$ Sol in cold acids (Glatzel, Dissert 1880)

Nickel tetrametaphosphate, $\text{Ni}_2\text{P}_4\text{O}_{12}$

Insol in HCl Sol in conc HNO_3 and pecially sol in H_2SO_4 on boiling (Glatzel)

Nickel tetrametaphosphate, $\text{Ni}_2\text{P}_4\text{O}_{12} + 12\text{H}_2\text{O}$

Easily sol in acids (Glatzel)

Nickel orthophosphate, $\text{Ni}_3(\text{PO}_4)_2 + 7\text{H}_2\text{O}$

Insol in H_2O Sol in acids (Rammelsberg, Pogg 68 383)

Sol in Ni salts + Aq (Rose, Pogg 76 25)

Insol in $\text{NaHPO}_4 + \text{Aq}$ (Tupputi, 1811)

Very sl sol in hot $(\text{NH}_4)_2\text{HPO}_4 + \text{Aq}$

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethylacetate (Naumann, B 1910, 43 314)

Nickel pyrophosphate, $\text{Ni}_2\text{P}_2\text{O}_7 + 6\text{H}_2\text{O}$

Insol in H_2O , sol in mineral acids, $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$, and $\text{NH}_4\text{OH} + \text{Aq}$ Not pptd from $\text{Ni}_2\text{P}_2\text{O}_7 + \text{Aq}$ by alcohol (Schwarzenberg, A 65 158)

Nickel potassium dimetaphosphate,

$\text{NiK}_2\text{P}_2\text{O}_{11} + 6\text{H}_2\text{O}$

Sol in 130 pts H_2O (Glatzel)

Nickel potassium orthophosphate, NiKPO_4

Insol in H_2O , sol in dil acids (Ouvrard, R 106 1729)

3NiO , $3\text{K}_2\text{O}$, $2\text{P}_2\text{O}_5$ As above

Nickel sodium triphosphate, $\text{Na}_3\text{NiP}_3\text{O}_{13} + 12\text{H}_2\text{O}$

Very sol in H_2O , decomp in Aq solution (Schwarz, Z anorg 1895, 9 261)

Nickel sodium metaphosphate, $3\text{Ni}(\text{PO}_3)_2$, NaPO_3

Insol in H_2O and dil acids Sol in conc H_2SO_4 (Maddrell, A 61 56)

$\text{NiNa}_4(\text{PO}_3)_3 + 8\text{H}_2\text{O}$ Easily sol in H_2O (Lindbom)

Nickel sodium dimetaphosphate, $\text{NiNa}_2\text{P}_2\text{O}_{11} + 6\text{H}_2\text{O}$

Sl sol in H_2O Moderately sol in acids (Glatzel, Dissert 1880)

Nickel sodium trimetaphosphate,

$\text{Ni}_2\text{Na}_2(\text{P}_3\text{O}_9)_2 + 9\text{H}_2\text{O}$

1 l H_2O dissolves 60.6 g at 20° (Lamann, J pr 1892, (2) 45 426)

$\text{Na}_3\text{NiP}_3\text{O}_{10} + 12\text{H}_2\text{O}$ Insol and not decomp by H_2O Sol in acids (Schwartz, Z anorg 1895, 9 261)

Nickel sodium octometaphosphate,

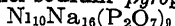
$\text{Na}_2\text{Ni}_3(\text{PO}_3)_8$

(Lamann, J pr 1892, (2) 45 469)

Nickel sodium orthophosphate, $\text{NiNaPO}_4 + 7\text{H}_2\text{O}$

Ppt (Debray, C R 59 40)

NiO , $2\text{Na}_2\text{O}$, P_2O_5 Insol in H_2O Easily sol in dil acids (Ouvrard)

Nickel sodium pyrophosphate,

Insol in H_2O Moderately sol in acids (Wallroth)

Osmium phosphate (?)

Sl sol in H_2O , sol in $\text{HNO}_3 + \text{Aq}$ (Berzelius)

Palladium orthophosphate (?)

Ppt

Phosphorus phosphate, $4\text{P}_4\text{O}$, $3\text{P}_4\text{O}_5$ (?)

Decomp spontaneously Sol in H_2O and alcohol when fresh, insol in ether (le Verrier, A 27 167, Reinitzer, B 14 1884)

Platinum phosphate, PtP_2O

Insol in H_2O , acids and alkalis Decomp by fusing with potassium carbonate (Barnett, C N 1895, 71 256)

Potassium monometaphosphate, KPO_3

Nearly insol in H_2O , sol in weak acids, even in acetic acid (Maddrell, A 61 62)

Insol in H_2O and weak acids (Fleitmann, Pogg 78 250)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Potassium dimetaphosphate, $\text{K}_2\text{P}_2\text{O}_6 + \text{H}_2\text{O}$

Sol in 1 2 pts cold H_2O , but not more in hot H_2O (Fleitmann, Pogg 78 250)

Potassium trimetaphosphate, $\text{K}_3\text{P}_3\text{O}_9$

Very sol in cold H_2O before it is fused (Lindbom, Acta I und 1873 14)

Potassium orthophosphate, K_3PO_4

Not deliquescent Very sol in H_2O (Graham, Pogg 32 47)

Very sl sol in cold, easily in hot H_2O (Darraq)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution mols

K	PO_4
9 14	3 13
8 84	3 22
8 42	3 44
7 52	3 78
6 90	4 15
6 85	4 12

(D'Ans and Schreiner, Z phys Ch 1910, 75 103)

Insol in alcohol

Potassium hydrogen orthophosphate,

Very unstable, very sol in H_2O with decomp Identical with the substance de-

scribed as dipotassium phosphate by Berzelius (Staudenmaier, Z anorg 1894, 5 389)

$3\text{K}_2\text{HPO}_4, \text{KH}_2\text{PO}_4 + 2\text{H}_2\text{O}$ Very unstable, very sol in H_2O with decomp (Staudenmaier)

Potassium hydrogen orthophosphate,

Deliquescent Very sol in H_2O and alcohol

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution mols

K	PO_4
6 80	4 08
6 80	4 05
6 76	3 96
6 50	3 81
6 16	3 61
5 24	3 25
4 42	2 94

(D'Ans and Schreiner, Z phys Ch 1910, 75 103)

Potassium dihydrogen phosphate, KH_2PO_4

Deliquescent Easily sol in H_2O (Vauquelin, A ch 74 96)

1 l sat aq solution at 7° contains 249.9 g KH_2PO_4 (Muthmann and Kuntze, Z Kryst Min 1894, 23 308)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution mols

K	PO_4
2 90	2 36
1 70	1 71
1 60	1 67
1 48	1 46
1 78	3 15
2 18	4 65
2 54	6 32
2 66	6 76
2 98	8 03
3 32	8 80

(D'Ans and Schreiner, Z phys Ch 1910, 75 103)

Sp gr of $\text{KH}_2\text{PO}_4 + \text{Aq}$ at 18° containing
 5 10 15% KH_2PO_4
 1.0341 1.0691 1.1092

(Kohlrausch, W Ann 1879 1)

Sol in 20% $\text{KC H}_3\text{O}_2 + \text{Aq}$ (Stromeyer)
 For solubility in H_2O , see K_2HPO_4 , H_3PO_4
 Insol in alcohol

Potassium orthophosphate, acid, KH_2PO_4
 H_3PO_4

Solubility in H_2O at t°

t°	KH_2PO_4 % H_3PO_4	Solid phase
— 0 6	3 337	Ice
— 2 5	12 13	"
— 6 7	29 43	"
— 9 2	36 98	"
— 13	44	Ice + KH_2PO_4
0 (?)	45 8	KH_2PO_4
+10 9	50 3	"
65 2	68 44	"
78	72 43	"
87 5	77 6	"
105 5	85 9	"
120	92 1	" + KH_2PO_4 , H_3PO_4
135	96 1	KH_2PO_4 , H_3PO_4
139	100	"

(Parravano and Miel, Gazz ch it 38 II, 536)

Solubility in anhydrous H_3PO_4 at t°

t°	% KH_2PO_4 , H_3PO_4
32 5	18 17
	58 42
	77 53
	92 26

(Parravano and Miel)

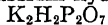
Potassium pyrophosphate, $\text{K}_4\text{P}_2\text{O}_7 + 3\text{H}_2\text{O}$

Very deliquescent, and sol in H_2O

Precipitated from aqueous solution by alcohol (Schwarzenberg, A 65 136)

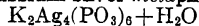
Insol in methyl acetate (Naumann, B 1909, 42 3790)

Potassium hydrogen pyrophosphate,



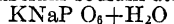
Very deliquescent, and sol in H_2O Insol in alcohol (Schwarzenberg)

Potassium silver metaphosphate,



(Tammann, J pr 1892, (2) 45 417)

Potassium sodium dimetaphosphate,



Sol in 24 pts H_2O (Fleitmann, Pogg 78 339)

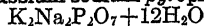
Potassium sodium phosphate, $\text{KNaHPO}_4 + 7\text{H}_2\text{O}$

Not efflorescent Sol in H_2O

Tripotassium trisodium hexahydrogen phosphate, $\text{H}_3\text{Na}_3\text{K}_3(\text{PO}_4)_4 + 22\text{H}_2\text{O}$

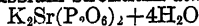
Sol in H_2O (Fihol and Senderens, C R 3 388)

Potassium sodium pyrophosphate,



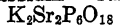
Sol in H_2O (Schwarzenberg, A 65 140)

Potassium strontium dimetaphosphate,



As the KBA comp (Glatzel, Dissert 1880)

Potassium strontium hexametaphosphate,



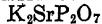
(Tammann, J pr 1892, (2) 45 435)

Potassium strontium orthophosphate,



Insol in H_2O , sol in dil acids (Grandeau, A ch (6) 8 193)

Potassium strontium pyrophosphate,



Insol in H_2O , sol in dil acids (Ouvrard, C R 106 1599)

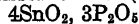
Potassium thorium phosphate, K_2O , 4ThO_3 , $3\text{P}_2\text{O}_5$

Insol in HCl , HNO_3 , or aqua regia (Troost and Ouvrard, C R 102 1422)

K_2O , 1hO_3 , P_2O_5 Insol in H_2O , sol in $\text{HNO}_3 + \text{Aq}$ (Troost and Ouvrard)

$6\text{K}_2\text{O}$, 3ThO_3 , $4\text{P}_2\text{O}_5$ Sol in acids (Troost and Ouvrard)

Potassium tin (stannic) phosphate, K_2O ,



(Ouvrard, C R 111 177)

K_2O , 2SnO_2 , P_2O_5 (Ouvrard)

Potassium titanium phosphate, K_2O , 4TiO_3 ,



(Ouvrard C R 111 177)

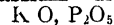
K_2O , 2TiO_3 , P_2O_5 (Ouvrard)

Potassium uranous phosphate, 4UO_2 , K_2O ,



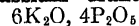
Practically insol in conc HNO_3 and HCl , even when the acids are boiling. Attacked by $\text{HF} + \text{HNO}_3$ (Colani, A ch 1907, (8) 12 133)

Potassium uranous metaphosphate, UO_2 ,



Easily sol in HNO_3 Sol in conc HCl (Colani)

Potassium uranous pyrophosphate, 3UO_2 ,



Sol in acids (Colani)

Potassium uranyl phosphate, K_2O , UO_3 ,



(Ouvrard, C R 110 1333)

$2\text{K}_2\text{O}$, UO_3 , P_2O_5 (Ouvrard)

K_2O , 2UO_3 , P_2O_5 (Ouvrard)

Potassium uranyl orthophosphate, $K(UO_2)PO_4 + 3H_2O$ As NH_4 comp (Lienau, Dissert 1898)	Rubidium pyrophosphate, $Rb_4P_2O_7$ Hydroscopic, sol in H_2O (von Berg)
Potassium vanadium phosphate See Phosphovanadate, potassium	Samarium anhydrometaphosphate, $Sm_5P_2O_6$ Insol in H_2O or $HNO_3 + Aq$ (Cleve)
Potassium yttrium phosphate, $3K_2O, Y_2O_3, 2P_2O_5$ $K_2O, Y_2O_3, 2P_2O_5$ $3K_2O, 5Y_2O_3, 6P_2O_5$ (Duboin C R 107 622)	Samarium orthophosphate, $SmPO_4$ Scarcely attacked by boiling $HNO_3 + 2H_2O$
Potassium zinc tetrametaphosphate, $K_2Zn(PO_3)_4 + 6H_2O$ Sol in 70 pts H_2O (Glatzel, Dissert 1880)	Samarium pyrophosphate, $SmHP_2O_7 + 1\frac{1}{2}H_2O$ (Cleve)
Potassium zinc phosphate, $KZnPO_4$ Insol in H_2O Sol in dil acids (Ouvrard, C R 106 1729) $K_2ZnP_2O_7$ As above	Silicon phosphate See Silicophosphoric acid Silver metaphosphate, $Ag_2O, 2P_2O_5 + H_2O$ (Kroll, Z anorg 1912, 76 408)
Potassium zirconium phosphate, $K_2O, 4ZrO_2, 3P_2O_5$ Insol in acids or aqua regia (Troost and Ouvrard, C R 102 1422) K_2O, ZrO_2, P_2O_5 Insol in H_2O, HNO_3, HCl, or aqua regia Sol in hot conc H_2SO_4 (Troost and Ouvrard)	Silver dimetaphosphate, $Ag_2P_2O_6$ Very sl sol in H_2O (Fleitmann, Pt 78 253) Sol in cold aniline metaphosphate + (Nicholson) Very sl sol in H_2O (Waischauer, I sert 1903) $+H_2O$ Very sol in H_2O (Langheld, 1912, 45 3760)
Potassium phosphate selenate See Selenophosphate, potassium	Silver trimetaphosphate, $Ag_3P_3O_9$ Sol in 60 pts cold H_2O Can be crys- lized from conc $HNO_3 + Aq$ (Fleitmann Henneberg) $+H_2O$ (Lindbom)
Potassium hydrogen phosphate sulphate, $KH_2PO_4, KHSO_4$ Decomp by H_2O and alcohol (Jucque- lain)	Silver hexametaphosphate, $Ag_6P_6O_{18}$ Insol in H_2O Sol in HNO_3 or NH_4OH Aq, and in a large excess of sodium he- metaphosphate + Aq (Rose) Easily decomp by $NH_3 + Aq$ Decomp gradually by hot H_2O $Ag_3P_3O_9$ When freshly pptd, easily sol in H_2O Easily sol in dil acids (Fudert, Z anorg 5 15)
Rhodium phosphate, basic, $4Rh_2O_3, 3P_2O_5 + 32H_2O$ Insol in H_2O or acids (Claus) $Rh_2O_3, P_2O_5 + 6H_2O = Rh_2(PO_4)_3 + 3H_2O$ Sol in H_2O (Claus)	Silver orthophosphate, Ag_3PO_4 Very sl sol in H_2O 1 l H_2O disso- 6.5 $\times 10^{-3}$ g Ag_3PO_4 at 19.46° (Pottgi- phys Ch 1903 46 603)
Rubidium metaphosphate, $RbPO_3$ Sol in H_2O (von Berg, B 1901 34 4183)	Sol in H_3PO_4, HNO_3, or HCl $H_2O + Aq$ NH_4OH or $(NH_4)_2CO_3 + Aq$ Less easily monomium nitrate or succinate and im- pletely in $(NH_4)_2SO_4 + Aq$ (Lussigne Pharm (3) 16 289)
Rubidium orthophosphate, $Rb_3PO_4 + 4H_2O$ Hydroscopic, sol in H_2O pptd by alcohol (von Berg, B 1901 34 4183)	Insol in $NaHPO_4 + Aq$ (Stromeyer) Not pptd in presence of Na citri- (Spiller) If 1 mol Ag_3PO_4 is boiled with 1 l Na_2CO_3, 44% of it is decomp (Muller) Readily sol in soluble hyposulphites + with decomp (Herschel) Insol in Ag salts + Aq (Rose) Insol in liquid NH_3 (Gor. Am Ch 1898, 20 829)
Rubidium hydrogen orthophosphate, $Rb_2HPO_4 + H_2O$ Sol in H_2O, insol in conc $NH_4OH + Aq$, insol in alcohol (von Berg)	
Rubidium dihydrogen orthophosphate, RbH_2PO_4 Very sol in H_2O, pptd by alcohol (von Berg)	

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790) ethyl acetate (Naumann, B 1910, 43 314)

Silver hydrogen orthophosphate, Ag_2HPO_4

Decomp by H_2O or alcohol into H_3PO_4 and Ag_3PO_4 (Joly, C R 103 1071)

Sol in $\text{H}_3\text{PO}_4 + \text{Aq}$, insol in ether (Schwarzenberg, A 65 162)

Silver pyrophosphate, $\text{Ag}_4\text{P}_2\text{O}_7$

Insol in hot or cold H_2O Sol in cold $\text{HNO}_3 + \text{Aq}$ without decomp Decomp by hot HNO_3 or H_2SO_4 into orthophosphate Decomp by $\text{HCl} + \text{Aq}$ into AgCl and H_3PO_4 Insol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in $\text{NH}_4\text{OH} + \text{Aq}$ without decomp (Stromeyer, Schw J 58 126)

Insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ Very sl sol in $\text{AgNO}_3 + \text{Aq}$ (Schwarzenberg, A 65 161)

Not completely insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Rose)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Silver hydrogen pyrophosphate, $\text{Ag}_2\text{H}_2\text{P}_2\text{O}_7$

Decomp by H_2O into $\text{Ag}_4\text{P}_2\text{O}_7$ (Hurtzig and Geuther, A 111 160)

Decomp by cold H_2O (Cavaliere, C R 1904, 139 285)

Silver hydrogen pyrophosphate metaphosphate, $2\text{Ag}_2\text{HP}_2\text{O}_7, \text{HPO}_3$

Decomp by H_2O Easily sol in $\text{HNO}_3 + \text{Aq}$ (H and G)

Silver tetraphosphate, $6\text{Ag}_2\text{O}, 4\text{P}_2\text{O}_5 = \text{Ag}_6\text{P}_4\text{O}_{17}$

Insol in, but gradually decomp by boiling H_2O (Berzelius)

Sol in large excess of the corresponding Na salt + Aq

Silver dekaprophosphate, $\text{Ag}_{10}\text{P}_{10}\text{O}_{41}$

Easily sol in sodium dekaprophosphate + Aq (Fleitmann and Henneberg, A 65 330)

Silver ultraphosphate, $\text{Ag}_6\text{O}, 3\text{P}_2\text{O}_5$

(Kroll, Z anorg 1912 76 107)

Silver sodium dimetaphosphate, $\text{AgNa}_2\text{P}_2\text{O}_5$

Sol in H_2O (Fleitmann and Henneberg, Pogg 65 310)

Silver sodium pyrophosphate, $6\text{Ag}_4\text{P}_2\text{O}_7, \text{Na}_4\text{P}_2\text{O}_7 + 4\text{H}_2\text{O}$

Not completely sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ Easily sol in $\text{HNO}_3 + \text{Aq}$ (Bur, Pogg 75 152)

Easily sol in H_2O (Stromeyer)

$\text{Ag}_3\text{Na}_3\text{P}_2\text{O}_7 + \frac{1}{2}\text{H}_2\text{O}$ Ppt (Stange, Z anorg 1896, 12 460)

Silver uranyl phosphate, $2\text{Ag}_2\text{O}, 6\text{UO}_3, 3\text{P}_2\text{O}_5 + 30\text{H}_2\text{O}$

(Blinkoff Dissert 1900)

Silver phosphate ammonia, $\text{Ag}_3\text{PO}_4, 4\text{NH}_3$
(Widmann, B 17 2284)

Sodium triphosphate, $\text{Na}_5\text{P}_3\text{O}_{10}$

Very sol in H_2O , decomp easily in a solution at 100° (Schwarz, Z anorg 189 9 253)

Sodium monometaphosphate, NaPO_3

Insol in H_2O Sol in dil and conc acid (Maddrell, A 61 63)

Insol in acids (Graham)

Gradually decomp by alkalis

Sodium dimetaphosphate, $\text{Na}_2\text{P}_2\text{O}_6 + 2\text{H}_2\text{O}$

Deliquescent Sol in 72 pts of cold or h H_2O Verv sol in conc $\text{HCl} + \text{Aq}$ Sol $\text{NaOH} + \text{Aq}$ Insol in strong, verv sl sol dilute alcohol (Fleitmann Pogg 78 246)

Sodium trimetaphosphate, $\text{Na}_3\text{P}_3\text{O}_9 + 6\text{H}_2\text{O}$

Sol in 4 5 pts cold H_2O Insol in stror very sl sol in dil alcohol (Fleitmann a Henneberg, A 65 307)

Decomp by boiling H_2O (Lindbom)

Sodium tetrametaphosphate, $\text{Na}_4\text{P}_4\text{O}_{12}$

Sol in H_2O , cryst with about $4\text{H}_2\text{O}$ I sol in alcohol than in H_2O (Fleitmann, Pogg 78 851)

Sodium hexametaphosphate, $\text{Na}_6\text{P}_6\text{O}_{18}$

Deliquescent Very sol in H_2O Insol in alcohol (Graham Pogg 32 56)

Sodium orthophosphate, $\text{Na}_3\text{PO}_4 + 12\text{H}_2\text{O}$

Not deliquescent in dry air

100 pts H_2O dissolve 19 6 pts crystals at 15° (Graham)

100 pts H_2O dissolve 28 3 pts $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ at 15° (Schiff)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution in g

Na	H_3PO_4
1 28	0 040
3 24	0 183
2 21	0 752
2 73	1 08

(D'Ans and Schreiner, Z phys Ch 1910, 101)

Sp gr of $\text{Na}_3\text{PO}_4 + \text{Aq}$ at 15°

$c = c, \text{Na}_3\text{PO}_4 + 12\text{H}_2\text{O}$

	Sp gr		Sp gr	c	Sp gr
1	1 0043	9	1 0399	17	1 073
2	1 0086	10	1 0455	18	1 087
3	1 0130	11	1 0492	19	1 093
4	1 0174	12	1 0539	20	1 098
5	1 0218	13	1 0586	21	1 103
6	1 0263	14	1 0633	22	1 108
7	1 0308	15	1 0681	23	1 113
8	1 0353	16	1 0729	24	1 117

(Schiff, calculated by Gerlach, Z anal 8 2)

Insol in CS₂ (Arctowski, Z anorg 1894, 6 257)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)
 +10H₂O (Rammelsberg)
 Could not be obtained (Hall, J pr 94 237)
 +7H₂O (Hall)
 Melts in crystal water at 76.6° (Graham)

Sodium hydrogen phosphate, Na₂HPO₄Sol in H₂O with evolution of heat100 pts H₂O dissolve at t°

t°	Pts Na ₂ HPO ₄	t°	Pts Na ₂ HPO ₄	t°	Pts Na ₂ HPO ₄
0	1 55	40	30 88	80	81 29
10	4 10	50	43 31	90	95 02
20	11 08	60	55 29	100	108 20
30	19 95	70	68 72	106.2	114 43

(Poggiale J Pharm (3) 44 273)

100 pts H₂O at 13° dissolve 3.4 pts Na₂HPO₄
 (Ferein Ph Viertelj 7 244) at 15° 5.9 pts (Neese)
 at 16° 6.3 pts (Mulder) at 16° 8.4 pts (Müller J pr 95 52) at 20° 6.8 pts (Neese Russ Z Pharm 1 101) at 25° 12.5 pts (ibid)

Solubility in 100 pts H₂O at t°

t°	Pts Na ₂ HPO ₄	t°	Pts Na ₂ HPO ₄	t°	Pts Na ₂ HPO ₄
0	2 5	35	39 3	69	94 8
1	2 6	36	43 6	70	95 0
2	2 6	37	49 5	71	95 1
3	2 7	38	55 5	72	95 2
4	2 7	39	60 6	73	95 4
5	2 8	40	63 9	74	95 6
6	3 0	41	66 2	75	95 8
7	3 2	42	68 6	76	96 0
8	3 4	43	70 8	77	96 1
9	3 6	44	72 9	78	96 3
10	3 9	45	74 8	79	96 5
11	4 2	46	76 5	80	96 6
12	4 5	47	78 2	81	96 8
13	4 9	48	79 7	82	96 9
14	5 3	49	81 2	83	97 0
15	5 8	50	82 5	84	97 1
16	6 3	51	83 7	85	97 2
17	6 9	52	84 8	86	97 4
18	7 6	53	85 8	87	97 5
19	8 4	54	86 7	88	97 6
20	9 3	55	87 7	89	97 7
21	10 3	56	88 6	90	97 8
22	11 4	57	89 4	91	97 9
23	12 6	58	90 2	92	98 0
24	14 0	59	90 9	93	98 1
25	15 4	60	91 6	94	98 2
26	16 9	61	92 2	95	98 4
27	18 5	62	92 7	96	98 5
28	20 2	63	93 1	97	98 6
29	22 0	64	93 5	98	98 7
30	24 1	65	93 8	99	98 8
31	26 4	66	94 1	105	82 5
32	29 1	67	94 4	105 57	80 7
33	32 1	68	94 6	106 4	79 2
34	35 5				

(Mulder, Scheek Verhandl 1864 103)

Solubility in H₂O at t°

t°	G Na ₂ HPO ₄ in 100 g H ₂ O
10 26	3 55
25 15	12 02
40 29	54 88
60 23	83 00
99 77	102 15

Three breaks in the curve at 36.45°, transition from dodecahydrate to heptahydrate, at 48°, transition from heptahydrate to the dihydrate, at 95.2°, transition from dihydrate to the monohydrate (Shiomi, C C 1909, II 106)

Solubility of Na₂HPO₄ in H₂O at t°

t°		Solid phase
-0 43	1 42	Ice
-0 24	0 70	"
-0 5*		
+0 05	1 67	Na ₂ HPO ₄ +12H ₂ O
20 0	7 66	"
25 0	12 0	"
32 0	25 7	"
34 0	33 8	"
35 2*		
39 2	51 8	Na ₂ HPO ₄ +7H ₂ O
45 0	67 3	"
48 3*		
50 0	80 2	Na ₂ HPO ₄ +2H ₂ O
60 0		
80 0	82 9	"
90 0	92 4	"
95*	101 0	"
96 2	104 6	Na ₂ HPO ₄
105 0	102 3	"
120	99 2	"

(Menzies and Humphery, Int Cong App Chem 1912, 2 177)

* Transition points

Solubility in H₂O at t°

t	100 g H ₂ O dissolve g Na ₂ HPO ₄	Solid phase
0°	2 51	Na HPO ₄ , 12H ₂ O
25	12 47	"
35 4*	46 11	Na HPO ₄ , 7H ₂ O
40 3	54 80	"
48 35*	79 00	Na HPO ₄ , 2H ₂ O
59 7	91 3	
71	95 1	
91	98 15	

(D'Ans and Schreiner Z phys Ch 1911, 75 99)

*Transition points

The composition of the hydrates formed by this salt at different dilutions is calculated

from determinations of the lowering of the fr-pt produced by the salt and of the conductivity and sp gr of its aqueous solutions (Jones, Am Ch 1 1905, 34 318)

$\text{Na}_2\text{HPO}_4 + \text{Aq}$ saturated at 15° has 1 0469 sp gr (Michel and Krafft), saturated at 16° , 1 0511 (Stolba)

Sp gr of $\text{Na}_2\text{HPO}_4 + \text{Aq}$ at 19°

Na_2HPO_4 % + $12\text{H}_2\text{O}$	Sp gr	Na_2HPO_4 % + $12\text{H}_2\text{O}$	Sp gr	Na_2HPO_4 % + $12\text{H}_2\text{O}$	Sp gr
1	1 0041	5	1 0208	9	1 0376
2	1 0083	6	1 0250	10	1 0418
3	1 0125	7	1 0292	11	1 0460
4	1 0166	8	1 0332	12	1 0503

(Schiff, A 110 70)

Saturated solution freezes at -0.45° (Rudorff, Pogg 122 337), and boils at 105° (Griffiths), $105-106.4^\circ$ (Mulder), 106.5° (Legrand)

Sat $\text{Na}_2\text{HPO}_4 + \text{Aq}$ boils at 105.5° (Griffiths) at 106.5° , and contains 113.2 pts Na_2HPO_4 to 100 pts H_2O (Legrand), forms a crust at 106.4° , and contains 108.8 pts Na_2HPO_4 to 100 pts H_2O highest temp observed, 106.8° (Gerlach, Z anal 26 127)

B-pt of $\text{Na}_2\text{HPO}_4 + \text{Aq}$ containing pts Na_2HPO_4 to 100 pts H_2O G=according to Gerlach (Z anal 26 450), L=according to Legrand (A ch (2) 69 426)

B-pt	G	L	B pt	G	L
100 5°	8 6	11 0	104 $^\circ$	68 4	76 4
101	17 2	21 0	104 5	76 9	84 2
101 5	25 8	31 0	105	85 3	91 5
102	34 4	40 8	105 5	93 7	98 4
102 5	42 9	50 3	106	102 1	105 0
103	51 4	59 4	106 5	110 5	111 4
103 5	59 9	68 1	106 6		112 6

+ H_2O Transition point, 95.2° (Shiomi)

+ $2\text{H}_2\text{O}$ Transition point, 48.35° (D'Ans and Schreiner), 48° (Shiomi), 48.3° (Menzies and Humphrey)

+ $7\text{H}_2\text{O}$ Not efflorescent Sol in H_2O with absorption of heat
Sol in 8 pts H_2O at 23° (Necse, J B 1863 181)

Transition point, 35.4° (D'Ans and Schreiner), 36.45° (Shiomi), 35.2° (Menzies and Humphrey)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution mols	
Na	PO_4
6 31	4 63
6 76	4 88
7 31	5 55

(D'Ans and Schreiner, Z phys Ch 1910, 101)

See also above

+ $12\text{H}_2\text{O}$ Efflorescent Sol in H_2O with absorption of heat

14 pts $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$ mixed with 1 pts H_2O at 10.8° lower the temperature 3 (Rudorff, B 2 68)

Sol in 8.48 pts H_2O at 17° or 100 pts H_2O dissoc

11.8 pts at 17° and solution has sp gr = 1 0422 (Schiff)

Sol in 4 pts cold and 2 pts boiling H_2O (Page)

Sol in 4 pts H_2O at 18.75° (Abl)

100 pts H_2O dissolve 12 735 pts $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$

(Michel and Krafft)

100 pts H_2O dissolve 6.5 pts Na_2HPO_4

12 H O at 0° , 27.5 pts at 30° (Tilden, Chem Soc 45 409)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution mols	
Na	PO_4
2 62	1 09
1 56	0 78
2 38	1 60
3 18	2 24
4 65	3 55
5 63	3 87

(D'Ans and Schreiner, Z phys Ch 1910, 101)

See also above

Melts in crystal water below 100° , and easily forms supersaturated solutions (Cf. Tassart)

Melts in crystal H_2O at 34.6° (Perron), 35° (Kopp), $40-41^\circ$ (Mulder)

Melts in crystal H_2O at 35° (Tilden, Chem Soc 45 409)

Supersaturated solutions are brought to crystallization by addition of a crystal of $\text{Na}_2\text{HPO}_4 + 12\text{H}_2\text{O}$ or an isomorphous substance as $\text{Na}_2\text{HAsO}_4 + 12\text{H}_2\text{O}$ (Thomson, Chem Soc 35 200)

Insol in alcohol

Sodium dihydrogen phosphate, NaH_2PO_4

Very sol in H_2O Insol in alcohol (Graham)

+ $2\text{H}_2\text{O}$ Unchanged on air Very so in H_2O , and solubility increases rapidly with the temperature (Joly and Dufet, C R 12 1391)

100 pts H_2O dissolve 59.9 pts at 0° , 84.6 pts at 18° (Joly and Dufet)

Solubility of NaH_2PO_4 in H_2O at t°
G of anhydrous NaH_2PO_4 in 100 g H_2O
Solid phase, $\text{NaH}_2\text{PO}_4 + 2\text{H}_2\text{O}$

t°	G NaH_2PO_4	t°	G NaH_2PO_4
0	57.86	28	101.71
1	59.08	30	106.45
3	61.47	31	108.93
5	63.82	33	114.31
10	69.87	34	117.14
15	76.72	35	120.44
20	85.21	37	126.76
25	94.63	40	138.16
26	96.73	40	110.83
27	99.20		

40 8° , transition point

Solid phase, $\text{NaH}_2\text{PO}_4 + \text{H}_2\text{O}$

41	142.55	52	163.84
42	143.83	55	170.85
45	148.20	56	173.23
50	158.61	57	175.81

57 4° , transition point

Solid phase, NaH_2PO_4

58	177.24	69	190.24
60	179.33	80	207.29
62	181.35	90	225.31
65	184.99	99	246.56

(Imadzu, Chem Soc 1912, **33** 359)

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

In 1000 μ of the solution mols

Na	PO_4
6.19	4.68
6.01	4.67
5.12	4.36
4.81	4.22
4.36	4.08
4.06	4.03
4.19	4.38
4.32	4.96
4.65	5.89
4.55	6.40

(D'Ans and Schreiner, Z phys Ch 1910, **75** 101)

Trisodium trihydrogen phosphate,
 $\text{Na}_3\text{H}(\text{PO}_4)_2$

Not hygroscopic. Sol in H_2O in all proportions (Joulie, C R 1902, **134** 604)
 $+1\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O (Fihol and Senderens, C R **93** 388)

$+7\text{H}_2\text{O}$ (Salzer, Arch Pharm 1894, **232** 365)

$+7\frac{1}{2}\text{H}_2\text{O}$ (Joulie)

Sodium orthophosphate acid, NaH_2PO_4 , H_3PO_4

Hygroscopic. Decomp by alcohol (Staudenmaier, Z anorg 1894, **5** 395)

Solubility of NaH_2PO_4 , H_3PO_4 in H_2O at t°

t°	% NaH_2PO_4 , H_3PO_4	Solid phase
-5	77	Ice
-7	92	"
-11	4	"
-38	56	"
-34	80	NaH_2PO_4
+41	81	"
51	7	83 68
79	7	87 48
85		88 65
101	7	91 47
104	5	92 67
110		95 79
119		97 99
126	5	100

(Parravano and Miel, Gazz ch it **38**, II 536)

Solubility in anhydrous H_3PO_4

t°	% NaH PO_4 , H_3PO_4
98	5
111	
119	
122	
123	

(Parravano and Miel)

$+ \text{H}_2\text{O}$ Very deliquescent (Salzer, Arch Pharm 1894, **232** 369)

Sodium pyrophosphate, $\text{Na}_4\text{P}_2\text{O}_7$, and
 $+10\text{H}_2\text{O}$

Less sol in H_2O than sodium hydrogen orthophosphate (Clark, Ed J Sci **7** 298)

100 pts H_2O dissolve (a) pts $\text{Na}_4\text{P}_2\text{O}_7$, (b) pts $\text{Na}_4\text{P}_2\text{O}_7 + 10\text{H}_2\text{O}$ at

	0°	10°	20°	30°	40°	50°
a	3.16	3.95	6.23	9.95	13.50	17.41
b	5.41	6.81	10.92	18.11	24.97	33.25

	60°	70°	80°	90°	100°
a	21.83	25.62	30.04	35.11	40.26
b	44.07	52.11	63.40	77.47	93.11

(Poggiale)

Sol in H_2SO_4 (Walden, Z anorg 1902, **29** 384)

Crystallizes unchanged from $\text{NH}_4\text{Cl} + \text{Aq}$ (Winkler), or conc $\text{NH}_4\text{OH} + \text{Aq}$ (Uelsmann)
Decomp into orthophosphate by heating with H_2SO_4 , HCl , $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{H}_3\text{PO}_4 + \text{Aq}$
Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)
Insol in alcohol Insol in methyl acetate (Naumann, B 1909, 42 3790)

Sodium hydrogen pyrophosphate, $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$
Decomp by H_2O Sol in H_2O containing $\text{HC}_2\text{H}_3\text{O}_2$ without decomp (Bayer, J pr 106 501)

Sl sol in alcohol Much more sol in H_2O than NaH_2PO_4
 $+6\text{H}_2\text{O}$ (Rammelsberg, B A B 1883 21)

100 g sat solution contain 14.95 g $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$ at 18° (Giran, A ch 1902, (7) 30 249)

$\text{NaH}_2\text{P}_2\text{O}_7$ Very hygroscopic (Salzer, Arch Pharm 1894, 232 369)

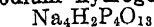
100 g sat solution contain 62.7 g at 18° (Giran, A ch 1902, (7) 30 249)

$\text{Na}_2\text{HP}_2\text{O}_7 + \text{H}_2\text{O}$ Sol in 3 pts H_2O (Salzer, Arch Pharm 1894, 232 366)
 $+6\text{H}_2\text{O}$ 100 g sat solution contain 28.17 g $\text{Na}_2\text{HP}_2\text{O}_7$ at 18° (Giran)

Sodium tetraphosphate, $\text{Na}_6\text{P}_4\text{O}_{13}$

Slowly sol in 2 pts cold H_2O Easily decomp
 $+18\text{H}_2\text{O}$ (Uelsmann)

Sodium hydrogen tetraphosphate,



Sol in H_2O

Sodium dekaphosphate, $\text{Na}_4\text{P}_{10}\text{O}_{31}$

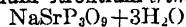
Sol in H_2O (Fleitmann and Henneberg, A 65 333)

Sodium strontium dimetaphosphate,



As the NaBa comp (Glatzel, Dissert 1880)

Sodium strontium trimetaphosphate,



Easily sol in H_2O and acids (Fleitmann, A 65 315)

Sodium strontium orthophosphate, NaSrPO_4



Scarcely sol in H_2O , sol in acids

$+9\text{H}_2\text{O}$ (Joly, C R 104 905)

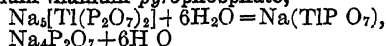
Sodium strontium pyrophosphate (?)

Sl sol in H_2O Insol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Bae, Pogg 75 166)

Easily sol in $\text{HCl} + \text{Aq}$, or $\text{HNO}_3 + \text{Aq}$

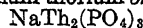
Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Sodium thallium pyrophosphate,



Decomp by H_2O (Rosenheim, B 1915, 48 588)

Sodium thorium orthophosphate,



Insol in acids (Wallroth, Bull Soc (2) 39 316)

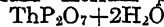
Sodium thorium phosphate, Na_2O , 4ThO_2 , $3\text{P}_2\text{O}_5$

Insol in HNO_3 , HCl , or aqua regia (Troost and Ouvrard, C R 105 30)

$5\text{Na}_2\text{O}$, 2ThO_2 , $3\text{P}_2\text{O}_5$ Sol in $\text{HNO}_3 + \text{Aq}$ (T and O)

Na_2O , ThO_2 , P_2O_5 (T and O)

Sodium thorium pyrophosphate, $\text{Na}_4\text{P O}_7$,



(Cleve)

Sodium tin (stannic) phosphate, $\text{NaSn}_2(\text{PO}_4)_3$

(Ouvrard, C R 111 177)

$\text{Na}_2\text{Sn}(\text{PO}_4)_2$ (Wunder, J pr (2) 4 339)

$6\text{Na}_2\text{O}$, 3SnO_2 , $4\text{P}_2\text{O}_5$ (Ouvrard)

Sodium titanium phosphate, $\text{NaTi}_2(\text{PO}_4)_3$

Insol in acids (Rose, J B 1867 9)

$6\text{Na}_2\text{O}$, TiO_2 , $4\text{P}_2\text{O}_5$ (Ouvrard, C R 111 177)

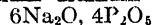
Sodium uranium phosphate, UO_2 , Na_2O , P_2O_5

Easily attacked by acids (Colani, A ch 1907, (8) 12 137)

Sodium uranium metaphosphate, 4UO , Na_2O , $3\text{P}_2\text{O}_5$

Insol in boiling HNO_3 (Colani)

Sodium uranium pyrophosphate, 3UO ,



Sol in acids (Colani)

Sodium uranyl phosphate, Na_2O , UO_2 , P_2O_5

(Ouvrard, C R 110 1333)

$2\text{Na}_2\text{O}$, UO_2 , P_2O_5 (Ouvrard)

Na_2O , 5UO_3 , $2\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$ Insol in H_2O , decomp by acetic acid (Werther, A 68 312)

Sodium uranyl pyrophosphate

Very sol in H_2O (Persoz, A ch (3) 20 322)

Sodium ytterbium pyrophosphate, NaYbP_2O_7

Easily sol in the strong acids (Wallroth)

Sodium yttrium pyrophosphate, NaYP_2O_7

Sol in H_2O (Stromeyer)

Insol in H_2O Easily sol in strong acids (Wallroth)

Sodium zinc triphosphate,

$\text{Na}_2\text{O}, 4\text{ZnO}, 3\text{P}_2\text{O}_5 + 19\text{H}_2\text{O}$
Sol in H_2O (Schwarz, Z anorg 1895, 9 266)

Sodium zinc trimetaphosphate, $\text{Na}_2\text{O}, 2\text{ZnO}, 3\text{P}_2\text{O}_5$

Ppt Sol in H_2O (Fleitmann and Henneberg, A 65 304)

Sodium zinc tetrametaphosphate,

$\text{Na}_2\text{Zn}(\text{PO}_3)_4 + 6\text{H}_2\text{O}$
As K comp (Glatzel, Dissert 1880)

Sodium zinc octometaphosphate,

$\text{Na}_2\text{Zn}_3(\text{PO}_3)_8$
Insol in acids
Sol in conc H_2SO_4 (Tammann, J pr 1892, (2) 45 420)

Sodium zinc orthophosphate, NaZnPO_4

Difficultly sol in H_2O or acetic acid Easily sol in dil mineral acids (Scheffer, A 145 53)
 $2\text{Na}_2\text{O}, \text{ZnO}, \text{P}_2\text{O}_5$ Insol in H_2O , sol in dil acids (Ouvrard, C R 106 1796)

Sodium zinc pyrophosphate, $\text{Na}_2\text{ZnP}_2\text{O}_7$

Insol in H_2O , sol in dil acids (Wallroth)
 $3\text{Na}_2\text{P}_2\text{O}_7, \text{Zn}_2\text{P}_2\text{O}_7 + 24\text{H}_2\text{O}$ Very efflorescent (Pahl)
 $\text{Na}_4\text{P}_2\text{O}_7, \text{Zn}_2\text{P}_2\text{O}_7 + 2\frac{1}{2}, 3, 3\frac{1}{2}, \text{and } 8\text{H}_2\text{O}$ Insol in H_2O , sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Pahl, Sv V A F 30, 7 35)
 $4\text{Na}_4\text{P}_2\text{O}_7, 5\text{Zn}_2\text{P}_2\text{O}_7 + 20\text{H}_2\text{O}$ Insol in H_2O (Pahl)
 $\text{Na}_4\text{P}_2\text{O}_7, 4\text{Zn}_2\text{P}_2\text{O}_7 + 12\text{H}_2\text{O}$ Sl sol in H_2O (Pahl)

Sodium zirconium phosphate, $\text{Na}_2\text{O}, 4\text{ZrO}_2,$

$3\text{P}_2\text{O}_5 = \text{Na}_4\text{Zr}(\text{PO}_4)_3$
Insol in acids or aqua regia (Troost and Ouvrard, C R 105 30)
 $6\text{Na}_2\text{O}, 3\text{ZrO}, 4\text{P}_2\text{O}_5$ Sol in acids (T and O)
 $4\text{Na}_2\text{O}, \text{ZrO}_2, 2\text{P}_2\text{O}_5$ Sol in acids (T and O)

Sodium phosphate fluoride, $\text{Na}_3\text{PO}_4, \text{NaF} + 12\text{H}_2\text{O}$

100 pts H_2O dissolve, at 25° , 12 pts salt and form solution of 1 0329 sp gr, at 70° , 57 5 pts salt and form solution of 1 1091 sp gr (Brigleb, A 97 95)
 $2\text{Na}_3\text{PO}_4, \text{NaF} + 19\text{H}_2\text{O}$, and $22\text{H}_2\text{O}$ Sol in H_2O (Baumgarten, J B 1865 219)

Sodium phosphate stannate,

$4\text{Na}_3\text{PO}_4, \text{Na}_2\text{SnO}_3 + 43\text{H}_2\text{O}$
(Prandtl, B 1907 40 2132)

Sodium phosphate titanate,

$\text{Na}_2\text{O}, \text{TiO}_3, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$
Hygroscopic (Mazzuchelli and Pantanelli, C C 1909, II 420)

Sodium phosphate vanadate

See Phosphovanadate, sodium

Strontium monometaphosphate, $\text{Sr}(\text{PO}_3)_2$

Insol in H_2O and acids Not decomp by alkali carbonates + Aq (Maddrell, A 61 61)

Strontium hexametaphosphate

Nearly insol in H_2O , easily sol in acids (Ludert, Z anorg 5 15)

Strontium orthophosphate, basic, $\text{Sr}(\text{OH})_2, \text{Sr}_3(\text{PO}_4)_2$

(Woczyński, Z anorg 1894, 6 311)

Strontium orthophosphate, $\text{Sr}_3(\text{PO}_4)_2$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ (Erlenmeyer, J B 1857 145)

Strontium hydrogen phosphate, SrHPO_4

Insol in H_2O Sol in $\text{H}_2\text{PO}_4, \text{HCl}$, or $\text{HNO}_3 + \text{Aq}$ (Vauquelin) Easily sol in cold ammonium nitrate, chloride, or succinate + Aq, but is partly precipitated by a little $\text{NH}_4\text{OH} + \text{Aq}$ (Brett)
Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ (Fuchs, 1834)
Sol in Na citrate + Aq (Spiller)
Partly decomp by boiling Na CO_3 , and $\text{K}_2\text{CO}_3 + \text{Aq}$ (Dulong)
 $\text{SrH}_4(\text{PO}_4) + 2\text{H O}$ Decomp by treating with H_2O , leaving 4 29% SrHPO_4 (Barthe)

Strontium phosphate, acid, $\text{H O}, 2\text{SrO}, 3\text{P}_2\text{O}_5 + x\text{H O}$

Entirely sol in H O (Barthe C R 114 1267)

Strontium pyrophosphate, $\text{Sr P}_2\text{O}_7 + \text{H O}$

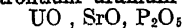
Somewhat sol in H_2O Easily sol in HCl or $\text{HNO}_3 + \text{Aq}$ Insol in HC H O or $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Schwarzenberg A 65 144)
 $+ 2\frac{1}{2}\text{H O}$ (Knorre and Oppelt B 21 773)

Strontium hydrogen pyrophosphate,

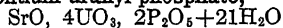
$\text{SrH}_2\text{P}_2\text{O}_7, 2\text{SrP}_2\text{O}_7 + 6\text{H O}$
Ppt (Knorre and Oppelt B 21 772)
 $\text{SrH}_2\text{P}_2\text{O}_7, 3\text{Sr P O}_7 + \text{H O}$, and $+ 2\text{H O}$ (Knorre and Oppelt)
 $\text{Sr}_3\text{H}_2(\text{P}_2\text{O}_7)_3 + 8\text{H}_2\text{O}$, and $+ 12\text{H O}$
Ppt (Pahl, Gm - K 2, 2 172)
 $\text{Sr}_{10}\text{H}_2(\text{P O}_7)_{10} + 5\text{H O}$, and $+ 18\text{H O}$ and $+ 20\text{H O}$
Insol in $\text{Sr}(\text{NO}_3) + \text{Aq}$ or $\text{Na}_4\text{P O} + \text{Aq}$ (Pahl, Gm - K 2, 2 171)

Strontium thorium phosphate,

$\text{Th}_2\text{O SrO}, \text{P}_2\text{O}$
(Colani, C R 1909, 149 209)

Strontium uranium metaphosphate,

(Colani, A ch 1907, (8) 12 141)

Strontium uranyl phosphate,

(Blinkoff, Dissert 1900)

 $2\text{SrO}, 5\text{UO}_3, 2\text{P}_2\text{O}_5 + 24\text{H}_2\text{O}$ As Ba comp (Blinkoff)**Strontium phosphate chloride, $3\text{Sr}_3(\text{PO}_4)_2, \text{SrCl}_2$** *Strontium apatite* Insol in H_2O (Deville and Caron)**Tellurium phosphate (?)**Insol in H_2O (Berzelius)**Thallous metaphosphate, TIPO_3**

Two modifications

 α Difficultly sol in H_2O β Extremely easily sol in H_2O (Lamy)**Thallous orthophosphate, TI_3PO_4** 1 pt is sol in 201 2 pts H_2O at 15° , and 149 H_2O , sol in $\text{HNO}_3 + \text{Aq}$
sol in $\text{HC H}_3\text{O}_2 + \text{Aq}$ Very
olutions of NH_4 salts (Car-
sol in alcohol (Lamy)**Thallous hydrogen phosphate, TI_2HPO_4** *Anhydrous* Much less sol in H_2O than the hydrous salt, but easily sol in a solution of the hydrous salt (Lamy) $+ \frac{1}{2}\text{H}_2\text{O}$ Easily sol in H_2O Insol in alcohol (Lamy)Composition is $\text{HTI}_2\text{PO}_4, 2\text{H TIPO}_4$ (Rammelsberg, W Ann 16 694)**Thallous dihydrogen phosphate, TIH_2PO_4** Very easily sol in H_2O Insol in alcohol (Rammelsberg, B 3 278)**Tri-thallous trihydrogen phosphate, $\text{TI}_3\text{HPO}_4, 2\text{TIH}_2\text{PO}_4$** True composition of TI_2HPO_4 of Lamy (Rammelsberg)**Thallous pyrophosphate, $\text{TI}_2\text{P}_2\text{O}_7$** Sol in 2 5 pts H_2O with slight decomposition (Lamy) $+ 2\text{H}_2\text{O}$ More sol in H_2O than the above salt, with partial decomp (Lamy)**Thallous hydrogen pyrophosphate, $\text{H}_2\text{TI}_2\text{P}_2\text{O}_7, + \text{H}_2\text{O}$** Very sol in H_2O (Lamy)**Thallous phosphate, basic, $2\text{TI}_2\text{O}_3, \text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$** Insol in H_2O **Thallous phosphate, basic, $\text{TI}_3\text{P}_2\text{O}_7 + 13\text{H}_2\text{O}$**

(Rammelsberg, W Ann 16 694)

 $\text{TI}_3\text{P}_4\text{O}_{19} + 12\text{H}_2\text{O}$ (R)**Thallous phosphate, $\text{TIPO}_4 + 2\text{H}_2\text{O}$** Completely insol in H_2O Sol in conc HNO_3 , and dil $\text{HCl} + \text{Aq}$ (Willm)**Thorium metaphosphate, $\text{Th}(\text{PO}_3)_4$** Insol in H_2O (Troost, C R 101 210)**Thorium metaphosphate, $\text{ThO}_3, 2\text{P}_2\text{O}_5$**

Insol in acids (Johnsson, B 22 976)

Thorium orthophosphate, $\text{Th}_3(\text{PO}_4)_4 + 4\text{H}_2\text{O}$ Insol in H_2O and phosphoric acid (Berzelius), also acetic acid (Cleve)Sol in HCl , and $\text{HNO}_3 + \text{Aq}$ (Cleve)**Thorium hydrogen phosphate, $\text{ThH}_2(\text{PO}_4)_2 + \text{H}_2\text{O}$**

Precipitate

Thorium pyrophosphate, $\text{ThP}_2\text{O}_7 + 2\text{H}_2\text{O}$ Precipitate Insol in H_2O Sol in great excess of pyrophosphoric acid or sodium pyrophosphate + Aq (Cleve)**Thorium phosphate bromide**

See Bromophosphate, thorium

Thorium phosphate chloride

See Chlorophosphate, thorium

Tin (stannous) phosphate, $5\text{SnO}, 4\text{P}_2\text{O}_5 + 4\text{H}_2\text{O}$ Insol in H_2O (I enssen, A 114 113) $\text{Sn}_3(\text{PO}_4)_2$ Insol in H_2O Sol in mineral acids (Kuhn)Insol in NH_4Cl or $\text{NH}_4\text{NO}_3 + \text{Aq}$ Sol in $\text{KOH} + \text{Aq}$ **Tin (stannic) phosphate, $2\text{SnO}_2, \text{P}_2\text{O}_5 + 10\text{H}_2\text{O}$** Insol in H_2O or $\text{HNO}_3 + \text{Aq}$ (Ragnoso, J p 54 261)*Anhydrous* Insol in acids (Hautefeuille and Margottet, C R 102 1017)**Tin (stannic) phosphate, SnP_2O_7**

Insol in acids (Hautefeuille und Margottet C R 102 1017)

Tin (stannous) phosphate chloride, $3\text{SnO}, \text{P}_2\text{O}_5, \text{SnCl}_2 + \text{H}_2\text{O}$ Not decomp by hot H_2O (I enssen, A 114 113)**Titanium phosphate, $\text{Ti}_2\text{P}_2\text{O}_7 = 2\text{TiO}_2, \text{P}_2\text{O}_5$**

Insol in acids (Hautefeuille and Margottet, C R 102 1017)

(Ouvrard, C R 111 177)

 $+ 3\text{H}_2\text{O}$ Ppt Insol in H_2O (Merz)

TiO_2 , P_2O_5 (Knop) Is $\text{NaTi}_2(\text{PO}_4)_3$
(Wunder, J B 1871 324)
 H_2TiPO_7 Sol in HCl , HNO_3 , H_2SO_4
Sl sol in H_3PO_4
Sol in KOH , NH_4OH , $(\text{NH}_4)_2\text{CO}_3$ and
 $(\text{NH}_4)_2\text{HPO}_4 + \text{Aq}$
Very sl sol in acetic acid (Faber, Z
anal 1907, 46 288)

Uranous metaphosphate, $\text{U}(\text{PO}_3)_4$

Insol in HNO_3 , HCl , or H_2SO_4 , even
when hot and conc (Colani, A ch 1907, (8)
12 105)

Uranic metaphosphate, $\text{U}_2(\text{PO}_3)_6$

Insol in H_2O and acids (Hautefeuille and
Margottet, C R 96 849)

Uranous orthophosphate, $\text{U}_3(\text{PO}_4)_4$

More easily attacked by acids than the pyro
and meta phosphates, especially by HNO_3
(Colani, A ch 1907, (8) 12 123)

Uranous hydrogen orthophosphate, $\text{UHPO}_4 + \text{H}_2\text{O}$

Insol in H_2O Insol in dil, sl sol in
conc $\text{HCl} + \text{Aq}$ Decomp by $\text{KOH} + \text{Aq}$,
not by $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg
59 1)

Uranous pyrophosphate, UP_2O_7

Insol in H_2O
Sl sol in min acids (Colani)

Uranous phosphate, 2UO_2 , P_2O_5

Easily attacked by boiling HNO_3
(Colani)

UO_2 , $\text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$ Insol in H_2SO_4 and
in $\text{HCl} + \text{Aq}$ of medium concentration Sol
in very conc $\text{HCl} + \text{Aq}$ (Aloy, Dissert
1901)

Uranyl metaphosphate, $\text{UO}(\text{PO}_3)_3$

(Rammelsberg, B A B 1872 447)
 UO_2 , $2\text{P}_2\text{O}_5$ Insol in acids (Johnsson,
B 22 976)

Uranyl orthophosphate, $\text{UO}(\text{HPO}_4) + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O
+ $3\text{H}_2\text{O}$
+ $4\text{H}_2\text{O}$
+ $4\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O Sol in 67,000
pts $\text{HCl} + \text{Aq}$ 50,000 pts $\text{NH}_4\text{Cl} + \text{H}_2\text{O}_2 +$
 Aq , and 300,000 pts of a mixture of the above
two solutions Sol in K_2CO_3 or $\text{Na}_2\text{CO}_3 +$
 Aq (Kitschin, C N 27 199)

Uranyl dihydrogen phosphate,

$\text{UO}_2\text{H}_4(\text{PO}_4)_2 + 3\text{H}_2\text{O}$
Decomp by H_2O Sol in $\text{H}_3\text{PO}_4 + \text{Aq}$
(Werther, J pr 43 322)

Uranyl pyrophosphate, $(\text{UO}_2)_2\text{P}_2\text{O}_7 + 5\text{H}_2\text{O}$

Efflorescent Insol in H_2O Sol in
 $\text{HNO}_3 + \text{Aq}$, and $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ Insol in
 $\text{Na}_2\text{HPO}_4 + \text{Aq}$ Insol in alcohol or ether
(Girard, C R 34 22)
+ $4\text{H}_2\text{O}$ (Casteing, Bull Soc (2) 34 20)

Uranyl tetraphosphate (?), $\text{UO}_2\text{P}_4\text{O}_{11}$

(Johnsson, B 22 978)

Uranous orthophosphate chloride, $\text{U}_3(\text{PO}_4)_4$, UCl_4

Sl sol in $\text{HCl} + \text{Aq}$ Sol in HNO_3 and
 $\text{HNO}_3 + \text{HCl}$ (Colani, A ch 1907, (8) 12
127)

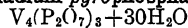
Uranous hydrogen orthophosphate chloride, $\text{U}(\text{HPO}_4)_2$, UCl_4

Very sl sol in H_2O (Aloy, Dissert 1901)

Vanadium phosphate, $(\text{VO}_2)_2\text{H}_2\text{PO}_4 + 4\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O
See Phosphovanadic acid

Vanadium pyrophosphate,



Insol in H_2O (Rosenheim, B 1915, 48
590)

Divanadyl phosphate

Very deliquescent, and sol in H_2O Insol
in alcohol (Berzelius)

Ytterbium metaphosphate, $\text{Yb}(\text{PO}_3)_3$

Insol in H_2O (Cleve, Z anorg 1902, 32
149)

Ytterbium orthophosphate, $\text{YbPO}_4 + 4\frac{1}{2}\text{H}_2\text{O}$

Ppt (Cleve)

Ytterbium phosphate, Yb_2O_3 , $2\text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$

Sol in H_2O (Cleve)

Yttrium metaphosphate, $\text{Y}(\text{PO}_3)_3$

Insol in H_2O or acids (Cleve)

Yttrium orthophosphate, YPO_4

Anhydrous Insol in H_2O or acids after
hydration

Min *Xenotime* Insol in conc acids Sl
sol in much conc $\text{HCl} + \text{Aq}$, but easily sol
therein when first heated with a little $\text{HCl} +$
 Aq (Wuth, A 139 237)

Yttrium hydrogen orthophosphate, $\text{Y}_2(\text{HPO}_4)_3$

Decomp by boiling with H_2O into insol
 YPO_4 and sol acid salt

Yttrium pyrophosphate, $\text{YHP}_2\text{O}_7 + 3\frac{1}{2}\text{H}_2\text{O}$

Difficultly sol in acids Decomp by
 H_2SO_4 Sol in $\text{Na}_4\text{P}_2\text{O}_7 + \text{Aq}$ (Cleve)
 $2\text{Y}_2\text{O}_3$, $3\text{P}_2\text{O}_5$ Insol in acids (Johnsson,
B 22 976)

Zinc metaphosphateSol in H₂O (Berzelius)**Zinc dimetaphosphate, ZnP₂O₆**Sol only in boiling H₂SO₄ (Fleitmann, Pogg 78 350)Not decomp by boiling Na₂S or (NH₄)₂S + Aq+4H₂O Insol in H₂O, but decomp by boiling therewith (Fleitmann, Pogg 78 253)Sol in 4 pts H₂O Conc H SO₄ decomp it easily, other acids act slightly (Glatzel, Dissert 1880)

Difficultly decomp by boiling acids

Zinc trimetaphosphate, Zn₃(PO₃)₆+9H₂O1 l H₂O dissolves 0.1 g at 20° (Lamann, J pr 1892, (2) 45 426)**Zinc tetrametaphosphate, Zn₄(PO₃)₈+10H₂O**Sol in 55 pts H₂O Decomp by acids only on boiling (Glatzel, Dissert 1880)Somewhat sol in HNO₃+Aq Sol in boiling H₂SO₄ (Glatzel)**Zinc orthophosphate, Zn₃(PO₄)₂+4H₂O**Insol in H₂O Easily sol in acids, NH₄OH, (NH₄)₂CO₃, (NH₄)₂SO₄, or NH₄NO₃+Aq (Heintz, A 143 356)Sol in NH₄Cl+Aq (Fuchs)

Easily sol in Zn salts+Aq (Rose)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 930)

Min Hopeite

+6H₂O (Reynoso)**Zinc hydrogen phosphate, ZnHPO₄+H₂O**Insol in H₂O, sol in H₃PO₄+Aq (Graham)**Zinc tetrahydrogen phosphate, ZnH₄(PO₄)₂+2H₂O**Nearly insol in H₂O, but decomp thereby into H₃PO₄ and 10ZnO, 4P₂O₅+10H₂O (Demel, B 12 1171)**Zinc phosphate, 10ZnO, 4P₂O₅+10H₂O**Insol in H₂O (Demel, B 12 1171)**Zinc pyrophosphate, Zn P O₇+³/₂H₂O**Ppt Sol in H SO₄+Aq Sol in acids, KOH+Aq, NH₄OH+Aq (Schwarzenberg, A 65 151)Sol in Na₂P₂O₇+Aq (Gladstone), and in ZnSO₄+Aq (Rose)

Insol in acetic acid (Knorre, Z anorg 1900, 24 389)

+5H₂O Insol in H₂O (Pahl, J B 1873 229)**Zinc hydrogen pyrophosphate**Sol in H₂O (Pahl, Sv V A F 30, 7 45)**Zinc metaphosphate ammonia**

Ppt (Bette)

Zinc orthophosphate ammonia, 2ZnO, P₂O₅, 3NH₃+3H₂O

(Rother, A 143 356)

6ZnO, 3P₂O₅, 8NH₃+4H₂O (Schweikeit, A 145 517)**Zinc pyrophosphate ammonia, 3Zn₂P₂O₇, 4NH₃+9H₂O**Ppt Insol in H₂O (Bette)**Zirconium orthophosphate, 5ZrO₂, 4P₂O₅+8H₂O**

Somewhat sol in acids (Hermann, J pr 97 321)

Insol in acids (Paykull, Bull Soc (2) 20 65)

2ZrO₂, 4P₂O₅ Not attacked by acids (Hautefeuille and Margottet, C R 102 1017)**Zirconium pyrophosphate, Zr₂(PO₃)₄**

(Knop, A 159 36)

Phosphoricovanadicotungstic acid**Ammonium phosphoricovanadicotungstate,**14(NH₄)₂O, 2P₂O₅, 7V₂O₅, 31WO₃+78H₂OSol in H₂O Insol in alcohol, ether, CS₂ and benzene (Rogers, J Am Chem Soc 1903, 25 305)**Phosphorimidamide, PN₂H₃**

(Joannis, C R 1904, 139 365)

Phosphorimide, P₂(NH)₂Very sol in ammoniacal solution of NH₄I (Hugot, C R 1905, 141 1236)**Phosphornitryl, PON**

See Phosphoryl nitride

Phosphorosomolybdic acid, P₂O₃,24MoO₃+63H₂O

(Rosenheim and Pinsker, Z anorg 1911, 70 77)

Ammonium phosphorosomolybdate,2(NH₄)₂O, 2H₃PO₃, 12MoO₃+12¹/₂H₂OInsol in cold, slightly sol in hot H₂O (Gibbs, Am Ch J 5 361)**Phosphorosophosphomolybdic acid****Ammonium phosphorosophosphomolybdate,**9(NH₄)₂O, 2H₃PO₃, 3P₂O₅, 72MoO₃+38H₂ONearly insol in H₂O (Gibbs)

Phosphorosophosphotungstic acid

Potassium phosphorosophosphotungstate,
 $5K_2O, 2H_3PO, P_2O_5, 24WO_3 + 13H_2O$
 Sol in much boiling H_2O (Gibbs, Am Ch J 7 313)

Phosphorosotungstic acid

Ammonium phosphorosotungstate, $6(NH_4)_2O, 4H_3PO_3, 22WO_3 + 25H_2O$
 Sl sol in cold H_2O

Potassium —, $5K_2O, 16H_3PO_3, 32WO_3 + 46H_2O$
 Sl sol in hot H_2O

Sodium —, $2Na_2O, 8H_3PO_3, 22WO_3 + 35H_2O$
 Nearly insol in cold, sl sol in hot H_2O
 (Gibbs, Am Ch J 7 313)

Phosphorous anhydride, P_2O_3

See Phosphorus trioxide

Phosphorous acid, H_3PO_3

Deliquescent Very sol in H_2O

Phosphites

The neutral alkali phosphites are sol in H_2O , most of the others are sl sol in H_2O , but sol in $H_3PO_3 + Aq$ all are insol in alcohol

Aluminum phosphite, basic, $Al(HPO_3)_3$
 $Al_2(OH)_2$
 Ppt (Grutzn, Arch Pharm 1897, 235 698)

Aluminum phosphite

Precipitate (Rose, Pogg 9 39)
 Sl sol in H_2O

Ammonium phosphite, $(NH_4)HPO_3 + H_2O$
 Very deliquescent, and sol in H_2O (Rose, Pogg 9 28)
 Sol in 2 pts cold, and less hot H_2O Insol in alcohol (Berzelius)
 Insol in acetone (Fudmann, C C 1899, II 1014, N um un, B 1904, 37 4328)

Ammonium hydrogen phosphite,
 $(NH_4)H_2PO_3$

Very deliquescent, and sol in H_2O 1 pt H_2O dissolves 1 71 pts salt at 0° , 1 9 pts at $14 5^\circ$, and 2 60 pts at 31° (Amst, C R 105 809)

Ammonium hydroxylamine phosphite,
 $NH_4(NH_2OH)HPO_3$

Sol in H_2O and abs alcohol (Hofmann, Z anorg 1898, 16 466)

Ammonium magnesium phosphite,
 $(NH_4)_2Mg_3(PO_3)_4 + 16H_2O$

Slightly sol in H_2O (Rammelsberg, Pogg 131 367)

Antimonyl phosphite, $(SbO)_2H_2PO_3$

Very sol in H_2O containing HCl (Grützner, Arch Pharm 1897, 235 694)

Barium phosphite, $BaHPO_3$

100 pts H_2O dissolve 0 25 pt (Ure)
 Very slightly sol in H_2O , and decomp by boiling H_2O (Dulong)
 Easily sol in H_2O containing NH_4Cl (Wackenroder, A 41 315)
 Sol in $H_3PO_3 + Aq$ or $HCl + Aq$ (Railton)

Barium hydrogen phosphite, $Ba_2H_2(HPO_3)_3 + 8H_2O$

Easily sol in H_2O , but decomp by boiling therewith Insol in alcohol (Rammelsberg, Pogg 132 496)

Barium dihydrogen phosphite, $BaH_2(HPO_3)_2 + \frac{1}{2}H_2O$

Easily sol in H_2O (Rose, Pogg 9 215)
 $+ H_2O$ Sol in H_2O , decomp by boiling H_2O into a neutral insol, and an acid sol salt (Wurtz, A 58 66)
 $+ 2H_2O$ Easily sol in H_2O (Rammelsberg, Pogg 132 496)
 Insol in alcohol (Wurtz)

Bismuth phosphite, $2Bi_2O_3, 3P O_3$

Insol in H_2O
 $Bi_2(HPO_3)_3 + 3H_2O$ Ppt (Grutzn, Arch Pharm 1897, 235 696)
 Decomp by H_2S Not decomp by $KOH + Aq$ (Vannino, J pr 1906, (2) 74 151)

Cadmium phosphite, $CdHPO_3 + 3H_2O$

Ppt (Rose, Pogg 9 41)

Calcium phosphite, $CaHPO_3 + \frac{1}{2}H_2O$

Sl sol in H_2O , the aqueous solution is decomp by boiling
 $+ H_2O$ Sol in $NH_4Cl + Aq$ (Wackenroder, A 41 315)
 Insol in alcohol

Calcium hydrogen phosphite, $CaH(HPO_3) + H_2O$

Sol in H_2O Aqueous solution is decomp by alcohol (Wurtz, A ch (3) 7 212)

Chromic phosphite

Precipitate Almost insol in H_2O (Rose, Pogg 9 40)

Cobaltous phosphite, $CoPHO_3 + 2H_2O$

Ppt Sl sol in H_2O (Rose)

Cupric phosphite, $\text{CuHPO}_3 + 2\text{H}_2\text{O}$

Ppt Insol in H_2O (Wurtz, A ch (3) 16 213)

Didymium phosphite, $\text{D}_{12}(\text{HPO}_3)_3$

Precipitate (Frerichs and Smith, A 191 331)

Glucinum phosphite

Precipitate Insol in H_2O (Rose, Pogg 9 39)

Iron (ferrous) phosphite, $\text{FeHPO}_3 + x\text{H}_2\text{O}$

Ppt Nearly insol in H_2O (Rose, Pogg 9 35)

Iron (ferric) phosphite, basic, $\text{Fe}_2(\text{HPO}_3)_3, \text{Fe}_2(\text{OH})_6$

(Grützner, Arch Pharm 1897, 235 697)
 $\text{Fe}_2(\text{HPO}_3)_3, \text{Fe}(\text{OH})_3 + 5\text{H}_2\text{O}$ Hydro-
 scopic (Berger, C R 1904, 138 1500)

Iron (ferric) phosphite, $\text{Fe}_2(\text{HPO}_3)_3 + 9\text{H}_2\text{O}$

Ppt Sol in iron alum + Aq (Rose)

Lanthanum phosphite, $\text{La}_2(\text{HPO}_3)_3$

(Smith)

hosphite, basic, $4\text{PbO}, \text{P}_2\text{O}_3 + 2\text{H}_2\text{O}$

(Rose, Pogg 9 222)

, $\text{P}_2\text{O}_3 + \text{H}_2\text{O}$ Insol in H_2O Sol in
 dil $\text{H}_3\text{PO}_3 + \text{Aq}$, from which it is
 pptd by $\text{NH}_4\text{OH} + \text{Aq}$ (Wurtz, A ch (3) 16 214)

Lead phosphite, PbHPO_3

Insol in H_2O Very sl sol in a solution
 of phosphorous acid, easily sol in cold HNO_3 ,
 + Aq (Wurtz)

Lead hydrogen phosphite, $\text{PbH}_2(\text{PO}_3)$

Decomp by H_2O (Amat, C R 110 901)

Lead pyrophosphite, $\text{PbH}_2\text{P}_2\text{O}_5$

Gradually decomp by H_2O into H_3PO_3 and
 PbHPO_3 (Amat, C R 110 903)

Lithium hydrogen phosphite, LiHPO_3

Very sol in H_2O (Amat A ch (6) 24 309)

Lithium pyrophosphite, $\text{LiH}_2\text{P}_2\text{O}_5$

Very sol in H_2O (Amat A ch 1891, (6) 24 352)

Magnesium phosphite, $\text{MgHPO}_3 + 3\text{H}_2\text{O}$

Sl sol in H_2O (Rose, Pogg 9 28)
 Sl in 400 pts H_2O (Berzelius)
 + $4\text{H}_2\text{O}$

Magnesium pyrophosphite, $\text{Mg}(\text{H}_2\text{P}_2\text{O}_5)$

Very sol in H_2O (Amat A ch 1891, (6) 24 313)

Manganous phosphite, $\text{MnHPO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Difficultly sol in H_2O , easily in MnCl_2 or
 $\text{MnSO}_4 + \text{Aq}$ (Rose, Pogg 9 33)

Nickel phosphite, $\text{NiHPO}_3 + 3\frac{1}{2}\text{H}_2\text{O}$

Ppt Sl sol in H_2O

Potassium phosphite, K_2HPO_3

Very deliquescent Very sol in H_2O
 Insol in alcohol (Dulong)

Potassium hydrogen phosphite, $(\text{KH})\text{HPO}_3$

1 pt H_2O dissolves about 172 pts salt at
 20° (Amat C R 106 1351)

$\text{K}_2\text{HPO}_3, 2\text{H}_3\text{PO}_3$ Very sol in H_2O
 (Wurtz, A 58 63)

Sol in 3 pts cold, and in less hot H_2O
 (Fourcroy and Vauquelin)

Potassium pyrophosphite, $\text{K}_2\text{H}_2\text{P}_2\text{O}_5$

Very sol in H_2O (Amat A ch (6) 24 351)

Sodium phosphite, basic, $\text{Na}_2\text{HPO}_3, \text{NaOH} (?)$

Not obtained in pure state (Zimmerman,
 B 7 290), = Na PO_3 (Wislicenus)
 Does not exist (Amat)

Sodium phosphite, $\text{Na}_2\text{HPO}_3 + 5\text{H}_2\text{O}$

Deliquescent, and very sol in H_2O In-
 sol in alcohol

Correct formula for Na_3PO_3 of Rose and
 Dulong

Sodium hydrogen phosphite, $(\text{NaH})\text{HPO}_3 + 2\frac{1}{2}\text{H}_2\text{O}$

0.56 pt salt dissolves in 1 pt H_2O at 0° ,
 0.66 pt at 10° 1.93 pts at 42° (Amat,
 C R 106 1351)

$\text{Na H}_2(\text{HPO}_3)_3 + \text{H}_2\text{O}$ Deliquescent in
 moist air Sol in 2 pts cold, and about the
 same amt hot H_2O Sl sol in spirit (Four-
 croy and Vauquelin)

Sodium pyrophosphite, $\text{Na}_2\text{H}_2\text{P}_2\text{O}_5$

Very sol in H_2O with gradual decomp into
 Na_2HPO_3 (Amat)

Strontium phosphite, $\text{SrHPO}_3 + 1\frac{1}{2}\text{H}_2\text{O}$

Difficultly sol in H_2O Aqueous solution
 decomp on heating into a sol acid salt and
 an insol basic salt

Strontium hydrogen phosphite, $\text{SrH}_2(\text{PO}_3)$

Very sol in H_2O (Amat, A ch (6) 24 312)

Thallous hydrogen phosphite, THHPO_3

Very sol in H_2O (Amat, A ch (6) 24 310)

Thallous pyrophosphite, $\text{THH}_2\text{P}_2\text{O}_5$

Deliquescent Very sol in H_2O (Amat)

Tin (stannous) phosphite, SnHPO_3

Ppt Sol in $\text{HCl} + \text{Aq}$ (Rose, Pogg 9 45)

Tin (stannic) phosphite, $2\text{SnO}_2, \text{P}_2\text{O}_3$

Ppt (Rose, Pogg 9 47)

Titanium phosphite (?)

Precipitate (Rose, Pogg 9 47)

Uranyl phosphite, $(\text{UO})_2\text{H}_2(\text{HPO}_3)_4 + 12\text{H}_2\text{O}$

Precipitate (Rammelsberg Pogg 132 500)

Zinc phosphite, ZnHPO_3

Sol in H_2O (Rammelsberg, Pogg 132 481)

+ $2\frac{1}{2}\text{H}_2\text{O}$ More easily sol in cold than warm H_2O (Rammelsberg)

Zinc phosphite, acid, $\text{Zn}_2\text{H}_3\text{P}_3\text{O}_8$

Sol in H_2O

+ $2\text{H}_2\text{O}$ Sol in H_2O (Rammelsberg, Pogg 132 498)

$\text{Zn}_3\text{H}_3\text{P}_3\text{O}_{13}$ Sol in H_2O

+ $3\text{H}_2\text{O}$ Sol in H_2O (Rammelsberg)

$\text{Zn}_2\text{H}_3\text{P}_3\text{O}_{14}$ Sol in H_2O

+ H_2O Sol in H_2O (Rammelsberg)

Zirconium phosphite, $\text{Zr}(\text{PO}_3)_2 + \text{H}_2\text{O}$

Ppt Nearly insol in dil mineral acids (Hauser, Z anorg 1913 84 92)

Phosphorous anhydride, P_2O_3

See Phosphorus trioxide

Phosphorus, P

(a) *Ordinary white phosphorus* Insol in H_2O , but slowly decomp thereby (G K), very sl sol in H_2O (Berchius and others)

A pure aqueous solution containing 0.1 g P in 500 cc H_2O can be obtained by dissolving 0.1 g P in CS_2 mixed with ether and hot alcohol, this solution is poured into 500 cc boiling H_2O free from air, and the boiling continued with stirring until the alcohol, ether and CS_2 are boiled off (Pokorny, Ch Ztg 1896, 20 1022)

100 g H_2O sat with P contains 0.0003 g P (Stich, C C 1903, I 1291)

Sol with decomp in hot conc $\text{HNO}_3 + \text{Aq}$

Decomp by boiling caustic alkalis + Aq

Easily sol in SCL_2 , especially if hot (Wohler)

Sol in sulphur phosphides

Largely sol in PCl_3

Easily sol in PCl_5

Sol in PBr_3 Sol in PSCl_3 , easily on warming, separating on cooling (Serullas, A ch 1829, 42 25)

Sol in liquid SO_2 (Sestini, Bull Soc 1868, (2) 10 226)

Sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Sol in S_2Cl_2 without foaming (Nicolardot, C R 1908, 147 1304)

Sol in PS_2Cl_3 (Gladstone, A 1850, 74 91)

Sol in 320 pts cold alcohol of 0.799 sp gr, and in 240 pts of the same when warm Pptd from alcoholic solution by H_2O (Buchner)

One gram P dissolves in 1 ounce abs alcohol (Schacht)

Sol in 20 pts absolute ether at 20° and 240 pts ordinary ether at 20° (Bucholz)

Sol in 80 pts absolute ether at 15.5° , and 240 pts ordinary ether at 15.5° (Brugnatelli, A ch 24 73)

Solubility of P_4 in 100 g ether at t°

t°	G phosphorus	Sp gr
0	0.4335	
5	0.62	
8	0.79	
10	0.85	
15	0.9	at 13° 0.7257
18	1.005	
20	1.04	at 19° 0.7187
23	1.121	
25	1.39	0.7283
28	1.601	
30	1.75	
33	1.8	
35	1.9984	

(Christomanos, Z anorg 1905, 45 136)

Solubility of P_4 in 100 g benzene at t°

t°	G phosphorus	Sp gr
0	1.513	
5	1.99	
8	2.31	
10	2.4	
15	2.7	at 13° 0.8959
18	3.1	
20	3.21	at 19° 0.8912
23	3.3995	at 22° 0.8875
25	3.7	0.8861
28	4.35	
30	4.601	
33	5.0	
35	5.17	
40	5.75	
45	6.105	
50	6.8	
55	7.315	
60	7.9	
65	8.4	
70	8.898	
75	9.4	
81	10.027	

(Christomanos)

Sol to about 1% in acetic acid (Vulpius, Arch Pharm 1878, **213** 38)
 100 g 96% acetic acid dissolve 0 105% P (Stich, Pharm Ztg 1903, **48** 343)
 Sol in 0 05 pt CS₂ (Bottger), 0 125 pt (Trommsdorf)
 Alcohol ppts P from CS₂ solution
 1 pt CS₂ dissolves 17-18 pts P (Vogel, J B 1868 149)

Solubility in CS₂ at t°
 (g per 100 g of solution)

t°	G P ₄	t°	G P ₄
-10	31 40	-2 5	75 00
-7 5	35 85	0 0	81 27
-5	41 95	+5 0	86 30
-3 5	66 14	+10 0	89 80
-3 2	71 72		

(Cohen and Inouye, Z phys Ch 1910, **72** 418)

Very sol in methylene iodide (Retgers, Z anorg **3** 343)

Strong vinegar dissolves P (Beudet)
 Sol in considerable amount in stearic acid (Vulpius, Arch Pharm (3) **13** 38)

Sol in ethyl chloride, benzoyl chloride, stannic chloride, and in liquid cyanogen

Sl sol in ethyl nitrite, and wood-spirit
 Sl sol in acetone, with gradual decomposition

Insol in nicotine, and conune
 Sl sol in cold, more sol in hot benzene (Mansfield)

Sol in 14 pts hot, and less in cold petroleum from Amiano (Saussure)

Sl sol in "liquid paraffine" (Crismer, B 17 649)

Sl sol in warm essential oils, as oil of turpentine, and in the fatty oils

Sol in hot oil of copaiba, separating out on cooling

Sol in hot oil of caraway, and mandarin oil (Luca)

Sl sol in cold, more sol in hot caoutchun, depositing on cooling

Readily sol in warm, less in cold styrene
 Sol in aniline, and quinoline (Hofmann)

Sl sol in cold creosote
 Somewhat sol in fusel oil

Easily sol in valerianic acid, and amyl valerate

Sol in hexyl alcohol, ethylene chloride, allyl sulphocyanide, mercury methyl, chloroform, bromoform, warm chloral, acetic ether, aldehyde, hot cacodyl sulphide, and in cacodyl oxide

100 g oil of almonds sat with P contain 1 25 g (Stich, C C 1903, I 1291)

100 g oleic acid sat with P contain 1 06 g (Stich)

100 g paraffine sat with P contain 1 g (Stich)

(b) *Amorphous phosphorus* Insol in H₂O
 Insol in NH₄OH+Aq (Fluckiger)

Sol in boiling KOH+Aq

The statement of Burgess and Chapman, (Chem Soc **79** 1235) that red P is sol in aqueous alcoholic alkali is incorrect Both ordinary crystalline and amorphous red P are insol in aqueous alcoholic alkali (Michaelis, A 1902, **325** 367)

Insol in liquid NH₃ (Hugot, A ch 1900 (7) **21**, **31**), (Franklin, Am Ch J 1898, **20** 828)

Bright red variety is sol in liquid NH₃ at ord temp leaving a black residue (Stoch, Bottcher and Lenger, B 1909, **42** 2854)

Red Amorphous

Sol in S₂Cl₂ with foaming (Nicolardot, C R 1908, **147** 1304)

Solubility of amorphous bright red P₄ in PBr₃ is diminished by long heating as follows

	172°	185°
Initial concentration	0 555	0 476
Final concentration	0 374	0 397
Length of expt in hours	34	24

	198°	218°
	0 592	0 476
	0 416	0 592
	18	17

(Buck, Dissert 1904)

Ordinary amorphous P₄ is sol in PBr₃

A sample prepared by heating bright red phosphorus P with 94 2% P dissolved by heating in PBr₃ as follows

% P	0 106	0 121	0 178
hours	10	20	42

A finely pulverized commercial product containing 98 0% P

% P	0 92	0 116
hours	10	20

An ordinary commercial product with 98% P

% P	0 056	0 108
hours	10	42

(Buck)

100 g PBr₃ dissolve 0 2601 g bright red phosphorus at 172°, 0 3634 g at 184° (Schenk, B 1902, **35** 35;)

Insol in KOH+Aq

Conc H₂SO₄ does not act upon it in the cold, but dissolves easily when hot

Insol in dil, easily sol in conc HNO₃+Aq with decomposition

Much more sol in HNO₃+Aq than ordinary P (Personne, C R **45** 115)

Insol in methylene iodide (Retgers)

Appreciably sol in isobutyl alcohol (Svedberg)

Insol in CS₂, alcohol, ether, naphtha, ligroine, PCl₃, etc

Sl sol in boiling oil of turpentine and

other high-boiling liquids, with conversion into ordinary phosphorus

Insol in oil of turpentine even at 270° (Colson, A ch 1908, (8) 14 554)

(c) *Crystalline* Insol in, and not attacked by dil $\text{HNO}_3 + \text{Aq}$

Sol in CS_2

Phosphorus tribromide, PBr_3

Decomposed by H_2O , slowly at 8°, but very rapidly at 25° (Löwig, Pogg 14 485)

Sol in liquid H_2S (Antony and Magri, Gazz ch it 1905, 35 (1) 206)

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84 27)

Sol in ether, acetone, CHCl_3 , C_6H_6 and CS_2 (Christomanos, Z anorg 1904, 41 287)

Phosphorus pentabromide, PBr_5

Fumes on air, and is violently decomp by H_2O

Phosphorus tribromide ruthenium bromide, $\text{Ru}_2\text{P}_3\text{Br}_{19}$

Decomp by boiling H_2O

Slowly sol in hot alcohol with decomp

Insol in benzene, CCl_4 , ligroin and cold alcohol (Streckler, B 1909, 42 1775)

Phosphorus thiophosphoryl bromide, PBr_3 , PSBr_3

Decomp by H_2O into PSBr_3 (Michaelis)

Phosphorus tribromide ammonia, 3PBr_3 , 5NH_3

Slowly but completely sol with decomp in H_2O (Storer's Dict)

Phosphorus pentabromide ammonia, PBr_5 , 9NH_3

(Besson, C R 111 972)

Phosphorus monobromotetrachloride, PBrCl_4

Decomp by H_2O (Prinvault, C R 74 868)

Phosphorus dibromotrichloride, PCl_3Br_2

Very unstable (Michaelis, B 5 9)

Phosphorus tetrabromotrichloride, PCl_3Br_4

Decomp with H_2O (Geuther)

Phosphorus heptabromodichloride, PCl_2Br_7

Very unstable (Prinvault, C R 74 868)

Phosphorus octobromotrichloride, PCl_3Br_8

Very easily decomp (Michaelis, B 5 9)

Phosphorus bromofluoride, PF_3Br_2

Decomp violently with H_2O (Moissan, Bull Soc (2) 43 2)

Phosphorus bromonitride

See Nitrogen bromophosphide

Phosphorus dichloride, P_2Cl_4

Decomp by H_2O (Besson, C R 1910, 150 103)

Phosphorus trichloride, PCl_3

Gradually decomp by H_2O

0.11 g is sol in 100 ccm liquid H_2S (Antony, Gazz ch it 1905, 35 (1) 206)

Acted upon by liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Miscible with CS_2 , C_6H_6 , CHCl_3 , and ether

Decomp with alcohol

Phosphorus pentachloride, PCl_5

Very deliquescent, and sol in H_2O with violent decomp and evolution of heat

Sol in liquid HCl Acted upon by liquid NH_3

Somewhat sol without decomp in CS_2 (Schiff, A 102 118 (Franklin, Am Ch J 1898, 20 828))

Sol without decomp in benzoyl chloride (Gerhardt)

Sol in oil of turpentine with evolution of heat

Monophosphorus platinous chloride, PCl_3 , PtCl_2

Deliquescent Sol in H_2O with formation of chloroplathosphoric acid

Similarly decomp by alcohol Abundantly sol in hot benzene, toluene, chloroform, or carbon tetrachloride, and crystallizes on cooling (Schutzenberger, Bull Soc (2) 17 482)

Diphosphorus platinous chloride, 2PCl_3 , PtCl_2

Decomp by H_2O with formation of chloroplathosphoric acid

Similarly decomp by alcohol Sol without decomp in PCl_3 , CCl_4 , CHCl_3 , C_6H_6 , or C_7H_8 (Schutzenberger)

Sol in propyl alcohol with formation of the propyl ether of platinochlorophosphorous acid and HCl (Pomoy, C R 104 364)

Phosphorus diphlatinous chloride, PCl_3 , 2PtCl_2

Sol in alcohol, with formation of ether (PtCl_2)₂ $\text{P}(\text{OC}_2\text{H}_5)_3$ (Cochin, C R 86 1402)

Phosphorus platonic chloride, PCl_3 , PtCl_4

(Schutzenberger)

Phosphorus pentachloride platonic chloride, PCl_3 , PtCl_4 , or $(\text{PCl}_4)_2\text{PtCl}_6$

Decomp at once by H_2O (Baudrimont, A ch (4) 2 47)

Phosphorus pentachloride selenium tetrachloride, $2\text{PCl}_5, \text{SeCl}_4$

Sol in H_2O with decomp (Baudrimont, A ch (4) 2 5)

Phosphorus trichloride ruthenium chloride, $\text{Ru}_2\text{P}_2\text{Cl}_{10}$

Slowly decomp by boiling H_2O

Sol in benzene and CHCl_3

Sl sol in CCl_4 Insol in ligroin (Strecker, B 1909, 42 1774)

Phosphorus tellurium chloride, $\text{PCl}_5, 2\text{TeCl}_4$

Very deliquescent

Sol in H_2O (Metzner, A ch 1898, (7) 15 203)

Phosphorus pentachloride stannic chloride, $\text{PCl}_5, \text{SnCl}_4$

Very deliquescent Sol in much H_2O with evolution of heat, forming SnCl_4 , HCl , and H_3PO_4 , and soon separates out stannic phosphate (Casselmann, A 83 257)

Phosphorus trichloride titanium chloride, $\text{PCl}_3, \text{TiCl}_4$

(Bertrand, Bull Soc (2) 33 565)

Phosphorus pentachloride titanium chloride, $\text{P}_2\text{Cl}_{10}, \text{TiCl}_4$

Deliquescent Decomp by H_2O and alcohol Sol in ether Sl sol in PCl_3 (Tuttschew, A 141 111)

Completely sol in dil acids (Weber)

Phosphorus uranium pentachloride, $\text{PCl}_5, \text{UCl}_5$

Decomp with H_2O

Phosphorus pentachloride zirconium chloride, $\text{PCl}_5, \text{ZrCl}_4$

Decomp by H_2O with pptn of Zr phosphate (Paykull)

Phosphorus trichloride ammonia, $\text{PCl}_3, 5\text{NH}_3$

Insol as such in H_2O , but slowly decomp by boiling H_2O More easily sol with decomp in acids Sol with decomp by boiling with KOH or $\text{NaOH} + \text{Aq}$ (Berzelius)

Phosphorus pentachloride ammonia, $\text{PCl}_5, 5\text{NH}_3$

Properties as $\text{PCl}_3, 5\text{NH}_3$ (Berzelius)
 $\text{PCl}_5, 8\text{NH}_3$ Sl decomp on air (Besson, C R 111 972)

Phosphorus pentachloride tungsten trioxide, $2\text{PCl}_5, \text{WO}_3(?)$

(Persoz and Bloch, C R 28 389)

Phosphorus chlorobromide

See Phosphorus bromochloride

Phosphorus chlorofluoride, PCl_2F_3

Absorbed by H_2O with decomp Absorbed by alcohol or ether (Poulenc, A ch (6) 24 555)

Phosphorus chloriodide, PCl_3I_2

Decomp by moist air or H_2O Sol in CS_2 (Most, B 13 2029)

Phosphorus chloronitride

See Nitrogen chlorophosphide

Phosphorus trifluoride, PF_3

Decomp slowly by H_2O (Moissan, Bull Soc (2) 43 2)

Rapidly absorbed by KOH or $\text{NaOH} + \text{Aq}$, slowly by BaO_2H_2 , and $\text{K}_2\text{CO}_3 + \text{Aq}$ Absorbed by absolute alcohol with decomp (Moissan, C R 99 655)

Phosphorus pentafluoride, PF_5

Fumes on air (Thorpe, A 182 20)

Phosphorus pentafluoride ammonia, $2\text{PF}_5, 5\text{NH}_3$

(Moissan, C R 101 1490)

Phosphorus pentafluoride nitrogen peroxide

Decomp by H_2O (Tassel, C R 110 1264)

Phosphorus fluobromide

See Phosphorus bromofluoride

Phosphorus fluochloride

See Phosphorus chlorofluoride

Phosphorus subiodide, P_2I_4

Sol in dil HNO_3 and in alkalis + Aq (Boulouch, C R 1905, 141 257)

Phosphorus diiodide, P_2I_4

Decomp by H_2O Sol in CS (Corenwinder, A ch (3) 30 242)

0.09 g is sol in 100 ccm liquid H_2S (Antony, C C 1905, I 1692)

Phosphorus triiodide, PI_3

Very deliquescent Decomp in moist air and by H_2O (Corenwinder, A ch (3) 30 242)

Very sol in CS_2

Phosphorus pentaiodide, $\text{PI}_5(?)$

(Hampton, C N 42 180)

Phosphorus iodosulphide

See Phosphorus sulphiodide

Phosphorus nitride, P_3N_5

Very slightly decomp by long boiling with H_2O

Completely insol in any solvent (Stock, B 1903, 36 317)

Phosphorus suboxide, P_4O

Unchanged in dry, gradually oxidized in moist air Insol in H_2O , alcohol, ether, and oils, not acted on by $HCl + Aq$, oxidized by HNO_3 or H_2SO_4 (Marchand, J pr 13 442)

Sl sol in H_2O (le Verrier, A 27 167)

Forms hydrate P_4O , $2H_2O$, which gives up its H_2O when dried

Two modifications (a) decomp slowly by H_2O or alkalies, (b) not decomp by H_2O or alkalies (Reinitzer and Goldschmidt, B 13 847)

Is oxyphosphuretted hydrogen (?), $P_4H(OH)$ (Franke, J pr (2) 35 341)

— H_3P_2O

Insol in all solvents Decomp by H_2O Not attacked by non-oxidizing acids Decomp by dil alkalies (Gautier, C R 76 173)

— P_4HO

Insol in nearly all substances Not attacked by dilute acids, oxidized by ordinary HNO_3 , and conc H_2SO_4 at 200° Attacked by very dil alkaline solutions Perhaps identical with phosphorus suboxide P_4O (Gautier, C R 76 49)

Phosphorus oxide, P_2O

Decomp by heating with H_2O at 100° (Besson, C R 1897, 124 764)

Phosphorus trioxide, P_4O_6 (formerly P_2O_3)

Deliquescent, but very slowly dissolved by cold H_2O to form H_3PO_3 Violently decomp by hot H_2O or alcohol

Sol without decomp in ether, carbon disulphide, benzene, or chloroform (Thorpe and Tutton, Chem Soc 57 545)

Phosphorus tetroxide, P_2O_4

Very deliquescent Sol with evolution of heat in H_2O (Thorpe and Fulton, Chem Soc 49 833)

Phosphorus pentoxide, P_2O_5

Very deliquescent Sol in H_2O with great evolution of heat, forming H_3PO_4

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in acetone (Fidmann, C C 1899, II 1014), (Nannmann, B 1904, 37 4329)

Phosphorus sulphur oxide, $P_2O_5 \cdot 3SO_3 = (PO)_2(SO_4)_3$ (phosphoryl sulphate) (?)

Decomp by H_2O Sol in cold, more sol in warm SO_3 (Weber, B 20 86)

Phosphorus oxy-compounds

See under Phosphoryl compounds

Phosphorus oxysulphide

See Phosphorus sulphoxide

Phosphorus semiselenide, P_4Se

Decomp with H_2O Insol in cold, decomp by boiling $KOH + Aq$ Insol in, but apparently decomp by alcohol and ether Easily sol in CS_2 (Hahn, J pr 93 430)

Phosphorus monoselenide, P_2Se

Stable in dry, decomp in moist air and by H_2O Insol in alcohol and ether Decomp by boiling $KOH + Aq$ CS_2 dissolves out P (Hahn, J pr 93 430)

Sl sol in CS_2 (Gore, Phil Mag (4) 30 414)

Phosphorous sesquiselenide, P_4Se_3

Sol in CCl_4 , sl sol in CS_2 (Meyer, 7 anorg 1902, 30 258)

Phosphorus triselenide, P_2Se_3

Decomp by boiling H_2O and slowly in moist air Easily sol in cold $KOH + Aq$, less easily in $M_2CO_3 + Aq$ Insol in alcohol, ether, and CS_2 (Hahn, J pr 93 430)

Phosphorus pentaselenide, P_2Se_5

Slowly decomp in moist air or by H_2O , easily by $KOH + Aq$ or alcohol Insol in CS_2 Sol in CCl_4 (Hahn, J pr 93 430)

Phosphorus selenides with M_2Se

See M phosphoselenide, under M

Phosphorus semisulphide, $P_4S(?)$

1 *Liquid* Not decomp by, and insol in boiled H_2O Insol in alcohol and ether Sl sol in fats and volatile oils, decomp by alkalies Dissolves P on warming, with separation on cooling Sol in CS_2

2 *Red modification* Not attacked at first by $HNO_3 + Aq$ (sp gr 1.22), but after a time is attacked with the greatest violence Weak acids attack only when hot (Berzelius, A 46 129)

Existence is doubtful (Schulze, B 13 1862, Isambart, C R 96 1628)

Phosphorus monosulphide, $P_2S(?)$

1 *Ordinary* Same properties as phosphorus semisulphide, 1

2 *Red modification* Unchanged by air, H_2O , or alcohol Decomp by conc $KOH + Aq$, not by dilute Sl sol in $NH_4OH + Aq$ (Berzelius, A 46 129)

Existence is doubtful (Schulze, Isambart)

Does not exist (Helff, Z phys Ch 12 206)

Phosphorus sesquisulphide, P_4S_3

Not attacked by cold, slowly by hot H_2O Cold $KOH + Aq$ dissolves with decomp

Oxidized by HNO_3 and aqua regia Sol in alcohol and ether with decomp Sol in CS_2 (100 pts CS_2 dissolve 60 pts P_4S_3), PCl_3 , and PSCl_3 , and in K_2S or $\text{Na}_2\text{S} + \text{Aq}$ (Lemoine, Bull Soc (2) 1 407)

Very sol in CS_2 (Rebs, A 246 367)

Decomp by dil and conc $\text{KOH} + \text{Aq}$ 1 pt P_4S_3 is sol in 9 pts CS_2 at -20° , in 37 pts CS_2 at 0° , in 1 pt CS_2 at 17° , in 40 pts benzene at 17° , in 9 pts benzene at 80° , in 32 pts toluene at 17° , in 65 pts toluene at 111° (Stock, B 1910, 43 156)

Phosphorus trisulphide, P_2S_3

Decomp by water (Kekulé, A 90 310)

Sol in $\text{M}_2\text{CO}_3 + \text{Aq}$ with separation of S Easily sol in KOH , NaOH , $\text{NH}_4\text{OH} + \text{Aq}$ (Berzelius, A 46 129)

Sol in alcohol and ether (Lemoine)

Correct formula is P_4S_6 (Isambert, C R 102 1386)

Extremely sl sol in CS_2 (Rebs, A 246 368)

Existence doubtful (Helff, Z phys Ch 12 210)

Phosphorus sulphide, P_4S_7

Sl sol in CS_2 (Mai, A 265 192)

Slowly decomp by cold, rapidly by hot H_2O

Sol in cold alkalis

1 pt is sol in 3500 pts CS_2 at 17° , in 20,000 pts at 0° (Stock, B 1910, 43 416)

Phosphorus disulphide, P_2S_5 (formerly P_2S_4)

Almost insol in CS_2 (Helff)

Phosphorus pentasulphide, P_2S_5

Very deliquescent Decomp by H_2O Very sol in KOH , NaOH , $\text{NH}_4\text{OH} + \text{Aq}$ Sol in $\text{M}_2\text{CO}_3 + \text{Aq}$ with separation of S at low temp Decomposes alcohol, acetic acid, etc (Kekulé, A 106 331)

Sol in CS_2 (Isambert, C R 102 1386)

Not very sol in CS_2 (Rebs, A 246 367)

Mpt, 290° , bpt, $513-515^\circ$ at 760 mm

Decomp by H_2O

Easily sol in warm $\text{NaOH} + \text{Aq}$

1 pt is sol in 450 pts CS_2 at room temp, in 550 pts at 0° , in 1200 pts at -20° (Stock, B 1910, 43 1225)

Ordinary form

Sol in 195 pts boiling CS_2

New form

Sol in 32 pts CS_2 (Stock, B 1905, 38 2722)

Phosphorus persulphide, P_2S_{12} (?)

Decomp by H_2O , alkalis, etc Consists of S, and mechanically united P (Ramme, B 12 941)

Phosphorus sulphides with M_2S

See M Phosphosulphide, under M

Phosphorus zinc sulphide, ZnP_2S_2

Sol in $\text{HCl} + \text{Aq}$ with separation of P_2S (?) (Berzelius, A 46 150)

Phosphorus trisulphide ammonia, $\text{P}_2\text{S}_3, 2\text{NH}_3$

Decomp by H_2O (Bineau)

Phosphorus pentasulphide ammonia,

$\text{P}_2\text{S}_5, 6\text{NH}_3$

Sol in liquid NH_3 (Stock, B 1903, 36 314)

$\text{P}_2\text{S}_5, 7\text{NH}_3$ (Stock)

Phosphorus sulphobromide

See Thiophosphoryl bromide

Phosphorus sulphochloride

See Thiophosphoryl chloride

Phosphorus sulphiodide, $\text{P}_2\text{S}_3\text{I}$

Sl attacked by cold, rapidly by hot H_2O , violently decomp by fuming HNO_3 Easily sol in CS_2 Sl sol in C_6H_6 or CHCl_3 , and still less in ether or absolute alcohol (Ouvrard, C R 115 1301)

$\text{P}_2\text{S}_2\text{I}_2$ Easily sol in CS_2 More easily than $\text{P}_2\text{S}_3\text{I}_2$ and less than PI_3 (Ouvrard, A ch 1894, (7) 2 224)

$\text{P}_2\text{S}_4\text{I}_2$ Easily decomp (Ouvrard)

$\text{P}_2\text{S}_3\text{I}_2$ Insol in H_2O , sol in warm ether Sl sol in benzene, CHCl_3 , and glacial acetic acid, sol in toluene and xylene (Wolter, Ch Ztg 1907, 31 640)

Easily sol in CS_2 Sl sol in benzene, ether, absolute alcohol and CHCl_3 (Ouvrard, C R 1892, 115 1301)

Phosphorus sulphoxide, $\text{P}_4\text{O}_6\text{S}_4$

Deliquescent Easily sol in H_2O with decomp Sol in 2 pts CS_2 without decomp Sol in benzene with decomp (Thorpe and Tutton, Chem Soc 59 1019)

$\text{P}_2\text{O}_3\text{S}_2$ Slowly decomp by H_2O Violently attacked by fuming HNO_3 (Besson, C R 1897, 124 152)

$\text{P}_2\text{S}_3\text{O}_4$ Deliquescent, sol in H_2O with decomp, insol in most solvents (Stock, B 1913, 46 1382)

Phosphoryl triamide, $\text{PO}(\text{NH}_2)_3$

Insol in boiling H_2O , $\text{KOH} + \text{Aq}$, or dil acids Decomp by long boiling with HCl or $\text{HNO}_3 + \text{Aq}$ More easily decomp with aqua regia Easily sol in warm H_2SO_4 or nitrosulphuric acid (Schiff, A 101 300)

Does not exist (Gladstone, Mente, A 248 238)

Phosphoryl bromide, POBr_3

Not miscible with H_2O , but gradually decomp in contact with it Sol in H_2SO_4 , ether, oil of turpentine (Gladstone, Phil Mag (3) 35 345), in CHCl_3 , CS_2 (Baudrimont, Bull Soc 1861 118)

Easily sol in AsBr_3 (Walden, Z anorg 1902, **29** 374)

Sol in CCl_4 , and in C_6H_6 (Oddo, Chem Soc 1900, **78** (2) 75)

Phosphoryl bromide sulphide

See Thiophosphoryl bromide

Phosphoryl bromochloride, POCl_2Br

Decomp by H_2O (Menschutkin, A **139** 343)

Phosphoryl dibromochloride, POClBr_2

Decomp by H_2O (Geuther, Jena Zeit **10** 130)

Phosphoryl chloride, POCl

Very hygroscopic Sol in H_2O with decomp Insol in most solvents Sol in PCl_3 (Besson, C R 1897, **125** 772)

POCl_3 Decomp by H_2O Not acted on by liquid CO_2 , P , PH_3 , CS_2 , I , Br , Cl , etc Sol in CCl_4 , C_6H_6 , CS_2 , CHCl_3 and ether (Oddo, Gazz ch it 1899, **29** (2) 318, Chem Soc 1900, **78** (2) 74)

Phosphoryl boron chloride, $\text{POCl}_3, \text{BCl}_3$

See Boron phosphoryl chloride

Phosphoryl stannous chloride, $\text{POCl}_3, \text{SnCl}_2$

Deliquescent Decomp by H_2O (Casselmann, A **91** 242)

Phosphoryl stannic chloride, $\text{POCl}_3, \text{SnCl}_4$

Deliquescent Decomp by H_2O (Casselmann)

Phosphoryl titanium chloride, $\text{POCl}_3, \text{TiCl}_4$

Deliquescent, and decomp by H_2O (Weber, Pogg **132** 453)

Pyrophosphoryl chloride, $\text{P}_2\text{O}_5\text{Cl}_4$

Decomp violently with H_2O (Geuther and Mich ulis, B **4** 766)

Very sol in H_2O with decomp, very unstable (Besson, C R 1897, **124** 1100)

Metaphosphoryl chloride, PO_2Cl

Decomp by H_2O (Gustafson)

Does not exist (Mich ulis)

Phosphoryl fluoride, POF_3

Absorbed and decomp at once by H_2O or alcohol (Moissan, C R **102** 1245)

Phosphoryl imidoamide, $\text{PN}_2\text{H}_3\text{O} =$



Insol in H_2O , gradually decomp by boiling with H_2O , more rapidly in presence of KOH Insol in boiling conc $\text{HCl} + \text{Aq}$ Insol in cold, decomp by hot H_2SO_4 Moderately dil $\text{H}_2\text{SO}_4 + \text{Aq}$ dissolves without evolution

of gas Insol in boiling nitric or nitrosulphuric acid (Gerhardt, A ch (3) **20** 255)

Insol in alcohol, oil of turpentine, etc

Phosphoryl iodide, $\text{P}_3\text{I}_5\text{O}_8$ (?)

Sol in H_2O , alcohol, and ether (Burton, Am Ch J **3** 280)

PO_2I_2 (Burton)

Phosphoryl nitride, PON

Insol in H_2O , acids, or alkalis (Gladstone, Chem Soc **2** 121)

Phosphoryl chlorosulphide, $\text{P}_2\text{O}_5\text{SCL}_4$

Slowly decomp in contact with H_2O (Besson, C R 1897, **124** 153)

Phosphoryl thio-compounds

See Thiophosphoryl compounds

Phosphoselenic acid

See Selenophosphoric acid

Phosphoselenide, M

See under M

Phosphosilicic acid

See Silicophosphoric acid

Phosphosilicosovanadicotungstic acid

Ammonium phosphosilicosovanadicotungstate

Exact formula not known (E F Smith, J Am Chem Soc 1903, **25** 1225)

Phosphosilicovanadic acid, $3\text{SiO}_2, 2\text{V}_2\text{O}_5, 2\text{P}_2\text{O}_5 + 6\text{H}_2\text{O}$

Sol in H_2O (Berzelius)

Phosphostannosovanadicotungstic acid

Ammonium phosphostannosovanadicotungstate

Exact formula not known (E F Smith, J Am Chem Soc 1903, **25** 1226)

Phosphosulphide, M

See under M

Phosphosulphuric anhydride, $\text{P}_2\text{O}_5, 3\text{SO}_3$

Very easily decomp (Weber, B **19** 3190)

Phosphotelluric acid

Ammonium phosphotellurate, $2(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, \text{TeO}_3 + 4\text{H}_2\text{O}$

Easily sol in H_2O (Weinland, Z anorg 1901, **28** 61)

$4(\text{NH}_4)_2\text{O}, 3\text{P}_2\text{O}_5, 2\text{TeO}_3 + 11\text{H}_2\text{O}$ Sol in H_2O without decomp (Weinland)

Potassium phosphotellurate, $1.5\text{K}_2\text{O}$, P_2O_5 , TeO_3
 $+17.5\text{H}_2\text{O}$ Very sol in H_2O
 $+4.5\text{H}_2\text{O}$ Ppt (Weinland)

Rubidium phosphotellurate, $1.5\text{Rb}_2\text{O}$, P_2O_5 , $\text{TeO}_3 + 4.5\text{H}_2\text{O}$
 Ppt (Weinland)

Sodium phosphotellurate, $2\text{Na}_2\text{O}$, P_2O_5 , $2\text{TeO}_3 + 9\text{H}_2\text{O}$
 Difficultly sol in cold H_2O (Weinland)

Phosphothorosovanadicotungstic acid

Ammonium phosphothorosovanadicotungstate

Exact formula not known (E F Smith, J Am Chem Soc 1903, 25 1226)

Phosphotitanosovanadicotungstic acid

Ammonium phosphotitanosovanadicotungstate

Formula not known (E F Smith, J Am Chem Soc 1903, 25 1226)

Phosphotungstic acid, P_2O_5 , $12\text{WO}_3 + 42\text{H}_2\text{O}$

Not efflorescent Sol in H_2O , alcohol, and ether (Péchar, C R 110 754)

P_2O_5 , $16\text{WO}_3 + 69\text{H}_2\text{O}$ Very efflorescent Sol in H_2O , alcohol, and ether (Péchar, C R 109 301)

$+x\text{H}_2\text{O} = \text{H}_5\text{PW}_8\text{O}_{28} + x\text{H}_2\text{O}$ (α -phospholutedungstic acid) Known only in aqueous solution (Kehrmann, B 20 1808)

$+48\text{H}_2\text{O} = \text{H}_3\text{PW}_8\text{O}_{28} + 16\text{H}_2\text{O}$ (α anhydrophospholutedungstic acid) Sol in its crystal H_2O by warmth of the hand, sol in less than $\frac{1}{8}$ pt H_2O (Kehrmann)

Correct composition is represented by $\text{H}_3\text{PW}_9\text{O}_{31} + 9\text{H}_2\text{O}$ (Kehrmann, Z anorg 1 422)

P_2O_5 , $20\text{WO}_3 + 8\text{H}_2\text{O}$ Very efflorescent (Gibbs, B 10 1386)

$+19\text{H}_2\text{O} = \text{H}_{11}\text{PW}_{10}\text{O}_{38} + 8\text{H}_2\text{O}$ Sol in H_2O (Scheibler, B 5 801)

$+50$, and $62\text{H}_2\text{O}$ Very efflorescent (Péchar, C R 109 301)

$3\text{H}_2\text{O}$, P_2O_5 , $21\text{WO}_3 + 30\text{H}_2\text{O}$ Efflorescent Sol in H_2O in nearly every proportion

P_2O_5 , $22\text{WO}_3 + 28\text{H}_2\text{O} = \text{H}_3\text{PW}_{11}\text{O}_{43} + 18\text{H}_2\text{O}$ Efflorescent (Scheibler, B 5 801)

Composition is $6\text{H}_2\text{O}$, 22WO_3 , $\text{P}_2\text{O}_5 + 45\text{H}_2\text{O}$ (Gibbs)

H_3PO_4 , $12\text{WO}_3 + 18\text{H}_2\text{O}$, or P_2O_5 , $24\text{WO}_3 + 39\text{H}_2\text{O}$ Sol in H_2O , alcohol and ether (Soboleff, Z anorg 1896, 12 18)

P_2O_5 , $24\text{WO}_3 + 40\text{H}_2\text{O} = 6\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 34\text{H}_2\text{O}$ Very efflorescent Sol in H_2O (Gibbs)
 $+45\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	100 ccm H_2O dissolves g of the cryst acid	Sp gr of the solution
0	16 206	1 1890
22	49 718	1 6913
43	53 64	1 8264
92	86 75	2 5813

(Soboleff, Z anorg 1896, 12 31)

Solubility in ether at t°

t°	100 ccm ether dissolves g of the cryst acid
0	81 196
7 8	85 327
18 2	96 017
24 2	101 348

(Soboleff)

$+53\text{H}_2\text{O} = 6\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 47\text{H}_2\text{O}$ Sol in H_2O (Gibbs)

Sol in ether If an equal vol of ether is placed above a layer of conc aqueous solution of acid, only drops form between the two layers, which sink to bottom, forming a third layer The sp gr of the latter is 1 525 The crystallized acid dissolved in smallest amt ether forms an oil of sp gr = 2 083 Ethereal solution is miscible with alcohol, and also with a large quantity of H_2O (Drechsel, B 20 1452)

$+61\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Proc Am Acad 16 116)

Aluminum ammonium phosphotungstate

See Aluminicophosphotungstate, ammonium

Ammonium phosphotungstate, $3(\text{NH}_4)_2\text{O}$, P_2O_5 , $7\text{WO}_3 + \text{Aq}$

Sl sol in cold H_2O without decomp De-comp by hot H_2O (Kehrmann, Z anorg 1892, 1 438)

$2(\text{NH}_4)_2\text{O}$, P_2O_5 , $12\text{WO}_3 + 5\text{H}_2\text{O}$ Insol in cold H_2O (Péchar, C R 110 754)

$6(\text{NH}_4)_2\text{O}$, P_2O_5 , $16\text{WO}_3 + 10\text{H}_2\text{O}$ Easily sol in hot H_2O (Péchar)

$5(\text{NH}_4)_2\text{O}$, P_2O_5 , $16\text{WO}_3 + x\text{H}_2\text{O} = (\text{NH}_4)_3\text{PW}_8\text{O}_{28} + x\text{H}_2\text{O}$ (Ammonium α phospholutedungstic acid) Sl sol in H_2O (Kehrmann)

$3(\text{NH}_4)_2\text{O}$, P_2O_5 , $16\text{WO}_3 + 16\text{H}_2\text{O} = (\text{NH}_4)_3\text{PW}_8\text{O}_{28} + 8\text{H}_2\text{O}$ (Ammonium α anhydrophospholutedungstic acid) Efflorescent Easily sol in H_2O (Kehrmann)

$5(\text{NH}_4)_2\text{O}$, P_2O_5 , $17\text{WO}_3 + 16\text{H}_2\text{O}$ Very sl sol in cold H_2O (Kehrmann, Z anorg 1894, 6 387)

$3(\text{NH}_4)_2\text{O}$, P_2O_5 , $18\text{WO}_3 + 14\text{H}_2\text{O}$ (Phospholutedungstic acid) (Kehrmann, Z anorg 1893, 4 140)

$3(\text{NH}_4)_2\text{O}$, P_2O_5 , $21\text{WO}_3 + x\text{H}_2\text{O}$ Rather sl sol in cold, easily in hot H_2O and alcohol Insol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ (Kehrmann and Freinkel, B **25** 1972)

$3(\text{NH}_4)_2\text{O}$, $3\text{H}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 18\text{H}_2\text{O}$ Sl sol in cold H_2O (Gibbs)

$3(\text{NH}_4)_2\text{O}$, $3\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 26\text{H}_2\text{O}$ Very sl sol even in hot H_2O (Gibbs, Proc Am Acad **16** 122)

Ammonium barium α anhydropospholuto-
tungstate, $\text{NH}_4\text{BaPW}_8\text{O}_{28} + x\text{H}_2\text{O} =$
 $(\text{NH}_4)_2\text{O}$, 2BaO , P_2O_5 , $16\text{WO}_3 + x\text{H}_2\text{O}$
Sol in H_2O (Kehrmann)

Barium phosphotungstate, 2BaO , P_2O_5 ,
 $12\text{WO}_3 + 15\text{H}_2\text{O}$

Very efflorescent Sol in H_2O , insol in alcohol (Péchar, C R **110** 754)

3BaO , P_2O_5 , $16\text{WO}_3 + x\text{H}_2\text{O} = \text{Ba}_3(\text{PW}_8\text{O}_{28}) + x\text{H}_2\text{O}$ (Barium α -anhydropospholuto- tungstate) Not efflorescent Quite difficultly sol in H_2O (Kehrmann)

2BaO , P_2O_5 , $16\text{WO}_3 + 10\text{H}_2\text{O}$ Efflorescent (Péchar, A ch (6) **22** 240)

2BaO , $6\text{H}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 24\text{H}_2\text{O}$ Sol in H_2O (Gibbs, B **10** 1386)

6BaO , $2\text{H}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 46\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Proc Am Acad **16** 126)

7BaO , P_2O_5 , $22\text{WO}_3 + 59\text{H}_2\text{O}$ Sol in H_2O , (Sprenger, J pr (2) **22** 418)

$+53\text{H}_2\text{O}$ (Kehrmann, B **24** 2335)

4BaO , $2\text{H}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 39\text{H}_2\text{O}$ Sol in H_2O without decomp (Gibbs)

BaO , P_2O_5 , $24\text{WO}_3 + 59\text{H}_2\text{O}$ Sol in H_2O (Sprenger)

2BaO , P_2O_5 , $24\text{WO}_3 + 59\text{H}_2\text{O}$ Sol in H_2O (Sprenger)

3BaO , P_2O_5 , $24\text{WO}_3 + 46\text{H}_2\text{O} = 3\text{BaO}$, $3\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 43\text{H}_2\text{O}$ Easily sol in hot H_2O (Gibbs)

3BaO , P_2O_5 , $24\text{WO}_3 + 48\text{H}_2\text{O}$ Sol in H_2O (Sobokoff, Z anorg **12** 18)

$+58\text{H}_2\text{O}$ Sol in H_2O (Sprenger)

Efflorescent Sl sol in dil $\text{BaCl} + \text{Aq}$ (Kehrmann, Z anorg **1** 423)

Barium potassium phosphotungstate, 5BaO
 $2\text{K}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 48\text{H}_2\text{O}$

Sol in H_2O (Kehrmann and Freinkel, B **25** 1968)

Barium silver phosphotungstate, 4BaO
 $3\text{Ag}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 34\text{H}_2\text{O}$

Very sl sol in H_2O (Kehrmann and Freinkel, B **25** 1966)

Barium sodium phosphotungstate, 2BaO ,
 Na_2O , P_2O_5 , $24\text{WO}_3 + 46\text{H}_2\text{O}$

Sol in H_2O , forming cloudy liquid, which clears up Solution in HCl is not cloudy (Brandhorst and Kraut, A **249** 380)

Calcium phosphotungstate, CaO , $5\text{H}_2\text{O}$,
 16WO_3 , $\text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$

Readily sol in H_2O (Gibbs, Proc Am Acad **16** 130)

2CaO , P_2O_5 , $12\text{WO}_3 + 19\text{H}_2\text{O}$ Efflorescent Insol in alcohol (Péchar, C R **110** 754)

2CaO , P_2O_5 , $20\text{WO}_3 + 22\text{H}_2\text{O}$ Efflorescent (Péchar, A ch (6) **22** 233)

Cadmium phosphotungstate, 2CdO , P_2O_5 ,
 $12\text{WO}_3 + 13\text{H}_2\text{O}$

Sl efflorescent Very sol in H_2O (Péchar, C R **110** 754)

Cupric phosphotungstate, 3CuO , 24WO_3 ,
 $\text{P}_2\text{O}_5 + 58\text{H}_2\text{O}$

Sol in H_2O (Sprenger, J pr (2) **22** 418)

2CuO , P_2O_5 , $12\text{WO}_3 + 11\text{H}_2\text{O}$ Very efflorescent (Péchar, C R **110** 754)

2CuO , P_2O_5 , $20\text{WO}_3 + 13\text{H}_2\text{O}$ Efflorescent (Péchar, A ch (6) **22** 235)

Lead phosphotungstate, 2PbO , P_2O_5 , 12WO_3
 $+6\text{H}_2\text{O}$

Insol in cold, sol in boiling H_2O (Péchar, C R **110** 754)

2PbO , P_2O_5 , $20\text{WO}_3 + 6\text{H}_2\text{O}$ Sol in boiling H_2O (Péchar, A ch (6) **22** 236)

Lithium phosphotungstate, Li_2O , P_2O_5 ,
 $12\text{WO}_3 + 21\text{H}_2\text{O}$

Sol in H_2O (Péchar, C R **110** 754)

Magnesium phosphotungstate, 2MgO , P_2O_5 ,
 12WO_3

Sl efflorescent (Péchar, C R **110** 754)

2MgO , P_2O_5 , $20\text{WO}_3 + 19\text{H}_2\text{O}$ Sl efflorescent (Péchar, A ch (6) **22** 234)

Mercurous phosphotungstate

Insol in dil $\text{HNO}_3 + \text{Aq}$ (Péchar, C R **110** 754)

Potassium phosphotungstate, K_2O , P_2O_5 ,
 $12\text{WO}_3 + 9\text{H}_2\text{O}$

Insol in cold, sl sol in hot H_2O (Péchar, C R **110** 754)

$5\text{K}_2\text{O}$, P_2O_5 , $16\text{WO}_3 + x\text{H}_2\text{O} = \text{K}_5\text{PW}_8\text{O}_{21} + x\text{H}_2\text{O}$ (Potassium phosphotungstate)

Very sl sol in cold H_2O (Gibbs)

Sol in cold dil $\text{HNO}_3 + \text{Aq}$ (Kehrmann)

$3\text{K}_2\text{O}$, P_2O_5 , $16\text{WO}_3 + 16\text{H}_2\text{O} = \text{K}_3\text{PW}_8\text{O}_2 + 8\text{H}_2\text{O}$ (Potassium α -anhydropospholuto- tungstate) Efflorescent Easily sol in H_2O (Kehrmann)

$5\text{K}_2\text{O}$, P_2O_5 , $17\text{WO}_3 + 21$ or $22\text{H}_2\text{O}$ Sl sol in cold H_2O (Kehrmann, Z anorg **1894**, **6** 387)

$3\text{K}_2\text{O}$, P_2O_5 , $18\text{WO}_3 + 28\text{H}_2\text{O}$ (Duparc and Pearce, Bull Soc Min **1895**, **18** 42)

K_2O , $5\text{H}_2\text{O}$, P_2O_5 , $18\text{WO}_3 + 14\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs)

$6\text{K}_2\text{O}$, P_2O_5 , $18\text{WO}_3 + 30\text{H}_2\text{O}$, and $23\text{H}_2\text{O}$

The $23\text{H}_2\text{O}$ salt is more sol in H_2O than the $30\text{H}_2\text{O}$ salt (Gibbs)

$7\text{K}_2\text{O}, \text{H}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 27\text{H}_2\text{O}$ Sol in H_2O (Gibbs, B 10 1386)

$\text{K}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 5\text{H}_2\text{O}$ Nearly insol in H_2O (Péchar, A ch (6) 22 231)

$8\text{K}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 18\text{H}_2\text{O}$ Sl sol in H_2O (Gibbs)

$3\text{K}_2\text{O}, \text{P}_2\text{O}_5, 21\text{WO}_3 + 31\text{H}_2\text{O}$ Easily sol in cold H_2O or alcohol Much less sol in very dil $\text{HCl} + \text{Aq}$ or $\text{KCl} + \text{Aq}$ Decomp by boiling H_2O (Kehrmann and Freinkel, B 25 1971)

$2\text{K}_2\text{O}, 4\text{H}_2\text{O}, \text{P}_2\text{O}_5, 22\text{WO}_3 + 2\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs)

$7\text{K}_2\text{O}, \text{P}_2\text{O}_5, 22\text{WO}_3 + 31\text{H}_2\text{O}$ Easily sol in cold or hot H_2O Insol in alcohol (Kehrmann, B 25 1966)

$3\text{K}_2\text{O}, 3\text{H}_2\text{O}, \text{P}_2\text{O}_5, 24\text{WO}_3 + 8$, and $14\text{H}_2\text{O}$ Sol in a large amount of H_2O with partial decomp (Gibbs, Proc Am Acad 16 120)

Practically insol in H_2O Easily sol in NH_4OH , alkalies, or alkali carbonates + Aq (Kehrmann, B 24 2329)

$6\text{K}_2\text{O}, \text{P}_2\text{O}_5, 24\text{WO}_3 + 18\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Proc Am Acad 15 1)

Potassium lead α -phosphotungstate

Sl sol in H_2O (Kehrmann)

Silver phosphotungstate, $\text{Ag}_2\text{O}, \text{P}_2\text{O}_5, 12\text{WO}_3 + 8\text{H}_2\text{O}$

Ppt Insol in H_2O (Péchar, C R 110 754)

$5\text{Ag}_2\text{O}, \text{P}_2\text{O}_5, 16\text{WO}_3 + x\text{H}_2\text{O} = \text{Ag}_x\text{PW}_8\text{O}_{28} + x\text{H}_2\text{O}$ (Silver α -phosphotungstate)

Ppt (Kehrmann)

$3\text{Ag}_2\text{O}, \text{P}_2\text{O}_5, 16\text{WO}_3 + 16\text{H}_2\text{O} = \text{Ag}_3\text{PW}_8\text{O}_{28} + 8\text{H}_2\text{O}$ (Silver α -anhydroposphotungstate)

Easily sol in H_2O (Kehrmann)

$\text{Ag}_2\text{O}, 24\text{WO}_3, \text{P}_2\text{O}_5 + 60\text{H}_2\text{O}$ Insol in H_2O

$3\text{Ag}_2\text{O}, 24\text{WO}_3, \text{P}_2\text{O}_5 + 58\text{H}_2\text{O}$ Insol in H_2O (Sprenger, J pr (2) 22 418)

Sodium phosphotungstate, $3\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 7\text{WO}_3 + \text{Aq}$

Sol in H_2O (Kehrmann, Z anorg 1 437)

$5\text{Na}_2\text{O}, 11\text{H}_2\text{O}, 2\text{P}_2\text{O}_5, 12\text{WO}_3 + 26\text{H}_2\text{O} = \text{Na}_5\text{H}_{11}\text{P}_2\text{W}_6\text{O}_{31} + 13\text{H}_2\text{O}$ (?) (Scheibler, B 5 801)

$2\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 12\text{WO}_3 + 18\text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (Péchar, C R 110 754)

$5\text{Na}_2\text{O}, 14\text{WO}_3, 2\text{P}_2\text{O}_5 + 42\text{H}_2\text{O}$ Easily sol in H_2O (Gibbs)

$\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3, 2\text{H}_2\text{O} + 19\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Am Ch J 1895, 17 183)

$\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 23\text{H}_2\text{O} = \text{Na}_2\text{O}, 7\text{H}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 16\text{H}_2\text{O}$ Easily sol in H_2O (Gibbs)

+ $25\text{H}_2\text{O}$ Sl efflorescent, very sol in H_2O , insol in alcohol (Péchar, A ch (6) 22 227)

$2\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 10\text{H}_2\text{O}$ Sol in H_2O , insol in alcohol (Péchar)

+ $30\text{H}_2\text{O}$ (P)

$3\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 20\text{WO}_3 + 32\text{H}_2\text{O}$ As above (P)

$2\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 22\text{WO}_3 + 9\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs)

$3\text{Na}_2\text{O}, \text{P}_2\text{O}_5, 24\text{WO}_3 + 22\text{H}_2\text{O}$ Sol in H_2O (Brandhorst and Kraut, A 249 379)

+ $30\text{H}_2\text{O}$ Sol in H_2O (Soboleff, Z anorg 1896, 12 18)

+ $42\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	100 ccm H_2O dissolve g of the cryst salt
0	22 04
22	59 65
93	98 184

(Soboleff, Z anorg 1896, 12 31)

$2\text{Na}_2\text{O}, 4\text{H}_2\text{O}, 24\text{WO}_3, \text{P}_2\text{O}_5 + 23\text{H}_2\text{O}$ Readily sol in H_2O (Gibbs, Proc Am Acad 16 118)

Sp gr at 20° of solutions of $2\text{Na}_2\text{O}, 4\text{H}_2\text{O}, \text{P}_2\text{O}_5, 24\text{WO}_3 + 23\text{H}_2\text{O}$ containing

10 22	20 94	31 13% salt,
1 085	1 190	1 316

42 61	52 92	64 11% salt
1 496	1 702	2 001

or, by calculation, $a = \text{sp gr if } \% \text{ is crystallized salt}$, $b = \text{sp gr if } \% \text{ is anhydrous salt}$

	5	10	15	20	25% salt,
a	1 040	1 084	1 131	1 181	1 237
b	1 044	1 092	1 143	1 199	1 262

	30	35	40	45	50% salt,
a	1 299	1 370	1 449	1 538	1 640
b	1 333	1 414	1 507	1 613	1 734

	55	60	64% salt
a	1 754	1 884	1 998
b	1 872		

(Brandhorst and Kraut, A 249 377)

Strontium phosphotungstate, $2\text{SrO}, \text{P}_2\text{O}_5, 12\text{WO}_3 + 17\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol (Péchar, C R 110 754)

Thallium phosphotungstate, $\text{Tl}_2\text{O}, \text{P}_2\text{O}_5, 12\text{WO}_3 + 4\text{H}_2\text{O}$

Ppt (Péchar, C R 110 754)

Zinc phosphotungstate, $2\text{ZnO}, \text{P}_2\text{O}_5, 12\text{WO}_3 + 7\text{H}_2\text{O}$

Efflorescent (Péchar, C R 110 754)

Monometaphosphotungstic acid

Ammonium monometaphosphotungstate, $(\text{NH}_4)_2\text{O}, 2\text{NH}_4\text{PO}_3, 18\text{WO}_3 + 11\text{H}_2\text{O}$

Sl sol in cold H_2O

Potassium monometaphosphotungstate,
 $3K_2O, 2KPO_3, 24WO_3 + 20H_2O$

Very sl sol in H_2O (Gibbs, Am Ch J 7 319)

Orthometaphosphotungstic acid**Potassium sodium orthometaphosphotungstate,**
 $2K_2O, 4Na_2O, 6NaPO_3, 6K_2PO_4, 22WO_3 + 42H_2O$

Sl sol in H_2O (Gibbs, Am Ch J 7 319)

Pyrophosphotungstic acid**Ammonium manganous sodium pyrophosphotungstate,**
 $5(NH_4)_2O, 6MnO, 2Na_2O, 2P_2O_5, 28WO_3 + 48H_2O$

Very sol in cold and in hot H_2O (Gibbs, Am Ch J 1895, 17 90)

Ammonium sodium pyrophosphotungstate,
 $6(NH_4)_2P_2O_7, 3Na_4P_2O_7, 2(NH_4)_2O, 22WO_3 + 31H_2O$

Nearly insol in cold H_2O or $NH_4OH + Aq$ Sol in a large amount of hot H_2O

Manganous sodium pyrophosphotungstate,
 $6Na_2O, 3MnO, P_2O_5, 14WO_3 + 36H_2O$

Efflorescent in dry air Sol in H_2O and can be recryst therefrom (Gibbs)

Potassium pyrophosphotungstate,
 $9K_4P_2O_7, 22WO_3 + 49H_2O$

Very sl sol in cold H_2O
 $6K_4P_2O_7, 3H_4P_2O_7, 22WO_3, K_2O, H_2O + 42H_2O$ Sl sol in cold Sol in much boiling H_2O (Gibbs, Am Ch J 7 392)

Phosphovanadic acid, $P_2O_5, V_2O_5, 2H_2O + 9H_2O$

Sol in H_2O

Composition is vanadium phosphate $(VO_2)_2H_2PO_4 + 4\frac{1}{2}H_2O$ (Friedheim, B 23 1531)

This is the only "acid" which exists (F) $P_2O_5, V_2O_5 + 14H_2O$ Sol in H_2O , can be recryst from dil $H_3PO_4 + Aq$ (Ditte, C R 102 757)

$3P_2O_5, 2V_2O_5 + 9H_2O$ Sol in H_2O (Ditte) $P_2O_5, 3V_2O_5$ (Berzelius)
 $3H_2O, 7P_2O_5, 6V_2O_5 + 34H_2O$ Sol in H_2O
Decomp by much H_2O into—
 $6H_2O, P_2O_5, 20V_2O_5 + 53H_2O$ Sol in H_2O (Gibbs, Am Ch J 7 209)

Ammonium phosphovanadate, $(NH_4)_2O, P_2O_5, V_2O_5 + H_2O$

Sl sol in cold H_2O (Gibbs, Am Ch J 7 209)
 $+ 3H_2O$ Composition is $(VO_2)(NH_4)HPO_4 + H_2O$ (Friedheim)
 $(NH_4)_2O, P_2O_5, 2V_2O_5 + 7H_2O$ Easily sol in H_2O (Gibbs) Sl sol in H_2O (Fried-

heim) Composition is $(NH_4)_2O, V_2O_5, + 2(VO_2)_2H_2PO_4 + 5H_2O$ (Friedheim)
 $5(NH_4)_2O, 2P_2O_5, 3V_2O_5 + 24H_2O$ Easily sol in H_2O (Ditte, C R 102 1019) Could not be obtained (Friedheim)

$5(NH_4)_2O, 4P_2O_5, 2V_2O_5 + 24H_2O$ As above (Ditte) Could not be obtained (Friedheim)

$7(NH_4)_2O, P_2O_5, 12V_2O_5 + 26H_2O$ Easily sol in H_2O Composition is $2(NH_4)_2HPO_4 + 5(NH_4)_2O, 12V_2O_5 + 25H_2O$ (Friedheim)

Potassium phosphovanadate, $K_2O, P_2O_5, 2V_2O_5 + 7H_2O$

Sl sol in H_2O , decomp thereby to $7K_2O, 12V_2O_5, P_2O_5 + 26H_2O$

Composition is $K_2O, V_2O_5 + 2(VO_2)_2H_2PO_4 + 5H_2O$ (Friedheim)

$3K_2O, 4P_2O_5, 6V_2O_5 + 21H_2O$ Sl sol in H_2O (Gibbs)

$7K_2O, P_2O_5, 12V_2O_5 + 26H_2O$ Easily sol in H_2O Composition is $2K_2HPO_4 + 5K_2O, 12V_2O_5 + 25H_2O$ (Friedheim)

$2K_2O, P_2O_5, V_2O_5$
 $3K_2O, 2P_2O_5, 2V_2O_5 + 5H_2O$
 $13K_2O, 2P_2O_5, 22V_2O_5 + 58H_2O$
 $15K_2O, 2P_2O_5, 25V_2O_5 + 76H_2O$ (Friedheim, Z anorg 1894, 5 446)

$16K_2O, 2P_2O_5, 27V_2O_5 + 57H_2O$

$6K_2O, P_2O_5, 11V_2O_5 + 33H_2O$

$7K_2O, P_2O_5, 13V_2O_5 + 38H_2O$

$4K_2O, P_2O_5, 3V_2O_5 + 3H_2O$

(Friedheim, Z anorg 1894, 5 459-465)

Silver phosphovanadate, $2Ag_2O, P_2O_5, V_2O_5 + 5H_2O$

Sl sol in cold or hot H_2O (Gibbs)

Phosphovanadicotungstic acid**Ammonium phosphovanadicotungstate,**
 $(NH_4)_2O, P_2O_5, V_2O_5, WO_3 + xH_2O$

Ppt (Smith, J Am Chem Soc 1902, 24 577)

$15(NH_4)_2O, 2P_2O_5, 6V_2O_5, 44WO_3 + 106H_2O$ Sol in H_2O Insol in alcohol, ether or benzene (Rogers, J Am Chem Soc 1903, 25 303)

Phosphovanadicovanadiotungstic acid**Ammonium phosphovanadicovanadiotungstate,**
 $14(NH_4)_2O, 2P_2O_5, 3V_2O_5, 7V_2O_3, 27WO_3 + 66H_2O$

Sparingly sol in cold H_2O Sol in hot H_2O (Rogers, J Am Chem Soc 1903, 25 309)

Phosphovanadicozirconosotungstic acid**Ammonium phosphovanadicozirconosotungstate**

Exact formula not known (E, F Smith, J Am Chem Soc 1903, 25 1226)

The $23\text{H}_2\text{O}$ salt is more sol in H_2O than the $30\text{H}_2\text{O}$ salt (Gibbs)

$7\text{K}_2\text{O}$, H_2O , P_2O_5 , $20\text{WO}_3 + 27\text{H}_2\text{O}$ Sol in H_2O (Gibbs, B 10 1386)

K_2O , P_2O_5 , $20\text{WO}_3 + 5\text{H}_2\text{O}$ Nearly insol in H_2O (Péchar, A ch (6) 22 231)

$8\text{K}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 18\text{H}_2\text{O}$ Sl sol in H_2O (Gibbs)

$3\text{K}_2\text{O}$, P_2O_5 , $21\text{WO}_3 + 31\text{H}_2\text{O}$ Easily sol in cold H_2O or alcohol Much less sol in very dil $\text{HCl} + \text{Aq}$ or $\text{KCl} + \text{Aq}$ Decomp by boiling H_2O (Kehrmann and Frenkel, B 25 1971)

$2\text{K}_2\text{O}$, $4\text{H}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 2\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs)

$7\text{K}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 31\text{H}_2\text{O}$ Easily sol in cold or hot H_2O Insol in alcohol (Kehrmann, B 25 1966)

$3\text{K}_2\text{O}$, $3\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 8$, and $14\text{H}_2\text{O}$ Sol in a large amount of H_2O with partial decomp (Gibbs, Proc Am Acad 16 120)

Practically insol in H_2O Easily sol in NH_4OH , alkalies, or alkali carbonates + Aq (Kehrmann, B 24 2329)

$6\text{K}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 18\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Proc Am Acad 15 1)

Potassium lead α -phospholutedungstate

sol in H_2O (Kehrmann)

r phosphotungstate, Ag_2O , P_2O_5 , $12\text{WO}_3 + 8\text{H}_2\text{O}$

Ppt Insol in H_2O (Péchar, C R 110 754)

$5\text{Ag}_2\text{O}$, P_2O_5 , $16\text{WO}_3 + x\text{H}_2\text{O} = \text{Ag}_5\text{PW}_8\text{O}_{29} + x\text{H}_2\text{O}$ (Silver α -phospholutedungstate) Ppt (Kehrmann)

$3\text{Ag}_2\text{O}$, P_2O_5 , $16\text{WO}_3 + 16\text{H}_2\text{O} = \text{Ag}_3\text{PW}_8\text{O}_{28} + 8\text{H}_2\text{O}$ (Silver α -anhydropospholutedungstate) Easily sol in H_2O (Kehrmann)

Ag_2O , 24WO_3 , $\text{P}_2\text{O}_5 + 60\text{H}_2\text{O}$ Insol in H_2O

$3\text{Ag}_2\text{O}$, 24WO_3 , $\text{P}_2\text{O}_5 + 58\text{H}_2\text{O}$ Insol in H_2O (Sprenger, J pr (2) 22 418)

Sodium phosphotungstate, $3\text{Na}_2\text{O}$, P_2O_5 , $7\text{WO}_3 + \text{Aq}$

Sol in H_2O (Kehrmann, Z anorg 1 437)

$5\text{Na}_2\text{O}$, $11\text{H}_2\text{O}$, $2\text{P}_2\text{O}_5$, $12\text{WO}_3 + 26\text{H}_2\text{O} = \text{Na}_5\text{H}_{11}\text{P}_2\text{W}_6\text{O}_{31} + 13\text{H}_2\text{O}$ (?) (Scheibler, B 5 801)

$2\text{Na}_2\text{O}$, P_2O_5 , $12\text{WO}_3 + 18\text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (Péchar, C R 110 754)

$5\text{Na}_2\text{O}$, 14WO_3 , $2\text{P}_2\text{O}_5 + 42\text{H}_2\text{O}$ Easily sol in H_2O (Gibbs)

Na_2O , P_2O_5 , 20WO_3 , $2\text{H}_2\text{O} + 19\text{H}_2\text{O}$ Sol in H_2O (Gibbs, Am Ch J 1895, 17 183)

Na_2O , P_2O_5 , $20\text{WO}_3 + 23\text{H}_2\text{O} = \text{Na}_4\text{O}$, $7\text{H}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 16\text{H}_2\text{O}$ Easily sol in H_2O (Gibbs)

+ $25\text{H}_2\text{O}$ Sl efflorescent, very sol in H_2O , insol in alcohol (Péchar, A ch (6) 22 227)

$2\text{Na}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 10\text{H}_2\text{O}$ Sol in H_2O , insol in alcohol (Péchar)

+ $30\text{H}_2\text{O}$ (P)

$3\text{Na}_2\text{O}$, P_2O_5 , $20\text{WO}_3 + 32\text{H}_2\text{O}$ As above (P)

$2\text{Na}_2\text{O}$, P_2O_5 , $22\text{WO}_3 + 9\text{H}_2\text{O}$ Very sl sol in H_2O (Gibbs)

$3\text{Na}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 22\text{H}_2\text{O}$ Sol in H_2O (Brandhorst and Kraut, A 249 379)

+ $30\text{H}_2\text{O}$ Sol in H_2O (Soboleff, Z anorg 1896, 12 18)

+ $42\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	100 ccm H_2O dissolve g of the cryst salt
0	22 04
22	59 65
93	98 184

(Soboleff, Z anorg 1896, 12 31)

$2\text{Na}_2\text{O}$, $4\text{H}_2\text{O}$, 24WO_3 , $\text{P}_2\text{O}_5 + 23\text{H}_2\text{O}$ Readily sol in H_2O (Gibbs, Proc Am Acad 16 118)

Sp gr at 20° of solutions of $2\text{Na}_2\text{O}$, $4\text{H}_2\text{O}$, P_2O_5 , $24\text{WO}_3 + 23\text{H}_2\text{O}$ containing

10 22 20 94 31 13% salt,
1 085 1 190 1 316

42 61 52 92 64 11% salt
1 496 1 702 2 001

or, by calculation, $a = \text{sp gr if } \% \text{ is crystal-}$
lized salt, $b = \text{sp gr if } \% \text{ is anhydrous salt}$

5 10 15 20 25% salt,
a 1 040 1 084 1 131 1 181 1 237
b 1 044 1 092 1 143 1 199 1 262

30 35 40 45 50% salt,
a 1 299 1 370 1 449 1 538 1 640
b 1 333 1 414 1 507 1 613 1 734

55 60 64% salt
a 1 754 1 884 1 998
b 1 872

(Brandhorst and Kraut, A 249 377)

Strontium phosphotungstate, 2SrO , P_2O_5 , $12\text{WO}_3 + 17\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol (Péchar, C R 110 754)

Thallium phosphotungstate, Tl_2O , P_2O_5 , $12\text{WO}_3 + 4\text{H}_2\text{O}$

Ppt (Péchar, C R 110 754)

Zinc phosphotungstate, 2ZnO , P_2O_5 , $12\text{WO}_3 + 7\text{H}_2\text{O}$

Efflorescent (Péchar, C R 110 754)

Monometaphosphotungstic acid

Ammonium monometaphosphotungstate, $(\text{NH}_4)_2\text{O}$, $2\text{NH}_4\text{PO}_3$, $18\text{WO}_3 + 11\text{H}_2\text{O}$

Sl sol in cold H_2O

Potassium monometaphosphotungstate,
 $3K_2O, 2KPO_3, 24WO_3 + 20H_2O$ Very sl sol in H_2O (Gibbs, Am Ch J 7 319)**Orthometaphosphotungstic acid****Potassium sodium orthometaphosphotungstate,**
 $2K_2O, 4Na_2O, 6Na_3PO_3, 6K_3PO_4, 22WO_3 + 42H_2O$ Sl sol in H_2O (Gibbs, Am Ch J 7 319)**Pyrophosphotungstic acid****Ammonium manganous sodium pyrophosphotungstate,**
 $5(NH_4)_2O, 6MnO, 2Na_2O, 2P_2O_5, 28WO_3 + 48H_2O$ Very sol in cold and in hot H_2O (Gibbs, Am Ch J 1895, 17 90)**Ammonium sodium pyrophosphotungstate,**
 $6(NH_4)_4P_2O_7, 3Na_4P_2O_7, 2(NH_4)_2O, 22WO_3 + 31H_2O$ Nearly insol in cold H_2O or $NH_4OH + Aq$
Sol in a large amount of hot H_2O **Manganous sodium pyrophosphotungstate,**
 $6Na_2O, 3MnO, P_2O_5, 14WO_3 + 36H_2O$ Efflorescent in dry air Sol in H_2O and can be recryst therefrom (Gibbs)**Potassium pyrophosphotungstate,**
 $9K_4P_2O_7, 22WO_3 + 49H_2O$ Very sl sol in cold H_2O
 $6K_4P_2O_7, 3H_4P_2O_7, 22WO_3, K_2O, H_2O + 42H_2O$ Sl sol in cold Sol in much boiling H_2O (Gibbs, Am Ch J 7 392)**Phosphovanadic acid,** $P_2O_5, V_2O_5, 2H_2O + 9H_2O$ Sol in H_2O Composition is vanadium phosphate
(VO) $H_2PO_4 + 4\frac{1}{2}H_2O$ (Friedheim, B 23 1531)This is the only "acid" which exists (F)
 $P_2O_5, V_2O_5 + 14H_2O$ Sol in H_2O , can be recryst from dil $H_3PO_4 + Aq$ (Ditte, C R 102 757) $3P_2O_5, 2V_2O_5 + 9H_2O$ Sol in H_2O (Ditte)
 $P_2O_5, 3V_2O_5$ (Berzelius)
 $3H_2O, 7P_2O_5, 6V_2O_5 + 34H_2O$ Sol in H_2O
Decomp by much H_2O into—
 $6H_2O, P_2O_5, 20V_2O_5 + 53H_2O$ Sol in H_2O (Gibbs, Am Ch J 7 209)**Ammonium phosphovanadate,** $(NH_4)_2O, P_2O_5, V_2O_5 + H_2O$ Sl sol in cold H_2O (Gibbs, Am Ch J 7 209)
 $+ 3H_2O$ Composition is $(VO_2)(NH_4)HPO_4 + H_2O$ (Friedheim)
 $(NH_4)_2O, P_2O_5, 2V_2O_5 + 7H_2O$ Easily sol in H_2O (Gibbs) Sl sol in H_2O (Fried-heim) Composition is $(NH_4)_2O, V_2O_5, + 2(VO_2)H_2PO_4 + 5H_2O$ (Friedheim) $5(NH_4)_2O, 2P_2O_5, 3V_2O_5 + 24H_2O$ Easily sol in H_2O (Ditte, C R 102 1019) Could not be obtained (Friedheim) $5(NH_4)_2O, 4P_2O_5, 2V_2O_5 + 24H_2O$ As above (Ditte) Could not be obtained (Friedheim) $7(NH_4)_2O, P_2O_5, 12V_2O_5 + 26H_2O$ Easily sol in H_2O Composition is $2(NH_4)HPO_4 + 5(NH_4)_2O, 12V_2O_5 + 25H_2O$ (Friedheim)**Potassium phosphovanadate,** $KO, P_2O_5, 2V_2O_5 + 7H_2O$ Sl sol in H_2O , decomp thereby to $7K_2O, 12V_2O_5, P_2O_5 + 26H_2O$ Composition is $K_2O, VO_5 + 2(VO)HPO_4 + 5H_2O$ (Friedheim) $3K_2O, 4P_2O_5, 6V_2O_5 + 21H_2O$ Sl sol in H_2O (Gibbs) $7K_2O, P_2O_5, 12V_2O_5 + 26H_2O$ Easily sol in H_2O Composition is $2K_2HPO_4 + 5K_2O, 12V_2O_5 + 25H_2O$ (Friedheim) $2K_2O, P_2O_5, V_2O_5$ $3K_2O, 2P_2O_5, 2V_2O_5 + 5H_2O$ $13K_2O, 2P_2O_5, 22V_2O_5 + 58H_2O$ $15K_2O, 2P_2O_5, 25V_2O_5 + 76H_2O$

(Friedheim, Z anorg 1894, 5 446)

 $16K_2O, 2P_2O_5, 27V_2O_5 + 57H_2O$ $6K_2O, P_2O_5, 11V_2O_5 + 33H_2O$ $7K_2O, P_2O_5, 13V_2O_5 + 38H_2O$ $4K_2O, P_2O_5, 3V_2O_5 + 3H_2O$

(Friedheim, Z anorg 1894, 5 459-460)

Silver phosphovanadate, $2Ag_2O, P_2O_5, VO_5 + 5H_2O$ Sl sol in cold or hot H_2O (Gibbs)**Phosphovanadicotungstic acid****Ammonium phosphovanadicotungstate,**
 $(NH_4)_2O, P_2O_5, V_2O_5, WO_3 + xH_2O$

Ppt (Smith, J Am Chem Soc 1902, 24 577)

 $15(NH_4)_2O, 2P_2O_5, 6VO_3, 44WO_3 + 106H_2O$ Sol in H_2O Insol in alcohol, ether or benzene (Rogers, J Am Chem Soc 1903, 25 303)**Phosphovanadicovanadiotungstic acid****Ammonium phosphovanadicovanadiotungstate,**
 $14(NH_4)_2O, 2P_2O_5, 3VO_3, 7VO_5, 27WO_3 + 66H_2O$ Sparingly sol in cold H_2O Sol in hot H_2O (Rogers, J Am Chem Soc 1903, 25 309)**Phosphovanadicozirconosotungstic acid****Ammonium phosphovanadicozirconosotungstate**

Exact formula not known (E. F. Smith, J Am Chem Soc 1903, 25 1226)

Phosphovanadico vanadic acid**Ammonium phosphovanadico vanadate,**

$7(\text{NH}_4)_2\text{O}, 2\text{P}_2\text{O}_5, \text{VO}_2, 18\text{V}_2\text{O}_5 + 50\text{H}_2\text{O}$
Sol in H_2O (Gibbs, Am Ch J 7 209)
 $7(\text{NH}_4)_2\text{O}, 14\text{P}_2\text{O}_5, 16\text{V}_2\text{O}_5, 6\text{V}_2\text{O}_5 + 65\text{H}_2\text{O}$
Decomp by boiling with H_2O into—
 $5(\text{NH}_4)_2\text{O}, 10\text{P}_2\text{O}_5, 11\text{VO}_2, \text{V}_2\text{O}_5 + 41\text{H}_2\text{O}$
Sol in H_2O (Gibbs)

Potassium —, $5\text{K}_2\text{O}, 12\text{P}_2\text{O}_5, 12\text{VO}_2, 6\text{V}_2\text{O}_5 + 40\text{H}_2\text{O}$

Decomp by hot H_2O into—
 $7\text{K}_2\text{O}, 12\text{P}_2\text{O}_5, 14\text{VO}_2, 6\text{V}_2\text{O}_5 + 52\text{H}_2\text{O}$
Sol in H_2O (Gibbs)

Sodium —, $4\text{Na}_2\text{O}, 5\text{P}_2\text{O}_5, \text{VO}_2, 4\text{V}_2\text{O}_5 + 37\text{H}_2\text{O}$

Insol in H_2O (Gibbs)

Phosphovanadomolybdic acid**Ammonium phosphovanadomolybdate,**

$7(\text{NH}_4)_2\text{O}, 2\text{P}_2\text{O}_5, \text{V}_2\text{O}_5, 48\text{MoO}_3 + 30\text{H}_2\text{O}$
Sl sol in cold, somewhat more in hot H_2O with partial decomp (Gibbs, Am Ch J 5 391)
 $8(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 8\text{V}_2\text{O}_5, 14\text{MoO}_3 + 50\text{H}_2\text{O}$
Easily sol in hot H_2O without decomp (Gibbs)
 $5(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 2\frac{1}{2}\text{V}_2\text{O}_5, 21\frac{1}{2}\text{MoO}_3 +$
 $\text{V}_2\text{O}_5, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 18\text{MoO}_3 + 45\text{H}_2\text{O}$
 $\text{V}_2\text{O}_5, \text{P}_2\text{O}_5, 5\frac{1}{2}\text{V}_2\text{O}_5, 16\frac{1}{2}\text{MoO}_3 +$

$4\text{V}_2\text{O}_5, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 15\text{MoO}_3 + 50\text{H}_2\text{O}$
All above compounds are sol in H_2O (Blum, J Am Chem Soc 1908, 30 1859)
 $6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 9\text{MoO}_3 + 28\text{H}_2\text{O},$
 $+ 33\text{H}_2\text{O}$, and $+ 37\text{H}_2\text{O}$

Can be recryst from H_2O (Hinsens, Dissert 1904)

$4(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 11\text{MoO}_3 + 37\text{H}_2\text{O}$ (Jacoby, Dissert 1900)
 $6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 11\text{MoO}_3 + 34\text{H}_2\text{O}$
and $+ 43\text{H}_2\text{O}$ (Hinsens, Dissert 1904)
 $8(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 11\text{MoO}_3 + 30\text{H}_2\text{O}$ (Hinsens)

$5(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 12\text{MoO}_3 + 39\text{H}_2\text{O}$
1 cc of solution in H_2O contains 0.2624 g of hydrous salt Sp gr of solution at $18^\circ = 1.0932$ (Lahrmann, Dissert 1904)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 12\text{MoO}_3 + 24\text{H}_2\text{O}$
Nearly insol in cold H_2O (Lahrmann)
 $7(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 6\text{V}_2\text{O}_5, 12\text{MoO}_3 + 33\text{H}_2\text{O}$ (Stamm, Dissert 1905)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 13\text{MoO}_3 + 37\text{H}_2\text{O}$
1 cc of solution sat at 18° contains 0.1543 g hydrous salt and has sp gr = 1.0900 (Toggenburg, Dissert 1902)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 13\text{MoO}_3 + 29\text{H}_2\text{O}$
1 cc solution sat at 18° contains 0.2533 g hydrous salt Sp gr = 1.0797 (Stamm, Dissert 1905)

$+ 32\text{H}_2\text{O}$ (Stamm)

$+ 34\text{H}_2\text{O}$ (Stamm)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 14\text{MoO}_3 + 28\text{H}_2\text{O}$
Easily sol in H_2O with decomp (Toggenburg, Dissert 1902)

$8(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 14\text{MoO}_3 + 24\text{H}_2\text{O}$
Decomp by cold H_2O (Lahrmann, Dissert 1904)

$5(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 5\text{MoO}_3 + 39\text{H}_2\text{O}$
1 cc of solution sat at 18° contains 0.2445 g hydrous salt and has sp gr = 1.144 (Jacoby, Dissert 1900)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 15\text{MoO}_3 + 41\text{H}_2\text{O}$
Extraordinarily easily sol in H_2O (Jacoby)

$7(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 18\text{MoO}_3 + 31\text{H}_2\text{O}$ (Schulz Dissert 1905)

$6(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 18\text{MoO}_3 + 40\text{H}_2\text{O}$ (Schulz)

$8(\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 73\text{MoO}_3 + 26\text{H}_2\text{O} + 33\text{H}_2\text{O}$ (Stamm, Dissert 1905)

Ammonium barium —, $0.5(\text{NH}_4)_2\text{O}, 5\text{BaO}, \text{P}_2\text{O}_5, 6\text{V}_2\text{O}_5, 8\text{MoO}_3 + 38\text{H}_2\text{O}$

(Hinsens, Dissert 1904)

$2(\text{NH}_4)_2\text{O}, 4\text{BaO}, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 10\text{MoO}_3 + 43\text{H}_2\text{O}$ Sl sol in H_2O Decomp on heating (Toggenburg, Dissert 1902)

$(\text{NH}_4)_2\text{O}, 5\text{BaO}, \text{P}_2\text{O}_5, 6\text{V}_2\text{O}_5, 12\text{MoO}_3 + 49\text{H}_2\text{O}$ Less sol in H_2O than NH_4 comp (Jacoby, Dissert 1900)

$2(\text{NH}_4)_2\text{O}, 4\text{BaO}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 13\text{MoO}_3 + 37\text{H}_2\text{O}$ Sol in much hot H_2O with decomp (Toggenburg, Dissert 1902)

$2(\text{NH}_4)_2\text{O}, 4\text{BaO}, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 13\text{MoO}_3 + 46\text{H}_2\text{O}$ (Stamm, Dissert 1905)

$3(\text{NH}_4)_2\text{O}, 4\text{BaO}, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 13\text{MoO}_3 + 40\text{H}_2\text{O}$ (Stamm)

$3(\text{NH}_4)_2\text{O}, 3\text{BaO}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 14\text{MoO}_3 + 39\text{H}_2\text{O}$ (Stamm)

$2(\text{NH}_4)_2\text{O}, 4\text{BaO}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 17\text{MoO}_3 + 46\text{H}_2\text{O}$ (Schulz, Dissert 1905)

Ammonium potassium —, $(\text{NH}_4)_2\text{O}, 6\text{K}_2\text{O}, \text{P}_2\text{O}_5, 6\text{V}_2\text{O}_5, 10\text{MoO}_3 + 38\text{H}_2\text{O}$

(Jacoby, Dissert 1900)

$(\text{NH}_4)_2\text{O}, 6\text{K}_2\text{O}, \text{P}_2\text{O}_5, 7\text{V}_2\text{O}_5, 11\text{MoO}_3 + 25\text{H}_2\text{O}$ (Jacoby, Dissert 1900)

$(\text{NH}_4)_2\text{O}, 5\text{K}_2\text{O}, \text{P}_2\text{O}_5, 6\text{V}_2\text{O}_5, 12\text{MoO}_3 + 46\text{H}_2\text{O}$ (Jacoby)

$(\text{NH}_4)_2\text{O}, 5\text{K}_2\text{O}, \text{P}_2\text{O}_5, 5\text{V}_2\text{O}_5, 13\text{MoO}_3 + 25\text{H}_2\text{O} + 29\text{H}_2\text{O} + 30\text{H}_2\text{O}$ Sl sol in cold, more easily in hot H_2O (Stamm, Dissert 1905)

$5\text{K}_2\text{O}, (\text{NH}_4)_2\text{O}, \text{P}_2\text{O}_5, 4\text{V}_2\text{O}_5, 14\text{MoO}_3 + 31\text{H}_2\text{O}$ (Stamm)

$(\text{NH}_4)_2\text{O}, 4\text{K}_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 15\text{MoO}_3 + 36\text{H}_2\text{O}$ (Jacoby, Dissert 1900)

$(\text{NH}_4)_2\text{O}, 6\text{K}_2\text{O}, \text{P}_2\text{O}_5, 3\text{V}_2\text{O}_5, 18\text{MoO}_3 + 43\text{H}_2\text{O}$ (Schulz, Dissert 1905)

$5(\text{NH}_4)_2\text{O}, \text{K}_2\text{O}, \text{P}_2\text{O}_5, 2\text{V}_2\text{O}_5, 20\text{MoO}_3 + 52\text{H}_2\text{O}$ (Schulz)

Barium potassium —, $2\text{BaO}, 2\text{K}_2\text{O}, \text{P}_2\text{O}_5, 2\text{V}_2\text{O}_5, 18\text{MoO}_3 + 47\text{H}_2\text{O}$

(Schulz, Dissert 1905)

Potassium phosphovanadomolybdate, $7K_2O$, P_2O_5 , $7V_2O_5$, $9MoO_3 + 25H_2O$
(Hinsen, Dissert 1904)
 $5K_2O$, P_2O_5 , $2V_2O_5$, $20MoO_3 + 53H_2O$
(Schulz, Dissert 1905)

Phosphovanadotungstic acid

Ammonium phosphovanadotungstate,
 $10(NH_4)_2O$, $3P_2O_5$, V_2O_5 , $60WO_3 + 60H_2O$

Nearly insol in cold, sl sol in hot H_2O
Sol in $(NH_4)_2HPO_4 + Aq$, and in $NH_4OH + Aq$

$5(NH_4)_2O$, P_2O_5 , $3V_2O_5$, $16WO_3 + 37H_2O$
Easily sol in H_2O (Gibbs, Am Ch J 5 391)

$13(NH_4)_2O$, $2P_2O_5$, $8V_2O_5$, $34WO_3 + 86H_2O$
Very sol in cold and hot H_2O

nsol in alcohol, ether, CS_2 , benzene and nitrobenzene (Rogers, J Am Chem Soc 1903, 25 299)

Barium —, $18BaO$, $3P_2O_5$, $2V_2O_5$, $60WO_3 + 144H_2O$

Easily sol in hot H_2O with decomp (Gibbs, Am Ch J 5 391)

Potassium —, $3K_2O$, P_2O_5 , V_2O_5 , $7WO_3 + 11H_2O$

Sol in H_2O
 $8K_2O$, $3P_2O_5$, $4V_2O_5$, $18WO_3 + 23H_2O$ Sol in hot H_2O with decomp into preceding salt (Gibbs, Am Ch J 5 391)

Silver —, $13Ag_2O$, $2P_2O_5$, $8V_2O_5$, $33WO_3 + 41H_2O$

Somewhat sol in H_2O
Completely sol in H_2O containing a few drops HNO_3 (Rogers, J Am Chem Soc 1903, 25 302)

Phosphovanadovanadicotungstic acid

Barium phosphovanadovanadicotungstate,
 $18BaO$, $3P_2O_5$, V_2O_5 , VO , $60WO_3 + 150H_2O$

Sl sol in cold, easily sol in hot H_2O (Gibbs, Am Ch J 5 391)

Phosphuretted hydrogen

See Hydrogen phosphide

Platbromonitrous acid

Potassium platbromonitrite, $K_2Pt(NO_2)_4Br_2$

Rather sl sol in H_2O (Blomstrand, J pr (2) 3 214)

Sol in about 40 pts cold, and 20 pts boiling H_2O Insol in alcohol Sl sol in KBr or $KNO_3 + Aq$ (Vèzes, A ch (6) 29 198)

$K_2Pt(NO_2)_3Br_3$ Sol in about 5 pts warm H_2O with decomp (Vèzes)

$K_2Pt(NO_2)_2Br_4$ Sol in less than 5 pts H_2O with decomp (Vèzes)

Platichloronitrous acid

Potassium platichloronitrite, $K_2Pt(NO_2)_4Cl_2$

Rather sl sol in H_2O (Blomstrand J pr (2) 3 214)

Sol in 40 pts cold, and 20 pts boiling H_2O Insol in alcohol Sl sol in KCl or $KNO_3 + Aq$ (Vèzes, A ch (6) 29 183)

$K_2Pt(NO_2)_3Cl_3$ Very sol in H_2O (Vèzes)

$K_2Pt(NO_2)_2Cl_4 + H_2O$ Sol in H_2O with decomp (Vèzes)

Platiodonitrous acid

Potassium platiodonitrite, $K_2Pt(NO_2)_2I_4$

Sl sol in cold, more easily in hot H_2O , decomp by boiling (Vèze, A ch (6) 29 207)

$K_2Pt(NO_2)_2I_5$ As above (Vèzes)

Platin-

See also Platin-, plat-, p at-, and platos-

Platindiamine compounds

See Chloro-, bromo-, hydroxylo-, iodo-, nitrate-, nitrito-, sulphato-, etc, platindiamine compounds

Platindiamine carbonate,

$Pt(NH_3)_6(CO_3)_2$

Ppt Sol in $NaOH + Aq$ (Geddes, J pr (2) 26 257)

— chloride $Pt(NH_3)_6Cl_4$

Sol in hot H_2O (Gerdes)

— chloroplatinate, $Pt(NH_3)_4Cl_4$, $PtCl_4 + 2H_2O$

Very sl sol in H_2O (Gerdes)

— nitrate, $Pt(NH_3)_4(NO_3)_4$

Easily sol in H_2O , sl sol in $HNO_3 + Aq$ (Gerdes)

— sulphate, $Pt(NH_3)_4(SO_4) + H_2O$

Nearly insol in H_2O (Gerdes)

Tetraplatinamine iodide, $Pt_4(NH_3)_8I_{10}$

(Blomstrand, B 16 1469)

Octoplatinamine iodide, $Pt_8(NH_3)_{16}I_{18}$

(Blomstrand)

Platinic acid

Barium platinate, basic (?), $3BaO$, $2PtO$

Insol in $HC H_3O + Aq$, easily sol in $HCl + Aq$ (Roussin)

Barium platinate, BaPtO₃

(Rousseau, C R 109 144)
 +H₂O Insol in dil HNO₃+Aq, sol in warm HCl+Aq (Topsoe, B 3 464)
 +4H₂O Very sl sol in H₂O, BaO₂H₂, or NaOH+Aq Easily sol in dil acids, except HC₂H₃O₂, in which it is insol in the cold, but decomp on heating (Topsoe, l c)
 Composition is 3BaPtO₃, BaCl₂, PtCl₂O+4H₂O (?) (Johannsen, A 155 204)

Calcium platinate chloride (?), 2Ca₂Pt₂O₅Cl₂+7H₂O (?)

"Herschel's precipitate"
 Easily sol in HCl+Aq, and in HNO₃+Aq, if freshly pptd (Herschel)
 Very sol in HNO₃+Aq (Weiss and Dobereiner, A 14 252)
 Composition is CaPtO₃, PtCl₂O, CaO+7H₂O (?) (Johannsen, A 155 204)

Potassium platinate

Sol in H₂O (Berzelius)
 K₂O, PtO₂+3H₂O Very sol in H₂O (Blondel, A ch 1905, (8) 6 90)
 K₂Pt(OH)₆ Sol in H₂O, insol in alcohol (Bellucci, Z anorg 1905, 44 173)

Sodium platinate, Na₂O, 3PtO₂+6H₂O

Dil acids dissolve out Na₂O and leave PtO₂
 Sol in HNO₃+Aq (Dobereiner, Pogg 28 180)
 Na₂O, PtO₂+3H₂O Sol in H₂O (Blondel)

Metaplatinic acid, 5PtO₂, 5H₂O

Insol, in H₂O (Blondel, A ch 1905, (8) 6 103)

Sodium metaplatinate, Na₂O, 5PtO₂+9H₂O

Insol in H₂O (Blondel)

Platinumolybdic acid, 4H₂O, PtO₂, 10MoO₃
(Gibbs)

Ammonium platinumolybdate,
 8MoO₃, 2PtO₂, 3(NH₄)₂O+12H₂O
 4MoO₃, 2PtO₂, 2(NH₄)₂O+19H₂O
 Sol in hot H₂O (Gibbs, Am Ch J 1895, 17 50-52)

Potassium platinumolybdate,
 60MoO₃, PtO₂, 10K₂O+40H₂O
 Sol in hot H₂O (Gibbs)

Silver platinumolybdate

Sodium platinumolybdate, 4Na₂O, PtO₂,
 10 MoO₃+29H₂O
 Sol in H₂O (Gibbs, Sill Am J (3) 14 61)

Platinungstic acid

Ammonium platinungstate, 4(NH₄)₂O, PtO₂,
 10WO₃+12H₂O
 Sol in H₂O (Gibbs, B 10 1384)

Potassium platinungstate, 4K₂O, PtO₂,
 10WO₃+9H₂O
 Sol in H₂O (Gibbs)

Sodium platinungstate, 4Na₂O, PtO₂,
10WO₃+25H₂O

Sol in H₂O (Gibbs)
 5Na₂O, 7WO₃, 2PtO₂+35H₂O Sol in H₂O (Gibbs)
 Is double salt 3Na₂O, 7WO₃+2Na₂PtO₃ (Rosenheim, B 24 2397)
 10WO₃, PtO₂, 4Na₂O+23H₂O
 10WO₃, PtO₂, 6Na₂O+28H₂O
 20WO₃, PtO₂, 9Na₂O+58H₂O
 30WO₃, 2PtO₂, 15Na₂O+89H₂O
 30WO₃, PtO₂, 12Na₂O+72H₂O
 All are sol in boiling H₂O (Gibbs, Am Ch J 1895, 17 74-80)

Platino-

See also Plato—

Platinochlorophosphoric acid

See Chloroplatinophosphoric acid

Platinocyanhydric acid, H₂Pt(CN)₄

Deliquescent Very sol in H₂O, alcohol, and ether

Ammonium platinocyanide, (NH₄)₂Pt(CN)₄,
+3H₂O.

Very sol in H₂O
 +2H₂O Sol in 1 pt H₂O, and still more easily in alcohol
 +H₂O

Ammonium hydroxylamine platinocyanide,
 NH₄(NH₄O)Pt(CN)₄+3½H₂O
 Sol in H₂O (Scholz, M Ch 1 900)

Ammonium magnesium platinocyanide,
 (NH₄)₂Mg[Pt(CN)₄]+6H₂O

Barium platinocyanide, BaPt(CN)₄+4H₂O

Sol in 33 pts H₂O at 16°, and in much less at 100° Sol in alcohol

Barium potassium platinocyanide,
 BaK₂[Pt(CN)₄]₂
 Sol in H₂O

Barium rubidium platinocyanide,
 BaRb₂[Pt(CN)₄]₂
 Sol in H₂O

Cadmium platinocyanide , $\text{CdPt}(\text{CN})_4$ Ppt Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Martius, A 117 376) $\text{CdPt}(\text{CN})_4, 2\text{NH}_3 + \text{H}_2\text{O}$ (M)	Lanthanum platinocyanide , $\text{La}_2[\text{Pt}(\text{CN})_4]_3 + 18\text{H}_2\text{O}$ Easily sol in H_2O (Cleve)
Calcium platinocyanide , $\text{CaPt}(\text{CN})_4 + 5\text{H}_2\text{O}$ Very sol in H_2O	Magnesium platinocyanide , $\text{MgPt}(\text{CN})_4 + 2\text{H}_2\text{O}$ Solubility in H_2O 100 g of the sat solution contain at 96 4° 100° 44 33 43 96 g $\text{MgPt}(\text{CN})_4$ (Buxhoevden, Z anorg 1897, 15 325)
Calcium potassium platinocyanide , $\text{CaK}_2[\text{Pt}(\text{CN})_4]_2$ Sol in H_2O	$+ 4\text{H}_2\text{O}$ Solubility in H_2O 100 g of the sat solution contain at 42 2° 46 3° 48 7° 55° 40 21 39 79 40 75 40 02 g $\text{MgPt}(\text{CN})_4$, 58 1° 69° 77 8° 87 4° 42 01 43 48 44 88 45 52 g $\text{MgPt}(\text{CN})_4$,
Cerium platinocyanide , $\text{Ce}_2[\text{Pt}(\text{CN})_4]_3 + 18\text{H}_2\text{O}$ Sol in H_2O	90° 93° 45 59 45 04 g $\text{MgPt}(\text{CN})_4$ (Buxhoevden)
Cobaltous platinocyanide ammonia , $\text{CoPt}(\text{CN})_4, 2\text{NH}_3$ Insol in H_2O , but sol in hot $\text{NH}_4\text{OH} + \text{Aq}$	$+ 7\text{H}_2\text{O}$ Sol in 3 4 pts H_2O at 16° Easily sol in alcohol and ether Solubility in H_2O 100 g of the sat solution contain at — 4 12° + 0 5° 5 5° 18 0° 24 9 26 33 28 07 31 23 g $\text{MgPt}(\text{CN})_4$,
Cupric platinocyanide , $\text{CuPt}(\text{CN})_4 + x\text{H}_2\text{O}$ Ppt	36 6° 45 0° 46 2° 38 36 41 32 41 96 g $\text{MgPt}(\text{CN})_4$ (Buxhoevden)
Cupric platinocyanide ammonia , $\text{CuPt}(\text{CN})_4, 2\text{NH}_3 + \text{H}_2\text{O}$ $\text{CuPt}(\text{CN})_4, 4\text{NH}_3$ Sol in H_2O , alcohol, and ether	Magnesium potassium platinocyanide , $\text{MgK}_2[\text{Pt}(\text{CN})_4]_2 + 7\text{H}_2\text{O}$ Sol in H_2O
Didymium platinocyanide , $\text{Dy}_2[\text{Pt}(\text{CN})_4]_3 + 18\text{H}_2\text{O}$ Efflorescent in dry air Sol in H_2O (Cleve)	Mercuric platinocyanide , $\text{HgPt}(\text{CN})_4$ Ppt
Dysprosium platinocyanide , $\text{Dy}_2[\text{Pt}(\text{CN})_4]_3 + 21\text{H}_2\text{O}$ Easily sol in H_2O (Jantsch, B 1911, 44 1277)	Mercuric platinocyanide nitrate , $5\text{HgPt}(\text{CN})_4, \text{Hg}(\text{NO}_3)_2 + 10\text{H}_2\text{O}$ Ppt
Erbium platinocyanide , $\text{Er}_2[\text{Pt}(\text{CN})_4]_3 + 21\text{H}_2\text{O}$ Sol in H_2O (Cleve)	Nickel platinocyanide ammonia , $\text{NiPt}(\text{CN})_4, 2\text{NH}_3 + \text{H}_2\text{O}$
Gadolinium platinocyanide , $2\text{Gd}(\text{CN})_3, 3\text{Pt}(\text{CN})_2 + 18\text{H}_2\text{O}$ Sol in H_2O , decomp in the air (Benedicks, Z anorg 1900, 22 405)	Potassium platinocyanide , $\text{K Pt}(\text{CN})_4 + 3\text{H}_2\text{O}$ Extremely efflorescent Sl sol in cold, easily in hot H_2O (Willm, B 19 950) Sol in alcohol and ether
Glucinum platinocyanide , $\text{GlPt}(\text{CN})_4$ (Toczynski, Dissert 1871)	Potassium sodium platinocyanide , $\text{K Pt}(\text{CN})_4, \text{Na}_2\text{Pt}(\text{CN})_4 + 6\text{H}_2\text{O}$ Sol in H_2O (Willm, B 19 950)
Hydroxylamine platinocyanide , $(\text{NH}_4\text{O})_2\text{Pt}(\text{CN})_4 + 2\text{H}_2\text{O}$ Deliquescent Very sol in H_2O (Scholz)	Praseodymium platinocyanide , $2\text{Pr}(\text{CN})_3, 3\text{Pt}(\text{CN})_2$ Sol in H_2O (Von Scheele, Z anorg 1898, 18 355)
Hydroxylamine lithium platinocyanide , $(\text{NH}_4\text{O})\text{LiPt}(\text{CN})_4 + 3\text{H}_2\text{O}$ Sol in H_2O	
Indium platinocyanide , $\text{In}_2[\text{Pt}(\text{CN})_4]_3 + 2\text{H}_2\text{O}$ Hydroscopic, sol in H_2O (Renz, B 1901, 34 2765)	

Samarium platnocyamide, $\text{Sm}_2[\text{Pt}(\text{CN})_4]_3$
 $+18\text{H}_2\text{O}$
 Sol in H_2O (Cleve)

Scandium platnocyamide, $\text{Sc}_2[\text{Pt}(\text{CN})_4]_3$
 $+21\text{H}_2\text{O}$
 Sol in H_2O and insol in alcohol, when
 boiled in alcohol it is dehydrated (Crookes,
 Phil Trans 1910, 210 A, 368)
 $+21\text{H}_2\text{O}$ (Orlow, Ch Z 1912, 36 1407)

Silver platnocyamide, $\text{Ag}_2\text{Pt}(\text{CN})_4$
 Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Silver platnocyamide ammonia, $\text{Ag}_3\text{Pt}(\text{CN})_4$,
 2NH_3
 Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Silver platnocyamide bromide
See Bromoplatnocyamide, silver

Silver platnocyamide chloride
See Chloroplatnocyamide, silver

Silver platnocyamide iodide
See Iodplatnocyamide, silver

Sodium platnocyamide, $\text{Na}_2\text{Pt}(\text{CN})_4 + 3\text{H}_2\text{O}$
 Easily sol in H_2O (Willm, Z anorg 4
 298)
 Sol in alcohol

Strontium platnocyamide, $\text{SrPt}(\text{CN})_4 + 5\text{H}_2\text{O}$
 Sol in H_2O

Thallous platnocyamide, $\text{Tl}_2\text{Pt}(\text{CN})_4$
 Nearly insol in cold, sl sol in hot H_2O
 (Friswell, Chem Soc 24 461)

Thallous platnocyamide carbonate,
 $2\text{Tl}_2\text{Pt}(\text{CN})_4, \text{Tl}_2\text{CO}_3$
 Nearly insol in cold H_2O (F)

Thorium platnocyamide, $\text{Th}[\text{Pt}(\text{CN})_4]_2 +$
 $16\text{H}_2\text{O}$
 Somewhat difficultly sol in cold, easily in
 hot H_2O (Cleve, Sv V A H Bih 2 No 6)

Uranyl platnocyamide, $(\text{UO}_2)\text{Pt}(\text{CN})_4 + x\text{H}_2\text{O}$
 Sol in H_2O (Levy, Chem Soc 1908, 93
 1459)

Ytterbium platnocyamide, $2\text{Yb}(\text{CN})_3$,
 $3\text{Pt}(\text{CN})_2 + 18\text{H}_2\text{O}$
 Easily sol in H_2O (Cleve, Z anorg 1902,
 32 139)

Yttrium platnocyamide, $\text{Y}_2[\text{Pt}(\text{CN})_4]_3 +$
 $21\text{H}_2\text{O}$
 Easily sol in H_2O Insol in absolute
 alcohol (Cleve and Hoglund)

Zinc platnocyamide ammonia, $\text{ZnPt}(\text{CN})_4$,
 $2\text{NH}_3 + \text{H}_2\text{O}$

Platinonitrous acid
See Platonitrous acid

Platinoplatnocyanyhydric acid, $\text{HPt}(\text{CN})_4$,
 $+x\text{H}_2\text{O}$
 Sol in H_2O (Levy, Chem Soc 1912, 101
 1093)

Platinoselenocyanyhydric acid

Potassium platinoselenocyamide,
 $\text{K}_3\text{Pt}(\text{SeCN})_6$
 Sol in H_2O and alcohol (Clarke and Dud-
 ley, B 1878, 11 1325)

Platinoselenostannic acid
See under Selenostannate, platinum

Platinososulphocyanyhydric acid,
 $\text{H}_2\text{Pt}(\text{SCN})_4$
 Known only in aqueous solution

Potassium platinososulphocyamide,
 $\text{K}_2\text{Pt}(\text{SCN})_4$
 Permanent Sol in 25 pts H_2O at 15° ,
 and more readily at higher temp Very sol
 in warm alcohol

Silver —, $\text{Ag}_2\text{Pt}(\text{SCN})_4$
 Insol in H_2O Sol in $\text{KSCN} + \text{Aq}$, and
 partly sol in $\text{NH}_4\text{OH} + \text{Aq}$

Platinosulphocyanyhydric acid,
 $\text{H}_2\text{Pt}(\text{SCN})_6$
 Known only in aqueous, and alcoholic solu-
 tions

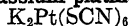
Ammonium platinosulphocyamide,
 $(\text{NH}_4)_2\text{Pt}(\text{SCN})_6$
 Sol in H_2O and alcohol

Barium —, $\text{BaPt}(\text{SCN})_4$
 Sol in H_2O and alcohol

Ferrous —, $\text{FePt}(\text{SCN})_6$
 Insol in H_2O or alcohol Not attacked by
 dil H_2SO_4 , HCl , or $\text{HNO}_3 + \text{Aq}$

Lead —, $\text{PbPt}(\text{SCN})_6$
 Sl sol in cold, decomp by hot H_2O Sol
 in alcohol
 $\text{PbPt}(\text{SCN})_6$, PbO Insol in H_2O or alco-
 hol Sol in acetic or nitric acids

Mercurous —, $\text{Hg}_2\text{Pt}(\text{SCN})_6$
 Ppt Insol in H_2O

Potassium platinosulphocyanide,

Sol in 12 pts H_2O at 60° Much more easily in boiling H_2O , and still more easily in hot alcohol

+ $2H_2O$ (Miolati and Bellucci, Gazz Ch it 1900, 30, II 592)

Silver —, $Ag_2Pt(SCN)_6$

Insol in H_2O or $K_2Pt(SCN)_6 + Aq$ Sol in cold $NH_4OH + Aq$ and in $KCN + Aq$

Sodium —, $Na_2Pt(SCN)_6$

Sol in H_2O and alcohol

Platinosulphostannic acid

See under Sulphostannate, platinum

Platinosulphurous acid

See Platinosulphurous acid

Platinum, Pt

Not attacked by H_2O , H_2SO_4 , HCl , or $HNO_3 + Aq$ Slowly sol in aqua regia, or a mixture of HBr and HNO_3 , but much less easily than Au

Precipitated Pt is remarkably sol in $HCl + Aq$ in presence of air (Wilm, B 1881, 14 636)

Pure Pt foil is attacked by fuming HCl under influence of light, but not in the dark (Berthelot, C R 1904, 138 1297)

Dil $HCl + Aq$ dissolves 10–15% Pt from active Pt black (Wohler, B 1903, 36 3482)

Conc HNO_3 oxidizes Pt black, Pt sponge, less easily, sheet Pt, slightly (Wohler, Dissert 1901)

Pt in presence of Hg is more or less sol in conc HNO_3 (Tarugi, Gazz ch it 1903, 33, II 171)

Pt vessels are attacked by evaporating HNO_3 therein (Jaunek and Meyer, Z anorg 1913, 83 71)

Sl sol in conc H_2SO_4 containing small amounts of nitrogen oxides (Schueren-Kestner C R 86 1052)

Pt black, pptd by formic acid, is easily sol in boiling H_2SO_4 (Dcville and Stas, Paris, 1878)

Thin sheet Pt is attacked by boiling H_2SO_4 containing K_2SO_4 , 1 sq cm loses 0.01 g in 1 hour and velocity of the reaction is not accelerated by addition of HNO_3 Pt black is completely dissolved under the above conditions in 50 hours (Delépine, C R 1905, 141 1013)

Further data on solubility of Pt in H_2SO_4 are given by Delépine (C R 1906, 142 631)

95% H_2SO_4 dissolves 0.04 g Pt from commercial Pt at 250 – 260° in 28 hours (Conroy, J Soc Chem Ind 1903, 22 465)

See also Quenessen (Bull Soc 1906, (3) 35 620)

0.0038 g is dissolved by 10 cc of boiling H_2SO_4 (McCoy, Eighth Inter Cong App Chem 1912 2)

$HCl + HNO_3$, so long as they are sufficiently dil or the temperature is so low that they cannot react on each other, have no action on Pt Addition of Cl does not bring about reaction, but a few drops of KNO_3 or $N_2O_5 + Aq$ bring about an immediate reaction (Millon) Slowly sol in $HI + Aq$ (Deville, C R 42 896)

Conc H_3PO_4 attacks Pt when heated in presence of air, but not in its absence (Hüttner, Z anorg 1908, 59 216)

Pt dissolves easily in most acids when they contain H_2O_2 (Fairley, B 1875, 8 1600)

Slowly sol in boiling $FeCl_3 + Aq$ (Saint-Pierre, C R 54 1077)

$FeCl_3$ in acid solution is without influence on Pt (Marie, C R 1908, 146 476)

Pt is completely insol in $KCN + Aq$ (Rossler, Z Chem 1866 175)

Pt is attacked by boiling conc $KCN + Aq$ (Deville and Debray, C R 82 241)

Solubility of Pt in 10% $KCN + Aq$ is very small at ord temp (1.4 mg in 8 days) but is considerably greater in boiling conc $KCN + Aq$ (71.5 mg in 5 hours) (Glaser, Z Elektrochem 1903, 9 15)

Pt foil is dissolved in boiling $KCN + Aq$ (0.030 g for 1 cc in 1 hour) Insol in cold $KCN + Aq$ (Brochet and Petit, C R 1904, C R 138 1255)

Sol in $RbCl_4I + Aq$ (Erdmann, Arch Pharm 1894, 232 30)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Platinum ammonium compounds

Data published since the first edition of this work have not been included in this edition

See —

Platosamine comps, $Pt < \begin{matrix} NH_3 \\ NH_3 \\ R \end{matrix}$

Platocumudamine comps,
 $Pt < \begin{matrix} NH_3 \\ NH_3 \\ R \end{matrix}$

Platomonothamine comps,
 $Pt < \begin{matrix} NH_3 \\ NH_3 \\ R \end{matrix}$

Platodiamine comps $Pt < \begin{matrix} NH_3 & NH_3 \\ NH_3 & NH_3 \\ R \end{matrix}$

Platosocumamine comps, $Pt < \begin{matrix} NH_3 \\ R \end{matrix}$

Diplatodiamine comps,
 $Pt - NH_3, NH_3, R$

Bromoplatinamine comps,
 $B_{12}Pt < \begin{matrix} NH_3 \\ NH_3 \\ R \end{matrix}$

Chloroplatinamine comps,
 $Cl_2Pt < \begin{matrix} NH_3 \\ NH_3 \\ R \end{matrix}$

Chloronitratoplatinamine comps,
 $\text{Cl}(\text{NO}_2)\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Iodoplatinamine comps, $\text{I}_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Hydroxyloplatinamine comps,
 $(\text{OH})_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Nitratoplatinamine comps,
 $(\text{NO}_3)_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Sulphatoplatinamine comps,
 $\text{SO}_4\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Bromoplatinsemidiamine comps,
 $\text{Br}_2\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Bromonitritoplatinsemidiamine comps,
 $\text{Br}_2(\text{NO}_2)\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Chloroplatinsemidiamine comps,
 $\text{Cl}_2\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Chlorohydroxylonitritosemidiamine comps,
 $\text{Cl}(\text{OH})(\text{NO}_2)\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Chloronitritoplatinsemidiamine comps,
 $\text{Cl}_2(\text{NO}_2)\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Iodoplatinsemidiamine comps,
 $\text{I}_2\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Hydroxylosemidiamine comps,
 $(\text{OH})_3\text{PtNH}_3 \text{ NH}_3 \text{ R}$
Bromoplatinmonodiamine comps,
 $\text{Br}_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Bromohydroxyloplatinmonodiamine comps
 $\text{Br}(\text{OH})\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Chloroplatinmonodiamine comps,
 $\text{Cl}_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Iodonitratoplatinmonodiamine comps,
 $\text{I}(\text{NO}_3)\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Hydroxyloplatinmonodiamine comps,
 $(\text{OH})_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Bromoplatindiamine comps,
 $\text{Br}_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ NH}_3 \text{ R} \end{smallmatrix}$
Bromocarbonatoplatindiamine comps,
 $\text{CO}_3 > [\text{Pt}(\text{NH}_3)_2\text{R}]_2$
Bromochloroplatindiamine comps,
 $\text{BrClPt}(\text{NH}_3)_4\text{R}_2$
Bromohydroxyloplatinndiamine comps,
 $\text{Br}(\text{OH})\text{Pt}(\text{NH}_3)_4\text{R}_2$
Bromonitratoplatindiamine comps,
 $\text{Br}(\text{NO}_3)\text{Pt}(\text{NH}_3)_4\text{R}_2$
Bromosulphatoplatindiamine comps,
 $\text{Br}_2(\text{SO}_4)[\text{Pt}(\text{NH}_3)_4\text{R}_2]_2$
Carbonatochloroplatindiamine comps,
 $(\text{CO}_3)\text{Cl}_2[\text{Pt}(\text{NH}_3)_4\text{R}_2]_2$
Carbonatonitratoplatindiamine comps,
 $(\text{CO}_3)(\text{NO}_3)_2[\text{Pt}(\text{NH}_3)_4\text{R}_2]_2$

Chloroplatindiamine comps,
 $\text{Cl}_2\text{Pt}(\text{NH}_3)_4\text{R}_2$
Chlorohydroxyloplatinndiamine comps,
 $\text{Cl}(\text{OH})(\text{NH}_3)_4\text{R}_2$
Chloroiodoplatindiamine comps,
 $\text{ClIPt}(\text{NH}_3)_4\text{R}_2$
Chloronitratoplatindiamine comps,
 $\text{Cl}(\text{NO}_3)\text{Pt}(\text{NH}_3)_4\text{R}_2$
Hydroxyloplatinndiamine comps,
 $(\text{OH})_2\text{Pt}(\text{NH}_3)_4\text{R}_2$
Hydroxylonitratodiamine comps,
 $(\text{OH})(\text{NO}_3)\text{Pt}(\text{NH}_3)_4\text{R}_2$
Hydroxylosulphatodiamine comps,
 $(\text{OH})_2\text{SO}_4[\text{Pt}(\text{NH}_3)_4\text{R}_2]_2$
Iodoplatindiamine comps, $\text{I}_2\text{Pt}(\text{NH}_3)_4\text{R}_2$
Iodonitritoplatindiamine comps,
 $\text{I}(\text{NO}_2)\text{Pt}(\text{NH}_3)_4\text{R}_2$
Nitratoplatindiamine comps,
 $(\text{NO}_3)_2\text{Pt}(\text{NH}_3)_4\text{R}_2$
Nitritoplatindiamine comps,
 $(\text{NO}_2)_2\text{Pt}(\text{NH}_3)_4\text{R}_2$
Sulphatoplatindiamine comps,
 $(\text{SO}_4)\text{Pt}(\text{NH}_3)_4\text{R}_2$
Iododiplatinamine comps,
 $\text{I}-\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \\ \text{NH}_3 \text{ R} \end{smallmatrix}$
Bromodiplatinndiamine comps,
 $\text{Br}-\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ NH}_3 \text{ R} \end{smallmatrix}$
Hydroxyloplatinndiamine comps,
 $(\text{OH})_2\text{Pt}_2(\text{NH}_3)_8\text{R}_4$
Iododiplatinndiamine comps,
 $\text{I}_2\text{Pt}_2(\text{NH}_3)_8\text{R}_4$
Nitratodiplatinndiamine comps,
 $(\text{NO}_3)_2\text{Pt}_2(\text{NH}_3)_8\text{R}_4$
Platintriamine comps,
 $\text{R}_2\text{Pt} < \begin{smallmatrix} \text{NH}_3 \text{ NH}_3 \text{ NH}_3 \text{ R} \\ \text{NH}_3 \text{ NH}_3 \text{ NH}_3 \text{ R} \end{smallmatrix}$
Tetraplatinamine comps, $\text{Pt}_4(\text{NH}_3)_{16}\text{R}_{10}$
Octoplatinamine comps, $\text{Pt}_8(\text{NH}_3)_{16}\text{R}_{18}$

Platinum antimonide, PtSb_2
 (Christoffe, 1863)

Platinum arsenide, Pt_3As_2
 (Tivoli, Gazz ch it 14 487)
 PtAs_2 Min *Sperrylite* SI attacked by
 aqua regia (Wells, Sill Am J (3) 37 67)

Platinum arsenic hydroxide (?), PtAsOH

Insol in, and slowly decom by H_2O and
 alcohol Easily decom by $\text{HCl} + \text{Aq}$, not
 attacked by $\text{HNO}_3 + \text{Aq}$ Sol in aqua regia,
 not attacked by cold conc H_2SO_4 , but de-
 comp on heating (Tivoli, Gazz ch it 14
 487)

Platinum potassium azoumide

Ppt Explodes violently even in aq solution (Curtius, J pr 1898, (2) 58 304)

Platinum boride, Pt₂B₂

Very slowly sol in aqua regia (Martius, A 109 79)

Platinous bromide, PtBr₂

Insol in H₂O Sol in HBr+Aq Sl sol in KBr+Aq (Topsoe, J B 1868 274)

Platinic bromide, PtBr₄

Not deliquescent, sol in H₂O (Meyer and Zühln, B 13 404)

Sl sol in H₂O 100 g PtBr₄+Aq sat at 20° contain 0.41 g PtBr₄ (Halberstadt, B 17 2962)

Easily sol in HBr+Aq, sl sol in HC₂H₃O₂+Aq Sol in considerable amount in K or NH₄ oxalate+Aq

Very sl sol in alcohol or ether, also in glycerine (Halberstadt)

Platinic hydrogen bromide

See Bromoplatinic acid

Platinous bromide carbonyl

See Carbonyl platinous bromide

Platinic bromide with MBr

See Bromoplatinate, M

Platinum carbide, PtC₂

Hot aqua regia dissolves out nearly all the Pt (Zeise, J pr 20 209)

Platinum carbon disulphide, PtCS₂

See Platinum sulphocarbide

Platinum monochloride, PtCl+zH₂O

Easily sol in HCl, mod sol in hot dil H₂SO₄ without decomp (Sonstadt, Proc Chem Soc 1898, 14 179)

Platinous chloride, PtCl₂

Insol in H₂O, conc H₂SO₄, or HNO₃ Sol in hot HCl+Aq with exclusion of air (Berzelius)

Insol in alcohol or ether, sol in NH₄OH+Aq (Raewsky, A ch (3) 22 280) Sol in aqua regia with formation of PtCl₄

Insol in cold conc KI+Aq, but sol when heated (Lassaigne, A ch (2) 51 117)

Sl sol in liquid NH₃ (Gore, Am Ch J 1898, 20 828)

Insol in acetone (Eidmann, C C 1899, II 1014)

Platinum trichloride, PtCl₃

Sl sol in cold, more sol in hot H₂O

Partially hydrolyzed by boiling with H₂O

Insol in cold conc HCl Sol in hot conc HCl with decomp

Sol in KI+Aq (Wöhler, B 1909, 42 3961)

Platinic chloride, PtCl₄

Not deliquescent Very sol in H₂O (Pulinger, Chem Soc 61 420)

Sp gr of aqueous solution containing

5	10	15	20	25	% PtCl ₄ ,
1 046	1 097	1 153	1 214	1 285	
30	35	40	45	50	% PtCl ₄
1 362	1 450	1 546	1 666	1 785	

(Precht, Z anal 18 512)

Insol in conc H₂SO₄ (Dumas)

Sl sol in liquid NH₃ (Gore, Am Ch J 1898, 20 828)

Sol in alcohol and ether, sol in anhydrous acetone (Zeise, A 33 34)

Insol in ether (Willstätter, B 1903, 36 1830)

Sl sol in methyl acetate (Naumann, B 1909, 42 3790)

Sol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4328)

+H₂O Sol in H₂O (Gutbier and Heinrich, Z anorg 1913, 81 378)

+4H₂O Sol in H₂O (Pigeon, C R 1891, 112 792)

+5H₂O Not deliquescent Sol in H₂O or HCl+Aq

Composition is probably H₂PtCl₄O+4H₂O (Norton, J pr 110 469)

+7H₂O Sol in H₂O (Pigeon)

+8H₂O (Blondel, A Ch 1905, (8) 6 98)

Platinic thallium chloride, Tl₃Pt₂Cl₈H₆O₄

Ppt, insol in H₂O (Miolati, Z anorg 1900, 22 460)

Platinous hydrogen chloride

See Chloroplatinous acid

Platinic hydrogen chloride

See Chloroplatinic acid

Platinous chloride with MCl

See Chloroplatinite, M

Platinic chloride with MCl

See Chloroplatinate, M

Platinous phosphorus chloride

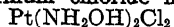
See Phosphorus platinous chloride

Platinic phosphorus chloride

See Phosphorus platinic chloride

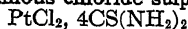
Platinous chloride carbonyl

See Carbonyl platinous chloride

Platinum chloride hydroxylamine,

Ppt Sol in alcohol and in ether Decomp in aq solution

$\text{Pt}(\text{NH}_2\text{OH})_2\text{Cl}_2$ Sol in H_2O (Uhlenhuth, A 1900, 311 124)

Platinous chloride sulphocarbamide,

Sl sol in H_2O , very sol in hot H_2O , decomp sl on boiling (Kurnakow, J pr 1894, (2) 60 483)

Platinum chloriodide, PtCl_2I_2

Very deliquescent (Kammerer, A 148 329)

PtClI_2 Insol in H_2O Sl sol in alcohol Sol in $\text{KOH} + \text{Aq}$, from which it is pptd by H_2SO_4 (Mather, Sil Am J 27 257)

Platinum chloronitride, PtNCl

(Alexander, C C 1887 1254)

Platinous cyanide with MCN

See Platinocyanide, M

Platinous fluoride, $\text{PtF}_2(?)$

Insol in H_2O (Moissan, A ch (6) 24 287)

Platmic fluoride, PtF_4

Deliquescent Sol in H_2O with immediate decomp into PtO_4H_4 and HF (Moissan, C R 109 807)

Platinous hydroxide, PtO_2H_2

Sol in HCl , HBr , and $\text{H}_2\text{SO}_3 + \text{Aq}$, but not in other oxygen acids Decomp by boiling $\text{KOH} + \text{Aq}$ (Thomsen, J pr (2) 16 344)

When freshly pptd, is insol in dil HNO_3 and H_2SO_4 , and in $\text{HC}_2\text{H}_3\text{O}_2$, sol in conc HNO_3 and H_2SO_4 Very sol in H_2SO_3 and HCl After drying, is insol in conc HNO_3 and H_2SO_4 (Wohler, Z anorg 1904, 40 424)

Platmic hydroxide, $\text{Pt}(\text{OH})_4$

Easily sol in dil acids and in $\text{NaOH} + \text{Aq}$ (Topsoe, J B 1870 386)

Nearly insol in acetic acid (Dobereiner) Insol in all acids except conc HCl and aqua regia (Wohler, Z anorg 1904, 40 438)

+ H_2O Ppt (Prost, Bull Soc (2) 44 256) Insol in $2\text{N}-\text{H}_2\text{SO}_4$ and dil $\text{HNO}_3 + \text{Aq}$, mod sol in conc HNO_3 , H_2SO_4 , $2\text{N}-\text{HCl}$ and $\text{NaOH} + \text{Aq}$ (Wohler)

+ $2\text{H}_2\text{O}$ Easily sol in dil acids, even acetic acid, and in $\text{NaOH} + \text{Aq}$ (Topsoe)

Insol in acetic acid, sl sol in $2\text{N}-\text{H}_2\text{SO}_4$ and HNO_3 , easily sol in HCl , and $\text{NaOH} + \text{Aq}$ (Wohler)

Platinoplatmic hydroxide, $\text{Pt}_3\text{O}_4, 9\text{H}_2\text{O}$

Ppt (Prost, Bull Soc (2) 46 156)

$\text{Pt}_5\text{O}_{11}, 11\text{H}_2\text{O}$ Ppt (Prost)

Platinum hydroxylamine comps

See—

Platodioxamine comps, $\text{Pt}(\text{NH}_3\text{O})_4\text{R}_2$

Platosoxamine comps, $\text{Pt}(\text{NH}_3\text{O})_2\text{R}_2$

Platosoxamine-amine comps,

$\text{Pt}(\text{NH}_3\text{O})_2\text{NH}_3\text{R}_2$

Platinous iodide, PtI_2

Insol in H_2O , acids, or alcohol (Lassaigne, A ch (2) 51 113)

Difficultly sol in $\text{Na}_2\text{SO}_3 + \text{Aq}$ (Topsoe) Gradually decomp by hot $\text{HI} + \text{Aq}$ of 1.038 sp gr, also by hot $\text{KI} + \text{Aq}$, PtI_4 being dissolved out and Pt left behind Not attacked by conc H_2SO_4 , HCl , or $\text{HNO}_3 + \text{Aq}$, but gradually decomp by KOH or $\text{NaOH} + \text{Aq}$ (Lassaigne)

Insol in acetone (Eidmann, C C 1889, II 1014)

Platmic iodide, PtI_4

Insol in H_2O Sol in NaOH or $\text{Na}_2\text{CO}_3 + \text{Aq}$, H_2SO_3 , or $\text{Na}_2\text{SO}_3 + \text{Aq}$ Sol in $\text{HI} + \text{Aq}$ or alkali iodides + Aq Sol in alcohol, with partial decomp Not attacked by acids (Lassaigne, A ch (2) 51 122)

Very sol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Sol in alcohol (Belluci, C C 1902, I 625)

Platmic iodide with MI

See Iodoplatinate, M

Platinum nitride chloride, PtNCl

See Platinum chloronitride

Platinous oxide, PtO

Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ Insol in other acids (Dobereiner, Pogg 28 183)

Sol in conc H_2SO_4 , easily in conc $\text{HCl} + \text{Aq}$ (Storer's Dict.)

Very sl sol in $\text{HCl} + \text{Aq}$ Sl sol in aqua regia (Wohler, B 1903, 36 3482)

Platmic oxide, PtO_2

Insol in acids, even aqua regia (Wohler, Dissert, 1901)

Platinum trioxide, PtO_3

Unattacked by dil H_2SO_4 , HNO_3 or acetic acid Sol with decomp in dil and conc HCl , conc H_2SO_4 or conc HNO_3 (Wohler, B 1909, 42 3329)

Platinum sesquioxide, $\text{Pt}_2\text{O}_3 + x\text{H}_2\text{O}$

Insol in dil sol in conc H_2SO_4 Sl sol in hot dil HNO_3 Sol in HCl Sol in conc alkali hydroxides + Aq (Wohler, B 1909, 42 3964)

+2H₂O Insol in HNO₃ and H₂SO₄
 Insol in alkalis +Aq, also cold dil HCl+Aq
 Sol in aqua regia (Dudley, Am Ch J
 1902, 28 66)
 +5H₂O (Delépine, Bull Soc 1910, (4)
 7 103)

Platinoplatinic oxide, Pt₂O₄

Not attacked by long boiling with HCl,
 HNO₃, or aqua regia (Jorgensen, J pr (2)
 16 344)

Does not exist (Wohler, Z anorg 1904,
 40 450)

Platinum oxychloride, 3PtO, PtCl₂ (?)

Sol in HCl, and in KOH+Aq (Kane,
 Phil Trans 1842 298)

PtCl₂(OH)₂=H₂PtCl₂O₂ (Jorgensen, J
 pr (2) 16 345)

5PtO₂, 2HCl+9H₂O Insol in cold H₂O,
 decomp on boiling Slowly sol in HCl
 (Blondel, A ch, 1905, (8) 6 100)

Platinum oxysulphide, PtOS

See Platinum sulphhydroxide

Platinum phosphide, PtP₂

Insol in HCl+Aq Sol in aqua regia
 (Schrotter, W A B 1849 303)

PtP₂H₂ Insol in H₂O, and HCl+Aq
 (Cavazzi, Gazz ch it 13 324)

PtP Insol in aqua regia (Clark and
 Joslin)

Pt₂P Sol in aqua regia (Clark and
 Joslin)

Pt₃P₅ Partially sol in aqua regia (Clark
 and Joslin, C N 48 385)

Attacked very slowly by aqua regia
 Rapidly sol in molten alkalis (Granger,
 C N 1893, 77 229)

Completely sol in aqua regia if the action
 sufficiently prolonged, though with difficulty
 (Granger, C R 1893, 123 1285)

Platinum diselenide, PtSe₂

As PtS₂ (Minozzi, Chem Soc 1909, 96
 (2) 899)

Platinum triselenide, PtSe₃

Sl attacked by hot conc HNO₃, not at-
 tacked by cold conc HCl+Aq, slowly sol
 in aqua regia and Cl₂+Aq, insol in CS₂

Platinum silicide, Pt₂Si

Sol in hot aqua regia (Vigouroux, C R
 1896, 123 117)

Pt₂Si₂ (Colson, C R 94 27)

Pt₂Si₃ Slowly decomp by aqua regia
 (Guyard, Bull Soc (2) 25 511)

PtSi Insol in HNO₃, H₂SO₄, HF, and HCl
 Completely sol in aqua regia (Lebeau and
 Novitzky, C R 1907, 145 241)

Platinum sulphhydroxide, PtOS+H₂O= PtS(OH)₂

Decomp easily into—

$$\text{Pt}_2\text{S}_2\text{O}_3\text{H}_2 = \frac{\text{PtS}}{\text{PtS}} \frac{\text{OH}}{\text{OH}} = \text{PtOS} + \frac{1}{2}\text{H}_2\text{O} \quad \text{H}_2\text{O}$$

 cannot be removed without decomposing the
 compound (v Meyer, J pr (2) 15 1)

Platinous sulphide, PtS

Not attacked by boiling acids, aqua regia,
 or KOH+Aq (Böttger, J pr 2 274)

Sol in large excess of (NH₄)₂S+Aq

Platinoplatinic sulphide, Pt₂S₃

Not attacked by HCl or HNO₃+Aq, and
 only slowly by aqua regia (Schneider, Pogg
 138 607)

Platinic sulphide, PtS₂

Anhydrous Aqua regia attacks sl, other
 acids not at all (Davy)

Hydrated Insol in HCl+Aq, sl sol in
 boiling HNO₃+Aq Sol in aqua regia
 (Fresenius) Sol in alkali sulphides, hydrates
 and carbonates+Aq (Berzelius) Very sl
 sol in (NH₄)₂S+Aq (Claus)

Insol in NH₄Cl, or NH₄NO₃+Aq

1 pt PtCl₄ in 100 pts H₂O+25 pts HCl is
 not pptd by H₂S (Reinsch)

Difficultly sol in alkali sulphhydroxides+
 Aq, but more easily in presence of SnS,
 Sb₂S₃, As₂S₃, or SnS₂ (Ribau, C R 85
 283)

Platinum sulphide, PtS₆, or Tetraplatinum sulphoplatinate, 4PtS, PtS₂

Decomp on moist air, but not attacked by
 acids (Schneider, J pr (2) 7 214)

Platinum sulphides with M₂S

See Sulphoplatinate, M

Platinum sulphocarbide, PtC₂S₂

Not attacked by hot HCl, HNO₃+Aq,
 slightly by aqua regia (Schutzenberger,
 C R 111 391)

Platinum telluride, PtTe

Decomp by fused oxidizing agents, slowly
 sol in conc HNO₃ (Roessler, Z anorg
 1897 15 407)

Platinum ditelluride, PtTe₂

Insol in boiling conc KOH+Aq, slowly
 sol in boiling conc HNO₃, decomp by fused
 oxidizing agents (Roessler)

Plato-

See also Platino-

Platoamidosulphonic acid

Potassium platoamidosulphonate,
 $K_2Pt(NH_2SO_3)_4 + 2H_2O$

Very sl sol in cold H_2O , sol in 10 pts boiling H_2O (Ramberg and St Kahlenberg, B 1912, 45 1514)

Sodium —, $Na_2(Pt(NH_2SO_3)_4 + 4H_2O$

Very sol in H_2O (Ramberg and St Kahlenberg)

Platodiamine bromide, $Pt[(NH_3)_2Br]_2 + 3H_2O$

Easily sol in H_2O (Cleve)

— **carbonate,** $Pt(N_2H_5)_2CO_3 + H_2O$

Sol in H_2O (Peyrone, A 51 14)

$Pt(N_2H_5CO_2H)_2$ Sl sol in, but decomp by boiling with H_2O into—

— **sesquicarbonate**

More sol than preceding salt (Reiset, C R 11 711)

— **chloride,** $Pt[(NH_3)_2Cl]_2 + H_2O$

"Reiset's first chloride" Sol in 4 pts H_2O at 16 $^{\circ}5'$, and in less hot H_2O Insol in alcohol or ether (Reiset, A ch (3) 11 419)

As sol in $NH_4Cl + Aq$ as in H_2O , insol in absolute alcohol, sl sol in dil alcohol, very sol in dil $HCl + Aq$ (Peyrone, A ch (3) 12 196)

— **cuprous chloride,** $Pt(NH_3)_4Cl_2$, Cu_2Cl_2

Sol in H_2O , and pptd from H_2O solution by alcohol (Buckton)

— **cupric chloride,** $Pt(NH_3)_4Cl_2$, $CuCl_2$

Sl sol in cold, decomp by hot H_2O into $Pt(NH_3)_4Cl_2$, Cu_2Cl_2 (Buckton, Chem Soc 5 218)

Nearly insol in H_2O , easily sol in warm $HCl + Aq$, insol in alcohol (Millon and Commaile, C R 57 822)

Millon and Commaile's salt is $Cu(NH_3)_4Cl_2$, $PtCl_2$, cuprammonium chloroplatinite

— **lead chloride,** $Pt(NH_3)_4Cl_2$, $PbCl_2$

Sol in hot, much less in cold H_2O Insol in $HCl + Aq$ or alcohol (Buckton, Chem Soc 5 213)

— **mercuric chloride,** $Pt(NH_3)_4Cl_2$, $HgCl_2$

Easily sol in hot H_2O , much less in cold Insol in $HCl + Aq$ (Buckton)

— **zinc chloride,** $Pt(NH_3)_4Cl_2$, $ZnCl_2$

Easily sol in hot H_2O Insol in alcohol (Buckton)

Platodiamine chloroplatinate, $Pt(NH_3)_4Cl_2$, $PtCl_4$

Ppt Insol in H_2O (Cossa, Gazz ch it 17 1)

— **chloroplatinite,** $Pt(NH_3)_4Cl_2$, $PtCl_2$

(Magnus' green salt) Insol in, and not decomp by H_2O , $HCl + Aq$, or alcohol (Magnus)

Slowly sol in boiling $NH_4OH + Aq$ and in conc NH_4 salts + Aq (Reiset, A ch (3) 11 427)

Almost as sol in $(NH_4)_2CO_3 + Aq$ as in $NH_4OH + Aq$ Sol in hot $PtCl_4 + Aq$ (Reiset)

Not decomp by boiling KOH , dil HCl , or $H_2SO_4 + Aq$, but easily by $HNO_3 + Aq$ (Gros, A 27 245)

— **chromate,** $Pt(NH_3)_4CrO_4$

Scarcely sol in H_2O (Cleve)

— **dichromate,** $Pt(NH_3)_4Cr_2O_7$

Sl sol in H_2O Insol in alcohol Sol in $KOH + Aq$ (Buckton, Chem Soc 5 213)

— **platinous cyanide,** $Pt(NH_3)_4(CN)_2$, $Pt(CN)_2$

Sl sol in cold, easily in boiling H_2O , sol in KOH , HCl , and dil $H_2SO_4 + Aq$ without decomp, but conc H_2SO_4 decomposes

— **potassium ferrocyanide,**

$Pt(NH_3)_4K_2[Fe(CN)_6]_2 + 3H_2O$

— **hydroxide,** $Pt[(NH_3)_2OH]_2$

"Reiset's first base" Easily sol in H_2O Sl sol in alcohol

— **iodide,** $Pt[(NH_3)_2I]_2$

Sl sol in cold, more easily in hot H_2O , but slowly decomp on boiling (Reiset)

— **nitrate,** $Pt[(NH_3)_2NO_3]_2$

Sol in about 10 pts boiling H_2O Insol or but sl sol in alcohol (Peyrone, A ch (3) 12 203)

— **nitrate sulphate,** $[Pt(NH_3)_4NO_3]_2SO_4$, $Pt(NH_3)_4SO_4$

Very easily sol in H_2O (Carlgren, Sv V A F 47 310)

— **nitrite,** $Pt[(NH_3)_2NO_2]_2 + 2H_2O$

Efflorescent Very sol in hot or cold H_2O Insol in 90% alcohol (Lang)

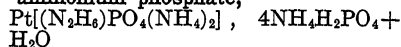
— **platinous nitrite,** $Pt[(NH_3)_2NO_2]_2$, $Pt(NO_2)_2$

Scarcely sol in cold, somewhat more easily in hot H_2O Not attacked by cold dil acids More sol in $NH_4OH + Aq$ than in H_2O (Lang)

Platodiamine phosphate, $\text{Pt}(\text{N}_2\text{H}_6)_2\text{HPO}_4 + \text{H}_2\text{O}$

Rather difficultly sol in cold, and very easily in hot H_2O (Cleve)

— **ammonium phosphate**,



Very easily sol in H_2O with decomp into—
 $\text{Pt}(\text{N}_2\text{H}_6\text{H}_2\text{PO}_4)_2, 2\text{NH}_4\text{H}_2\text{PO}_4 + 9\text{H}_2\text{O}$

Much more sol in H_2O than the preceding comp (Cleve)

— **sulphate**, $\text{Pt}(\text{NH}_3)_4\text{SO}_4$

Sol in 32 pts H_2O at 16.5° , more easily when heated (Reiset)

Sol in 50–60 pts boiling H_2O , less in cold H_2O , insol in alcohol (Cleve)

— **sulphate, acid**, $\text{Pt}[(\text{NH}_3)_2\text{SO}_4\text{H}]_2 + \text{H}_2\text{O}$

Decomp by H_2O or alcohol into neutral salt

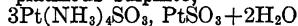
$3\text{Pt}(\text{NH}_3)_4\text{SO}_4, \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$ Sol in H_2O (Cleve)

— **sulphite**, $\text{Pt}(\text{NH}_3)_4\text{SO}_3$

Nearly insol in cold H_2O (Birnbaum, A 152 143)

$\text{Pt}[(\text{NH}_3)_2\text{SO}_3\text{H}]_2 + 2\text{H}_2\text{O}$ Ppt Sol in $\text{HCl} + \text{Aq}$ (Cleve)

— **platinous sulphite**,



Scarcely sol in cold H_2O , sol in 190 pts H_2O at 100° Easily sol in warm $\text{HCl} + \text{Aq}$ with decomp (Peyrone)

$+ 4\text{H}_2\text{O}$ (Carlgren, Sv V A F 47 308)
 $2\text{Pt}(\text{NH}_3)_4\text{SO}_3, \text{PtSO}_3, \text{H}_2\text{SO}_3$ Insol in cold H_2O or alcohol Scarcely sol in hot H_2O (Peyrone)

— **sulphocyanide**, $\text{Pt}(\text{NH}_3)_4(\text{CNS})_2 + \text{H}_2\text{O}$

Very sol in H_2O Solution is decomp on boiling (Cleve, Sv V A H 10, 9 7)

— **platinous sulphocyanide**,

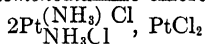


Insol in H_2O and alcohol, sol in dil $\text{HCl} + \text{Aq}$ (Buckton, Chem Soc 13 122)

Platomonodiamine chloride, $\text{Pt}(\text{NH}_3)_2\text{Cl}$

Easily sol in H_2O (Cleve)

Platomonodiamine chloroplatinite



Moderately sol in cold, but more easily in hot H_2O (Cleve)

— **nitrate**, $\text{Pt}(\text{NH}_3)_2\text{NO}_3 + \text{H}_2\text{O}$

Easily sol in H_2O (Cleve)

Platomonodiamine sulphate, $\text{Pt}(\text{NH}_3)_2\text{SO}_4$

Easily sol in cold, but much more in hot H_2O

Platosemudiamine bromide, $\text{Pt} < (\text{NH}_3)_2\text{Br}$

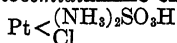
Sol in H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Cleve)

— **chloride**, $\text{Pt} < (\text{NH}_3)_2\text{Cl}$

(Peyrone's chloride) Sol in 387 pts H_2O at 0° , and 26 pts at 100° (Cleve), in 33 pts at 100° (Peyrone)

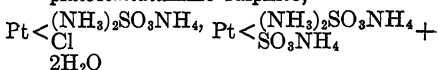
Sol in $\text{NH}_4\text{OH} + \text{Aq}$, very sl sol in HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$, more easily in $\text{HNO}_3 + \text{Aq}$, sol in alkali carbonates + Aq (Peyrone, A ch (3) 12 193)

Platosemudiamine chlorosulphurous acid,



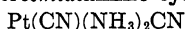
Easily sol in H_2O (Cleve)

Ammonium platosemudiamine chlorosulphite
platosemudiamine sulphite,



Easily sol in H_2O Insol in alcohol (Cleve)

Platosemudiamine cyanide,



Easily sol in H_2O (Cleve)]

— **platinous cyanide**, $\text{Pt}(\text{CN})(\text{NH}_3)_2\text{CN}$,



Ppt

— **hydroxide**, $\text{Pt} < (\text{NH}_3)_2\text{OH}$

Not known

— **iodide**, $\text{Pt} < (\text{NH}_3)_2\text{I}$

Sl sol in boiling H_2O (Cleve)

— **nitrate** $\text{Pt}(\text{NH}_3)_2\text{NO}_3$

Moderately sol in H_2O (Cleve)

— **nitrite**, $\text{Pt}(\text{NH}_3)_2\text{NO}_2$

Very sl sol in cold, more easily in hot H_2O

— **oxalate**, $\text{Pt}(\text{NH}_3)_2\text{C}_2\text{O}_4$

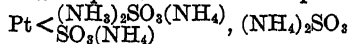
(Cleve)
 $+ 2\text{H}_2\text{O}$ (Cleve)

— **sulphate**, $\text{Pt} < (\text{NH}_3)_2 > \text{SO}_4$

Very sl sol even in hot H_2O (Cleve)

Platosemiamine sulphocyanide,
 $\text{Pt}(\text{SCN})(\text{NH}_3)_2\text{SCN}$

Easily sol in warm H_2O , but solution soon decomposes

Platosemiamine sulphurous acid**Ammonium platosemiamine sulphite,**

Very sol in H_2O (Cleve)

Barium —, $\text{Pt}(\text{SO}_3)[(\text{NH}_3)_2\text{SO}_3]\text{Ba}$, BaSO_3
Ppt (Cleve)

Silver —, $\text{Pt}(\text{SO}_3\text{Ag})[(\text{NH}_3)_2\text{SO}_3\text{Ag}]$,
 Ag_2SO_3
Ppt (Cleve)

Diplatodiamine chloride, $\text{Pt}_2(\text{NH}_3)_4\text{Cl}_2$
Insol in H_2O

— **hydroxide**, $\text{Pt}_2(\text{NH}_3)_4(\text{OH})_2 + \text{H}_2\text{O}$
Insol in H_2O

— **nitrate**, $\text{Pt}_2(\text{NH}_3)_4(\text{NO}_3)_2$
Insol in H_2O (Cleve)

— **sulphate**, $\text{Pt}_2(\text{NH}_3)_4\text{SO}_4$
Insol in H_2O (Cleve)

Platobromonitrous acid

Potassium platobromonitrite, $\text{K}_2\text{Pt}(\text{NO}_2)_2\text{Br} + 2\text{H}_2\text{O}$

Sol in about 3 pts cold, and 2 pts boiling H_2O (Vèzes, A ch (6) 29 194)

$\text{K}_2\text{Pt}(\text{NO}_2)_2\text{Br}_2 + \text{H}_2\text{O}$ Sol in 1 pt cold, and still less hot H_2O Insol in alcohol (Vèzes)

Platochloronitrous acid

Potassium chloronitrite, $\text{K}_2\text{Pt}(\text{NO}_2)_2\text{Cl} + 2\text{H}_2\text{O}$

Sol in about 3 pts cold, and 2 pts boiling H_2O (Vèzes, A ch (6) 29 178)

$\text{K}_2\text{Pt}(\text{NO}_2)_2\text{Cl}_2$ Sol in about 3 pts cold, and 2 pts boiling H_2O (Vèzes)

Platochlorosulphurous acid

See Chloroplatosulphurous acid

Platiodonitrous acid, $\text{H}_2\text{Pt}(\text{NO}_2)_2\text{I}_2$

Known only in solution (Nilson, J pr (2) 21 172)

Aluminum platiodonitrite, $\text{Al}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 27\text{H}_2\text{O}$

Easily sol in H_2O (Nilson)

Ammonium —, $(\text{NH}_4)_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 2\text{H}_2\text{O}$
Sol in H_2O , decomp on heating

Barium platiodonitrite, $\text{BaPt}(\text{NO}_2)_2\text{I}_2 + 4\text{H}_2\text{O}$

Very sol in H_2O

Cadmium —, $\text{CdPt}(\text{NO}_2)_2\text{I}_2 + 2\text{H}_2\text{O}$
Easily sol in H_2O

Cæsium —, $\text{Cs}_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 2\text{H}_2\text{O}$
Easily sol in H_2O

Calcium —, $\text{CaPt}(\text{NO}_2)_2\text{I}_2 + 6\text{H}_2\text{O}$
Very easily sol in H_2O

Cerium —, $\text{Ce}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 18\text{H}_2\text{O}$
Easily sol in H_2O

Cobalt —, $\text{CoPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Didymium —, $\text{D}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 24\text{H}_2\text{O}$
Sol in H_2O

Erbium —, $\text{Er}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 18\text{H}_2\text{O}$
Sol in H_2O

Ferrous —, $\text{FePt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Ferric —, $\text{Fe}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 6\text{H}_2\text{O}$
Sol in H_2O

Lanthanum —, $\text{La}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 24\text{H}_2\text{O}$
Sol in H_2O

Lead —, **basic**, $\text{PbPt}(\text{NO}_2)_2\text{I}_2$, $\text{Pb}(\text{OH})_2$
Insol in H_2O

Lithium —, $\text{Li}_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 6\text{H}_2\text{O}$
Very sol in H_2O

Magnesium —, $\text{MgPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Manganese —, $\text{MnPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Mercurous —, **basic**, $2\text{Hg}_2\text{Pt}(\text{NO})_2\text{I}_2$,
 $\text{Hg}_2\text{O} + 9\text{H}_2\text{O}$
Insol in H_2O

Nickel —, $\text{NiPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Potassium —, $\text{K}_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 2\text{H}_2\text{O}$
Sol in H_2O in all proportions
Very sol in alcohol

Rubidium —, $\text{Rb}_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 2\text{H}_2\text{O}$
Sol in H_2O

Silver platiodonitrite, $\text{Ag}_2\text{Pt}(\text{NO}_2)_2\text{I}_2$
Insol in H_2O

Sodium —, $\text{Na}_2\text{Pt}(\text{NO}_2)_2\text{I}_2 + 4\text{H}_2\text{O}$
Very sol in H_2O

Strontium —, $\text{SrPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Thallium —, $\text{Tl}_2\text{Pt}(\text{NO}_2)_2\text{I}_2$
Insol in H_2O

Yttrium —, $\text{Y}_2[\text{Pt}(\text{NO}_2)_2\text{I}_2]_3 + 27\text{H}_2\text{O}$
Sol in H_2O

Zinc —, $\text{ZnPt}(\text{NO}_2)_2\text{I}_2 + 8\text{H}_2\text{O}$
Sol in H_2O

Triplatoctonitrosylic acid, $\text{H}_4\text{Pt}_3\text{O}(\text{NO}_2)_8$
(Nilson, J pr (2) 16 241)

Potassium triplatoctonitrosylate
See under Platonitrite, potassium

Platonitrous acid, $\text{H}_2\text{Pt}(\text{NO}_2)_4$
Sol in H_2O or alcohol (Lang J pr 83 419)
Is called "Platotetranitrosylic acid" by Nilson

Aluminum platonitrite, $\text{Al}_2[\text{Pt}(\text{NO}_2)_4]_3 + 14\text{H}_2\text{O}$
Sol in H_2O
 $\text{Al}_2(\text{OH})_2[\text{Pt}(\text{NO}_2)_2]_4\text{O}_2 + 10\text{H}_2\text{O}$ Sl sol in cold, easily in hot H_2O and alcohol (Nilson, B 9 1727)

Ammonium platonitrite, $(\text{NH}_4)_2\text{Pt}(\text{NO}_2)_4 + 2\text{H}_2\text{O}$
Moderately sol in cold H_2O (Nilson, B 9 1724)

Barium platonitrite, $\text{BaPt}(\text{NO}_2)_4 + 3\text{H}_2\text{O}$
Sl sol in cold, very sol in hot H_2O (Lang)

Cadmium platonitrite, $\text{CdPt}(\text{NO}_2)_4 + 3\text{H}_2\text{O}$
Easily sol in H_2O (Nilson)

Cæsium platonitrite, $\text{Cs}_2\text{Pt}(\text{NO}_2)_4$
Resembles K salt

Calcium platonitrite, $\text{CaPt}(\text{NO}_2)_4 + 5\text{H}_2\text{O}$
Very sol in H_2O (Nilson)

Cerium platonitrite, $\text{Ce}[\text{Pt}(\text{NO}_2)_4]_3 + 18\text{H}_2\text{O}$
Sol in H_2O (Nilson)

Chromium diplatonitrite,
 $\text{Cr}_2(\text{OH})_2[\text{Pt}(\text{NO}_2)_2]_4\text{O}_2 + 24\text{H}_2\text{O}$
Sol in H_2O (Nilson)

Cobalt platonitrite, $\text{CoPt}(\text{NO}_2)_4 + 8\text{H}_2\text{O}$
Easily sol in H_2O (Nilson)

Copper platonitrite, $\text{CuPt}(\text{NO}_2)_4 + 3\text{H}_2\text{O}$
Sol in H_2O (Nilson)
 $3\text{CuPt}(\text{NO}_2)_4$, $\text{CuO} + 18\text{H}_2\text{O}$ Decomp by H_2O (Nilson)

Didymium platonitrite, $\text{Dl}_2[\text{Pt}(\text{NO}_2)_4]_3 + 18\text{H}_2\text{O}$
Deliquescent, sol in H_2O

Erbium platonitrite, $\text{Er}_2[\text{Pt}(\text{NO}_2)_4]_3 + 9$, and $21\text{H}_2\text{O}$
Deliquescent, sol in H_2O

Glucinum diplatonitrite, $\text{GlPt}(\text{NO}_2)_2]_2\text{O} + 9\text{H}_2\text{O}$
Sl sol in cold H_2O

Indium diplatonitrite, $\text{In}(\text{OH})_2[\text{Pt}(\text{NO}_2)_2]_4\text{O}_2 + 10\text{H}_2\text{O}$
Sl sol in H_2O

Ferric diplatonitrite, $\text{Fe}_2[\text{Pt}(\text{NO}_2)_2]_6\text{O}_8 + 30\text{H}_2\text{O}$
Sl sol in cold, easily in hot H_2O

Lanthanum platonitrite, $\text{La}_2[\text{Pt}(\text{NO}_2)_4]_3 + 18\text{H}_2\text{O}$
Deliquescent, sol in H_2O

Lead platonitrite, $\text{PbPt}(\text{NO}_2)_4 + 3\text{H}_2\text{O}$
Sl sol in H_2O (Nilson)

Lithium platonitrite, $\text{Li}_2\text{Pt}(\text{NO}_2)_4 + 3\text{H}_2\text{O}$
Sl deliquescent, easily sol in H_2O

Magnesium platonitrite, $\text{MgPt}(\text{NO}_2)_4 + 5\text{H}_2\text{O}$
Easily sol in H_2O

Manganese platonitrite, $\text{MnPt}(\text{NO}_2)_4 + 8\text{H}_2\text{O}$
Sol in H_2O

Mercurous platonitrite, $\text{HgPt}(\text{NO}_2)_4$, HgO
Nearly insol in H_2O (Lang, J pr 83 415)
 $+ \text{H}_2\text{O}$ Nearly insol in H_2O (Nilson)

Nickel platonitrite, $\text{NiPt}(\text{NO}_2)_4 + 8\text{H}_2\text{O}$
Easily sol in H_2O (Nilson)

Potassium platonitrite, $\text{K}_2\text{Pt}(\text{NO}_2)_4$
Sol in 27 pts H_2O at 15° , more easily sol in warm H_2O (Lang, J pr 83 415)
 $+ 2\text{H}_2\text{O}$ Efflorescent (Lang)
 $\text{K}_2\text{H}_4\text{Pt}_3\text{O}(\text{NO}_2)_8 + 3\text{H}_2\text{O}$ Very sl sol in cold (0.01 mol in 1 l at 16°), but very easily in hot H_2O (Vézes, A ch (6) 29 162)
 $\text{K}_4\text{Pt}_5\text{O}(\text{NO}_2)_8 + 2\text{H}_2\text{O}$ Sl sol in warm H_2O (Nilson)

Potassium platonitrite bromide

See Platbromonitrite and platobromonitrite, potassium

Potassium platonitrite chloride

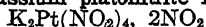
See Plati- and platochloronitrite, potassium

Potassium platnitrite hydrogen chloride,

Sol in H_2O (Miolati, Att Linc Rend 1896, (5) 5, II 358)

Potassium platonitrite iodide

See Plati- and platiodonitrite, potassium

Potassium platonitrite nitrogen dioxide,

Violently decomp by H_2O (Miolati, Atti Linc Rend 1896, (5) 5, II, 356)

Rubidium platonitrite, $Rb_2(Pt)(NO_2)_4$, and $+2H_2O$

Very slowly sol in cold, more easily in warm H_2O (Nilson)

Silver platonitrite, $Ag_2Pt(NO_2)_4$

Very sl sol in cold, easily in hot H_2O

Silver diplatonitrite, $Ag_2Pt_2(NO_2)_4O$

Insol in H_2O (Nilson)

Sodium platonitrite, $Na_2Pt(NO_2)_4$

Easily sol in H_2O

Strontium platonitrite, $SrPt(NO_2)_4+3H_2O$

Somewhat sl sol in cold H_2O , but easily sol in warm H_2O

Thallium platonitrite, $Tl_2Pt(NO_2)_4$

Very sl sol in H_2O (Nilson)

Yttrium platonitrite, $Y_2[Pt(NO_2)_4]_3+9$, or $21H_2O$

Sol in H_2O

Zinc platonitrite, $ZnPt(NO_2)_4+8H_2O$

Sol in H_2O

Platodioxamine chloride,

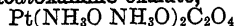
Easily sol in H_2O (Alexander, A 246 239)

chloroplatinite, $Pt(NH_3O NH_3OCl)_2$, $PtCl_2$

Sol in warm $HCl+Aq$ Insol in cold H_2O or alcohol, very sl sol in hot H_2O (Alexander)

hydroxide, $Pt(NH_3O NH_3O)_2(OH)_2$

Insol in H_2O or alcohol Easily sol in HCl or HNO_3+Aq Difficultly sol in hot dil H_2SO_4+Aq (Alexander)

Platodioxamine oxalate,

Insol in cold H_2O , alcohol, or organic acids (Alexander)

phosphate, $Pt_3(NH_3O NH_3O)_{12}(PO_4)_6+3H_2O$

Ppt (Alexander)

sulphate, $Pt(NH_3O NH_3O)SO_4+H_2O$

Sl sol in H_2O (Alexander)

Platosamine bromide, $Pt(NH_3Br)_2$

Sl sol even in hot H_2O (Cleve)

chloride, $Pt(NH_3Cl)_2$

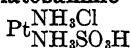
"Reiset's second chloride" Sol in 140 pts H_2O at 100° (Peyrone, A 61 180)

Sol in 130 pts H_2O at 100° , and 4472 pts at 0° (Cleve)

Easily sol in NH_4OH+Aq , HNO_3 , or aqua regia, with decomp Sol in $KCN+Aq$ with evolution of NH_3 (Clevc)

ammonium chloride, $Pt(NH_3Cl)_2$, $2NH_4Cl$

Sl sol in cold, easily in hot H_2O , insol in alcohol, sol in NH_4OH or $(NH_4)_2CO_3+Aq$ (Grimm, A 99 75)

Platosamine chlorosulphurous acid,

Easily sol in H_2O without decomp (Cleve)

Ammonium platosamine chlorosulphite,

Sol in H_2O (Peyrone, A 61 180)

Platosamine cyanide, $Pt(NH_3CN)_2$

Quite easily sol in H_2O or NH_4OH+Aq (Buckton)

hydroxide, $Pt(NH_3OH)_2$

"Reiset's second base" Very sol in H_2O (Odling, B 3 685)

iodide, $Pt(NH_3I)_2$

Very sl sol in H_2O Sol in cold NH_4OH+Aq to form platodiamine iodide (Clevc)

nitrate, $Pt(NH_3NO_3)_2$

Moderately sol in hot H_2O Sol in NH_4OH+Aq with combination (Reiset, A ch (3) 11 26)

nitrite, $Pt(NH_3NO_2)_2$

Very sl sol in cold, easily in hot H_2O Insol in alcohol (Lang)

Platosamine platinous nitrite, $\text{Pt}(\text{NH}_3\text{NO}_2)_2$,
 $\text{Pt}(\text{NO}_2)_2$

Slowly and sl sol in cold, more easily sol in hot H_2O

Extremely sl sol even in conc acids, more sol in $\text{NH}_4\text{OH} + \text{Aq}$ than in H_2O (Lang)

— **oxide**, $\text{Pt}(\text{NH}_3)_2\text{O}$

Insol in H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ (Reiset)

— **oxalate**, $\text{Pt}(\text{NH}_3)_2\text{H}_2(\text{C}_2\text{O}_4)_2 + 2\text{H}_2\text{O}$

Ppt (Cleve)

— **sulphate**, $\text{Pt}(\text{NH}_3)_2\text{SO}_4 + \text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O

— **sulphite**, $\text{Pt}(\text{NH}_3)_2\text{SO}_3 + \text{H}_2\text{O}$

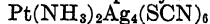
Easily sol in H_2O (Cleve)

— **sulphocyanide**, $\text{Pt}(\text{NH}_3\text{SCN})_2$

Insol in H_2O , can be cryst from alcohol, not attacked by HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Buckton)

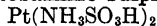
Very sol in hot H_2O (Cleve)

— **silver sulphocyanide**,



(Cleve)

Platosamine sulphurous acid,



Exists only in its salts

See **Platosamine sulphite**

Ammonium platosamine sulphite,



Sol in H_2O Insol in alcohol

Barium platosamine sulphite,



Ppt (Cleve)

Cobalt — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{CO} + 6\text{H}_2\text{O}$

Very sl sol in H_2O Sol in $\text{HCl} + \text{Aq}$

Copper — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{Cu} + 5\text{H}_2\text{O}$

Very sl sol in H_2O , sol in $\text{HCl} + \text{Aq}$

Lead — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{Pb} + \text{H}_2\text{O}$

Ppt

Manganese — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{Mn} + 4\text{H}_2\text{O}$

Ppt Sl sol in H_2O

Nickel — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{Ni} + 7\text{H}_2\text{O}$

Sl sol in H_2O

Sodium platosamine sulphite,
 $\text{Pt}(\text{NH}_3\text{SO}_3\text{Na})_2 + 5\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O 100 ccm sat solution at 20° contains 5.52 g cryst salt (Haberland and Hanekop, A 245 235)

Silver — — —, $\text{Pt}(\text{NH}_3\text{SO}_3\text{Ag})_2 + \text{H}_2\text{O}$

Ppt

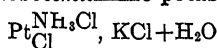
Uranyl — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{UO}_2 + \text{H}_2\text{O}$

Ppt

Zinc — — —, $\text{Pt}(\text{NH}_3)_2(\text{SO}_3)_2\text{Zn} + 6\text{H}_2\text{O}$

Ppt Very sl sol in H_2O (Cleve)

Platososammamine potassium chloride,



Very sol in H_2O , insol in alcohol (Cossa, B 23 2507)

Platosoxamine chloride, $\text{Pt}\begin{matrix} \text{NH}_3\text{OCl} \\ \text{NH}_3\text{OCl} \end{matrix}$

Sol in H_2O Much less sol in H_2O than platodioxamine chloride (Alexander, A 246 239)

Platosoxamine amine chloride,



Easily sol in H_2O Insol in alcohol and conc $\text{HCl} + \text{Aq}$ (Alexander, A 246 239)

— **chloroplatinite**, $\text{Pt}\begin{matrix} \text{NH}_3\text{O} & \text{NH}_3\text{Cl} \\ \text{NH}_3 & \text{NH}_3\text{OCl} \end{matrix}, \text{PtCl}_2$

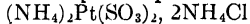
Ppt

Platosulphurous acid

Ammonium platosulphite, $(\text{NH}_4)_6\text{Pt}(\text{SO}_3)_4 + 3\text{H}_2\text{O}$

Sol in H_2O (Birnbbaum A 139 170)
 $(\text{NH}_4)_2\text{Pt}(\text{SO}_3)_2 + \text{H}_2\text{O}$ Sol in H_2O (Liebig, Pogg 17 105)

Ammonium platosulphite chloride,



Sol in H_2O (Birnbbaum)
 $\text{PtCl}_2\text{O}_3\text{H}, 2\text{NH}_4\text{Cl}$ Deliquescent, sol in H_2O (Birnbbaum, A 152 143)

See also **Chloroplatosulphite, ammonium**

Potassium platosulphite, $\text{K}_2\text{Pt}(\text{SO}_3)_4 + 4\text{H}_2\text{O}$

Sl sol in cold, easily in hot H_2O Much more sol than the Na salt (Birnbbaum, A 139 168)

$+ 3\text{H}_2\text{O}$ (Lang, J pr 83 415)
 $6\text{K}_2\text{O}, 2\text{PtO}, 10\text{SO}_2$ Sl sol in H_2O (Claus, J B 1847-48 453)

Does not exist (Lang)

$\text{K}_2\text{Pt}(\text{SO}_3)_2$ Sol in H_2O

Silver platotsulphite, $\text{Ag}_3\text{Pt}(\text{SO}_3)_4$

Ppt Very sol in cold $\text{NH}_4\text{OH} + \text{Aq}$
(Lang J, pr 83 415)

Sodium platotsulphite, $\text{Na}_3\text{Pt}(\text{SO}_3)_4$

Very sl sol in cold, somewhat more easily in hot H_2O Not decomp by boiling KOH or $\text{NaOH} + \text{Aq}$ Gradually sol in $(\text{NH}_4)_2\text{S}$ or $\text{K}_2\text{S} + \text{Aq}$ Insol in $\text{NaCl} + \text{Aq}$ or alcohol (Litton and Schnedermann, A 42 316)
 $+1\frac{1}{2}\text{H}_2\text{O}$
 $+7\text{H}_2\text{O}$
 $\text{Na}_3\text{Pt}(\text{SO}_3\text{H})_4$ Moderately sol in H_2O
 (Litton and Schnedermann)

Platothiosulphuric acid

Sodium platothiosulphate, $\text{Na}_3\text{Pt}(\text{S}_2\text{O}_3)_4 + 10\text{H}_2\text{O}$
 Very sol in H_2O (Schottländer, A 140 200)

$\text{PtS}_2\text{O}_3, 4\text{Na}_2\text{S}_2\text{O}_3 + 10\text{H}_2\text{O}$
 $\text{PtS}_2\text{O}_3, 6\text{Na}_2\text{S}_2\text{O}_3 + 19\text{H}_2\text{O}$
 $2\text{Pt}_2\text{S}_2\text{O}_3, 7\text{Na}_2\text{S}_2\text{O}_3 + 18\text{H}_2\text{O}$ (Jochum, C C 1885 642)

Plumbic acid**Barium plumbate, Ba_2PbO_4**

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ with evolution of Cl Sol in acids in presence of a reducing substance (Kassner, Arch Pharm 228 109)

Calcium plumbate

Insol in H_2O $\text{HNO}_3 + \text{Aq}$ dissolves out CaO (Crum, A 55 218)
 Ca_2PbO_4 Properties as Ba_2PbO_4 (Kassner, Arch Pharm 228 109)
 $+4\text{H}_2\text{O}$ Easily decomp by HNO_3 , (Kassner, Arch Pharm 1894, 232 378)

Calcium hydrogen plumbate, $\text{H CaPb}_2\text{O}_6$

Fairly stable, slowly sol in HNO_3 in the cold (Kassner)

Calcium lead orthoplumbate, CaPbPbO_4

Insol in H_2O Sol in HCl HNO_3 , acetic and other acids cause separation of PbO_2 (Kassner, Arch Pharm 1903, 241 147)

Copper metaplumbate, CuPbO_3

Decomp by acids Insol in $\text{NH}_4\text{OH} + \text{Aq}$ Acetic acid dissolves Cu (Hoehnel, Arch Pharm 1896, 234 399)

Lead metaplumbate, PbPbO_3

Identical with lead sesquioxide (Hoehnel, Arch Pharm 1896, 234 399)

Manganese metaplumbate

Decomp by acids (Hoehnel, Arch Pharm 1896, 234 399)

Potassium plumbate, $\text{K}_2\text{PbO}_3 + 3\text{H}_2\text{O}$

Very deliquescent Decomp by pure H_2O into PbO_2 and KOH Sol in $\text{KOH} + \text{Aq}$ with out decomp (Fremy, J Pharm (3) 3 32)

Silver metaplumbate, Ag_2PbO_3

Ppt (Grutzner, Arch Pharm 1895, 233 518)

Sodium plumbate

Sol in H_2O with decomposition Sl sol in alkalis + Aq (Fremy, A ch (3) 12 490)

Sodium metaplumbate, $\text{Na}_2\text{PbO}_3 + 4\text{H}_2\text{O}$

Decomp by H_2O , insol in alcohol (Hoehnel, Arch Pharm 1894, 232 224)

Strontium plumbate, Sr_2PbO_4

Properties as Ba_2PbO_4 (Kassner, Arch Pharm 228 109)

Zinc metaplumbate, $\text{ZnPbO}_3 + 2\text{H}_2\text{O}$

Decomp by dil acids, insol in H_2O (Hoehnel, Arch Pharm 1896, 234 398)

Plumbous acid**Calcium plumbite**

Sl sol in H_2O (Kersten, Scher J 5 575)

Potassium plumbite, $\text{PbO}, x\text{K}_2\text{O}$

Known only in solution

Silver plumbite, Ag PbO

Insol in H_2O , $\text{NH}_4\text{OH} + \text{Aq}$ and $\text{KOH} + \text{Aq}$, sol in HNO_3 and acetic acid, and in conc H_2SO_4 , HI , and HI (Bullnheimer, B 1898, 31 1288)
 $+2\text{H}_2\text{O}$ Insol in H_2O Decomp on air (Kritwig, B 15 264)

Sodium plumbite

Known only in solution

Potassium, K_2

Violently decomposes H_2O or alcohol Insol in hydrocarbons Sol with violent action in acids

Solubility in fused KOH at t°

t	K_2O sol in 100 g. fused KOH
480	7.8–8.9
600	3–4
650	2–2.7
700	0.5–1.3

(Hevesy, Z Elektrochem 1909, 15 534)

Sol in liquid NH_3 (Seely, C N 23 169), (Franklin, Am Ch J 1898, 20 829)
 1 gram atom of K dissolves in 4.74 mol

liquid NH_3 at 0° , in 4.79 mol at -50° , in 4.82 mol at -100° (Ruff, B 1906, 39 839)
 Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Slowly sol in ethylene diamine Insol in ethyl amine and in secondary and tertiary amines (Kraus, J Am Chem Soc 1907, 29 1561)

Potassium acetylde, K_2C_2

(Moissan, C R 1898, 127 917)

Potassium acetylde acetylene, K_2C_2 , C_2H_2

(Moissan, C R 1898, 127 915)

Potassium amalgams

Hg_4K , Hg_5K , Hg K , Hg_{10}K , Hg_{12}K and Hg_{13}K (Guntz, C R 1900, 131 183)

Hg_{14}K Stable up to 0° Can be cryst from Hg without decomp below 0°

Hg_{12}K Stable from 0° to 71° or 73° Can be cryst from Hg without decomp at any temp between these limits

Hg_{10}K Stable from 71° or $73-75^\circ$ Can be cryst from Hg without decomp at any temp between these limits (Kerp, Z anorg 1900, 25 68)

Potassium amide, KH_2N

Decomp by water or alcohol Insol in hydrocarbons

Potassium ammonickelate, $\text{N}_2\text{N}_3\text{K}_5$, 6NH_3

Decomp by H_2O Sl sol in liquid NH_3 (Bohart, J phys Chem 1915, 19 559)

Potassium ammonoargentate, AgNHK , NH_3 or AgNH_2 , KNH_2

Ppt, decomp in the air Decomp by H_2O or by liquid NH_3 solutions of acids (Franklin, J Am Chem Soc 1915, 37 855)

Potassium ammonobarate, BaNK , 2NH_3

Hydrolyzed by H_2O Insol in liquid NH_3 Decomp and dissolved in a solution of NH_4NO_3 in liquid NH_3 (Franklin, J Am Chem Soc 1915, 37 2297)

Potassium ammonocadmiate, $\text{Cd}(\text{NHK})_2$, 2NH_3

Ppt (Franklin, Am Ch J 1912, 47 310)
 $\text{Cd}(\text{NHK})_2$, 2NH_3 Decomp by H_2O Insol in liquid NH_3 (Bohart, J phys Chem 1915, 19 542)

Potassium ammonocalciate, CaNK , 2NH_3

Hydrolyzed by H_2O Readily sol in a solution of NH_4NO_3 in liquid NH_3 (Franklin, J Am Chem Soc 1915, 37 2300)

Potassium ammonocuprite, CuNK_2 , 3NH_3

Very sol in liquid NH_3
 CuNK_2 , 2NH_3

CuNK_2 , NH_3 (Franklin, J Am Chem Soc 1912, 34 1503)

CuNK_2 , $2\frac{1}{2}\text{NH}_3$ Ppt (Franklin, Am Ch J 1912, 47 311)

Potassium ammonomagnesate, $\text{Mg}(\text{NHK})_2$, 2NH_3

Sl sol in liquid NH_3 Rapidly hydrolyzed by H_2O (Franklin, J Am Chem Soc 1913, 35 1463)

Potassium ammonoplumbite, PbNK , $2\frac{1}{2}\text{NH}_3$

Completely hydrolyzed by action of water vapor Violently decomp by H_2O or dil acids Sol in liquid NH_3 (Franklin, J phys Chem 1911, 15 519)

Potassium ammonostannate, $\text{Sn}(\text{NK})_2$, 4NH_3

Decomp by H_2O Readily sol in $\text{HCl} + \text{Aq}$ Sl sol in liquid NH_3 Readily sol in a solution of NH_4I in liquid NH_3 (Fitzgerald, J Am Chem Soc 1907, 29 1696)

Potassium ammonostrontiate, SrNK , 2NH_3

Hydrolyzed vigorously by H_2O Sol in solutions of NH_4NO_3 in liquid NH_3 Insol in liquid NH_3 (Franklin, J Am Chem Soc 1915, 37 2299)

Potassium ammonothallate, TlNK_2 , 4NH_3

Sensitive to action of air or moisture Violently decomp by H_2O or dil acids Moderately sol in liquid NH_3 at 20° , more sol at higher temp and much less sol at lower temp Decomp by liquid NH_3 solutions of acids (Franklin, J phys Chem 1912, 16 689)

Potassium ammonotitanate, (N) TiNHK

Vigorouslv hydrolyzed by H_2O Insol in liquid NH_3 solutions of either potassium amide or NH_4Br (Franklin, J Am Chem Soc 1912, 34 1500)

Potassium ammonozincate, $\text{Zn}(\text{NHK})_2$, 2NH_3

Decomp by water Sl sol in liquid NH_3 (Fitzgerald, J Am Chem Soc 1907, 29 663)
 Decomp by H_2O Sol in dilute acids Sl sol in liquid NH_3 Sol in solutions of ammonium salts in liquid NH_3 (Franklin, Z anorg 1907, 55 195)

Potassium arsenide, K_3As

(Hugot, C R 1899, 129 604)
 K_2As_4 (Hugot)

Potassium arsenide, ammonia, AsK_3 , NH_3

Nearly insol in liquid NH_3 (Hugot)
 K_2As_4 , NH_3 (Hugot)

POTASSIUM AZOIMIDE

assium azoimide, KN₃

stable in aq solution

16.5 pts are sol in 100 pts H₂O at 10.5°

18.9 " " " " 100 " H₂O " 15.5

19.6 " " " " 100 " H₂O " 17

375 " " " " 100 " abs alcohol at

nsol in pure ether (Curtius, J pr 1898, 58 280)

assium bromide, KBr

Solubility of KBr in 100 pts H₂O at t°

t°	Pts KBr	t°	Pts KBr
0	53.48	60	85.35
20	64.52	80	93.46
40	74.63	100	102.0

(Kremers, Pogg 97 151)

Solubility of KBr in 100 pts H₂O at t°

t°	Pts KBr	t°	Pts KBr
13.4	46.17	43.15	77.0
6.2	49.57	45.45	77.73
0	53.32	50.5	80.33
-3.4	55.60	54.8	82.78
5.2	56.63	60.15	85.37
12.65	61.03	66.75	88.22
13.0	61.17	71.45	90.69
13.3	61.45	74.85	92.25
13.3	64.11	86.5	97.28
26.05	68.31	97.9	102.9
30.0	70.35	110.0	110.3
37.9	74.46		

Solubility is represented by a straight line the formula $54.43 + 0.5128t$ (Coppet, A (5) 30 416)

100 pts KBr+Aq sat at 15-16° contain 06 pts KBr (v Hauer, J pr 98 137)

solubility of KBr in 100 pts H₂O at high temp

t°	Pts KBr
140	120.9
181	145.6

ilden and Shenstone, Phil Trans 1884 23)

Sat solution boils at 112° (Kremers)

Sat KBr+Aq contains at

12° -10° +3° 32° 39°
1.0 31.5 35.7 41.6 47.7% KBr,

5° 77° 140° 173° 220°
5.5 48.7 54.1 58.5 61.6% KBr

(Étard, A ch 1894, (7) 2 539)

If solubility S=pts KBr in 100 pts solution, $S = 34.5 + 0.2420t$ from 0° to 40°, S=

41.5+0.1378t from 30° to 120° (Étard, C R 98 1432)

Solubility of KBr in 100 g H₂O at t°

t°	G KBr	t°	G KBr
10.5	62.1	-11	44.9
10	60.7	-10.5	41.8
3.5	55.5	-10	39.7
0	52.6	-8.5	35.7
-5	50.1	-8	31.2
-8	47.5	-6.5	25.0
-11.5	45.3		

(Meusser, Z anorg 1905, 44 80)

68.74 g KBr are sol in 100 g H₂O at 25° (Amadori and Pampanini, Rend Ac Linc 1911, V, 20 473)

Sp gr of KBr+Aq at 19°

% KBr	Sp gr	% KBr	Sp gr
5	1.037	30	1.256
10	1.075	35	1.309
15	1.116	40	1.366
20	1.159	45	1.432
25	1.207		

(Gerlach, Z anal 8 285)

Sp gr of KBr+Aq at 15° containing

5 10 20 30 36% KBr
1.0357 1.074 1.1583 1.2553 1.3198

(Kohlrausch, W Ann 1879 1)

Sp gr of KBr+Aq at t°

G KBr dissolved in 100 g H ₂ O	G KBr in 100 g of the solution	t°	Sp gr
4.166	4	14.5	1.0291
11.111	10	15.7	1.0753
25.000	20	16.5	1.1625
42.867	30	16.0	1.2580

(de Lannoy, Z phys Ch 1895, 18 460)

KBr+Aq containing 6.99%KBr has sp gr 20°/20°=1.0521 (Le Blanc and Rohland, Z phys Ch 1896, 19 278)

Sp gr of KBr+Aq at 20.5°

Normality of KBr+Aq	G KBr in 100 g of solution	Sp gr t°/4°
4.29	37.97	1.3449
3.01	28.83	1.2407
2.00	20.49	1.1629
1.00	11.03	1.0815

(Oppenheimer, Z phys Ch 1898, 27 452)

Solubility of $\text{KBr} + \text{NH}_4\text{Br}$ at 25°

% KBr	% NH_4Br	Sp gr
55 81	0 0	1 3756
55 42	0 64	1 3745
53 65	2 46	1 3733
51 68	5 13	1 3721
44 12	15 29	1 3711
34 73	26 22	1 3715
26 23	34 76	1 3753
26 03	38 14	1 3753
23 22	41 78	1 3766
22 23	43 25	1 3777
17 99	48 08	1 3766
0 0	57 73	1 3763

(Fock, Z Kryst Min 1897, 28 357)

Solubility in $\text{KNO}_3 + \text{Aq}$

1 litre of the solution contains

at 14.5°		at 25°	
Mol KNO_3	Mol KBr	Mol KNO_3	Mol KBr
0 0	4 332	0 0	4 761
0 362	4 156	0 131	4 72
0 706	4 093	0 527	4 61
1 235	3 939	0 721	4 54
		1 090	4 475
		1 170	4 44
		1 504	4 375

(Touren, C R 1900, 130 911)

See also under KNO_3

100 pts $\text{KBr} + \text{KCl} + \text{Aq}$ sat at $15-16^\circ$ contain 37.55 pts of the two salts, 10.0 pts $\text{KBr} + \text{KI} + \text{Aq}$ sat at $15-16^\circ$ contain 57.96 pts of the two salts, 100 pts $\text{KBr} + \text{KCl} + \text{KI} + \text{Aq}$ sat at $15-16^\circ$ contain 57.88 pts of the three salts (v Hauer, J pr 98 137)

Solubility of $\text{KBr} + \text{KCl}$ in H_2O at 25°

% KBr	% KCl	Sp gr
55 81	0 00	1 3756
53 15	2 34	1 3700
50 36	4 66	1 3648
45 46	8 26	1 3544
37 96	13 66	1 3320
32 48	16 69	1 3119
21 80	21 39	1 2689
14 07	25 09	1 2455
4 75	29 17	1 1977
0 00	31 13	1 1756

(Fock, Z Kryst Min 1897, 28 357)

Solubility of $\text{KBr} + \text{KCl}$ in H_2O at t°

t°	Sat solution contains		
	% KCl	% KBr	% total salt
-14	10 7	18 8	29 5
-13 7			29 4
-13 5			29 5
-7	10 7	19 8	30 5
+5 2			34 4
+6	11 3	22 6	33 9
10	11 0	23 7	34 7
21	10 8		35 3
26	11 2	25 5	36 7
30			39 4
32	11 9	26 6	38 5
39			39 8
47	11 0	30 8	41 8
52	11 0	31 2	42 2
55	11 9	29 9	41 8
71	12 0	31 7	43 7
73	11 8	32 9	44 7
102	12 8	35 8	48 6
152	13 2	40 6	53 8
160	12 5	42 3	54 8
168			55 0
225	14 7	45 0	59 7

(Étard, A ch 1894, (7) 3 281)

Solubility of $\text{KBr} + \text{KCl}$ in H_2O at 25° G per 100 g H_2O

KBr	KCl
68 47	0 0
62 26	5 43
58 50	8 46
52 45	12 48
45 42	17 17
38 70	21 23
26 62	25 88
12 94	31 02
0 0	36 12

(Amadori and Pampanini, Att Acc Linc 1911, 20, II 475)

Solubility in $\text{KCl} + \text{Aq}$ at 25°

1 litre of the solution contains

Mol KCl	Mol KBr
0 0	4 761
0 67	4 22
0 81	4 15
1 35	3 70
1 48	3 54
1 61	3 42
1 70	3 34
2 46	2 50
3 775	0 525

(Touren, C R 1900, 130 1252)

See also under KCl

By repeatedly heating KBr+Aq sat at 15-16° with KI and cooling to 15°, nearly all the KBr can be separated (v Hauer)

100 pts H₂O sat with KBr at 16° dissolve 13 15 pts KI, but on addition of more KI KBr is pptd (van Melckebeke, C C 1872 586)

Solubility in KI+Aq at t°

t°	Sat solution contains		
	% KBr	% KI	% total salt
-22	8 3	42 6	50 9
-19	9 5	42 8	52 3
-6	9 3	44 7	54 0
-1 5			55 3
+3	10 3	45 9	56 2
13 6	10 1	46 2	55 9
25	10 8	48 0	58 8
44 2	11 1	50 1	61 2
51	12 1	50 0	62 1
66	10 8	53 1	63 9
70	11 6	51 9	63 5
80	12 3	52 5	64 8
93	13 0	53 7	66 7
116	13 2	54 6	67 8
125	13 7	54 8	68 5
150	15 1	55 1	70 2
175	16 0	57 2	73 2
			72 7
	16 7	56 5	73 2
	17 6	57 0	74 6

(Étard, A ch 1894, (7) 3 279)

Solubility of KBr+KI in H₂O at 25°

G per 100 g H ₂ O			
KBr		KCl	
53 21		35 92	
42 32		66 63	
34 14		95 36	
30 08		119 59	
29 62		119	
22 15		127 10	
21 88		127 31	
18 54		130 61	
0 0		149 26	

(Amadori and Pampanini, Att Acc Linc 1911, 20, II 475)

Solubility of KBr in KOH+Aq

G per 1000 g H ₂ O		G per 1000 g H ₂ O	
KOH	KBr	KOH	KBr
36 4	558 4	277 6	248 1
113 5	433 6	434 7	137 1
177 2	358 1	579 6	64 8
231 1	281 2	806 9	33 4

(Ditte, C R 1897, 124 30)

Sol in Br₂ at 15° (Walden, Z anorg 1900, 25 220)

Moderately sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 829)

Sol in liquid NH₃ 45 pts are sol in 100 pts liquid NH₃ at -50° (Joannis, C R 1905, 140 1244)

Attacked by liquid NO₂ with liberation of Br₂ (Frankland, Chem Soc 1901, 79 1361)

Insol in liquid CO₂ (Büchner, Z phys Ch 1906, 54 674)

Sol in SO₃ (Walden, Z anorg 1900, 25 217)

Sol in SO₂Cl(OH) (Walden, Z anorg 1902, 29 382)

Difficultly sol in AsBr₃ (Walden, Z anorg 1902, 29 374)

Sol in SbCl₃ (Walden, Z anorg 1900, 25 220)

Sol in liquid SO₂ (Walden, Z anorg 1902, 30 160)

Hydrazine dissolves 56 4 pts KBr at 12 5-13° (de Bruyn, R t c 1899, 18 297)

Sl sol in alcohol (Ballard)

Sol in 200 pts cold, and 16 pts boiling 80% alcohol

Sol in 180 pts 90% alcohol (Hager)

Sol in 750 pts abs alcohol at 15° (Eder, Dingt 221 89)

100 pts absolute methyl alcohol dissolve 1 51 pts at 25°, 100 pts absolute ethyl alcohol dissolve 0 13 pt at 25° (de Bruyn, Z phys Ch 10 783)

Solubility of KBr in methyl alcohol+Aq at 25°

P = % by wt of alcohol in alcohol+Aq
S = Sp gr of alcohol+Aq sat with KBr
L = millimols KBr in 100 cem of the solution

P	S 25°/4	L
0	1 3797	471
10 6	1 300	389
30 8	1 159	252
47 1	1 058	162
64 0	0 9801	87
78 1	0 8906	44
98 9	0 8411	23
100	0 8047	14 2

(Herz and Anders, Z anorg 1907, 55 273)

100 g KBr+CH₃OH contain 0 2 g KBr at the critical temp (Centnerszwer, Z phys Ch 1910, 72 437)

Solubility of KBr in ethyl alcohol+Aq

Wt % alcohol	Temp =30°		Temp =40°	
	G KBr per 100 g		G KBr per 100 g	
	Solution	Solvent	Solution	Solvent
0	41 62	71 30	43 40	76 65
5	38 98	67 25	40 85	72 70
10	36 33	63 40	38 37	69 00
20	31 09	56 40	33 27	62 30
30	25 98	50 15	28 32	56 45
40	21 24	44 95	23 22	50 46
50	16 27	38 85	18 11	44 25
60	11 50	32 50	13 02	37 40
70	6 90	24 70	7 98	28 90
80	3 09	15 95	3 65	18 95
90	0 87	8 80	1 03	10 45

(Taylor, J phys Ch 1896, 1 724)

At room temp, 1 pt KBr by weight is sol in

52 pts methyl alcohol, D¹⁵ 0 7990
 350 " ethyl " D¹⁵ 0 8100
 1818 " propyl " D¹⁵ 0 8160

(Rohland, Z anorg 1898, 18 325)

Solubility of KBr in ethyl alcohol at 0°

Cone of alcohol in mol g per l H ₂ O	G KBr in 1 l H ₂ O	Mol solubility
—	536 75	4 51
1/4	529 25	4 45
1/2	502 85	4 22
1	491 75	4 13
2	455 25	3 82

(Armstrong and Fyre, Proc R Soc 1910, [A] 84 127)

100 g methyl alcohol dissolve 2 17 g KBr at 25°

100 g ethyl alcohol dissolve 0 142 g KBr at 25°

100 g propyl alcohol dissolve 0 035 g KBr at 25°

100 g isoamyl alcohol dissolve 0 003 g KBr at 25°

(Turner and Bissett, Chem Soc 1913, 103 1909)

0 055 g is sol in 100 g propyl alcohol (Schlamp, Z phys Ch 1894, 14 276)

Sol in 5000 pts ether (sp gr 0 729 at 15°) (Eder, l c)

Sol in 1700 pts alcohol-ether (1 1) at 15° (Eder, l c)

100 pts acetone dissolve 0 023 pt KBr at 25° (Krug and M'Elroy, J Anal Ch 6 184)

Solubility of KBr in acetone+Aq at 25°

A=cc acetone in 100 cc acetone+Aq
 KBr=millimols KBr in 100 cc of the solution

A	KBr	Sp gr
0	481 3	1 3793
20	366 7	1 2688
30	310 5	1 2118
40	259 0	1 1558
50	202 9	1 0918
60	144 9	1 0275
70	95 3	0 9591
80	46 5	0 89415
90	10 1	0 8340

(Herz and Knoch, Z anorg 1905, 45 262)

Solubility of KBr in glycerine+Aq at 25°

G=g glycerine in 100 g glycerine+Aq
 KBr=millimols KBr in 100 cc of the solution

G	KBr	Sp gr
0	481 3	1 3793
13 28	444 3	1 3704
25 98	404 0	1 3655
45 36	340 5	1 3594
54 23	310 4	1 3580
83 84	219 25	1 3603
100	172 65	1 3691

(Herz and Knoch, Z anorg 1905, 45 267)

100 g 95% formic acid dissolve 23.2 g KBr at 18 5° (Aschan, Chem Ztg 1913, 37 1117)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

100 ccm of a sat solution of KBr in furfural at 25° contain 0 139 pts by wt KBr (Wulden, Z phys Ch 1906, 55 713)

Insol in CS₂ (Arcetowski, Z anorg 1894, 6 257)

Potassium rhodium bromide

See Bromorhodite, potassium

Potassium ruthenium tribromide

See Bromoruthenite, potassium

Potassium ruthenium tetrabromide

See Bromoruthenate, potassium

Potassium selenium bromide

See Bromoselenate, potassium

Potassium tellurium bromide*See* Bromotellurate, potassium**Potassium thallic bromide, KBr, TlBr₃+2H₂O**Sol in H₂O
3KBr, 2TlBr₃+3H₂O Sol in H₂O (Ram-melsberg)**Potassium thorium bromide**Sol in H₂O (Berzelius)**Potassium tin (stannous) bromide, KBr, SnBr₂+H₂O**Sol in H₂O (Benas, C C 1884 958)
Can be recryst from HBr or KBr+Ag (Richardson, Am Ch J 14 95)
2KBr, SnBr₂+2H₂O Cannot be recryst from HBr+Ag (Richardson)**Potassium tin (stannic) bromide, 2KBr, SnBr₄***See* Bromostannate, potassium**Potassium uranous bromide, KUBr₃**Very sol in H₂O (Aloy, Bull Soc 1899, (3) 21 264)**Potassium uranyl bromide, 2KBr, UO₂Br₂+2H₂O**Very easily sol in H₂O (Sendtner)**Potassium zinc bromide, KBr, ZnBr₂+2H₂O**

Not hygroscopic (Ephraim, Z anorg 1908, 59 60)

2KBr, ZnBr₂+2H₂O Not hygroscopic (Ephraim)**Potassium bromide ammonia, KBr, 4NH₃**

(Joannis, C R 1905, 140 1244)

Potassium bromide ruthenium dihydronitroschloride, (NO)Ru₂H₂Cl₃, 2HCl, 3KBrPpt Sl sol in H₂O (Brizard, A ch 1900, (7) 21 359)**Potassium bromiodide, KBr·I**

Decomp rapidly on air (Wells and Wheeler, Sill Am J 143 475)

Potassium carbonyl, K₂C₂O₂Decomp by H₂O with explosion (Joannis, C R 116 158)**Potassium chloride, KCl**Sol in H₂O with absorption of heat
30 pts KCl+100 pts H₂O at 13 2° lower the temp 12 6° (Rüdorff, B 2 68)100 pts H₂O dissolve 29 31 pts KCl at 0° (Gay-Lussac), 28 5 pts KCl at 0° (Mulder, Gerardin)

The saturated solution contains 58 5%, and boils at 107 6° (Mulder), contains 59 40%, and boils at 108 3° (Legrand), contains 59 26%, and boils at 109 6° (Gay-Lussac), boils at 110° (Kremers)

Sol in 3 016 pts H₂O at 15° (Gerlach), in 3 03 pts at 17 5° or 100 pts H₂O at 17 5° dissolve 33 pts KCl (Schiff)100 pts H₂O at t dissolve pts KCl

t°	Pts KCl	t°	Pts KCl	t°	Pts KCl
0	29 21	52 39	43 59	109 60	59 26
19 35	34 53	79 58	50 93		

(Gay-Lussac A ch (2) 11 308)

100 pts H₂O dissolve 34 6 pts KCl at 11 8° 34 9 pts at 13 8° 35 pts at 15 6° (Kopp)100 pts H₂O at 17 5° dissolve 33 24 pts KCl and sp gr of solution is 1 635 (Karsten)100 pts H₂O at 12° dissolve 32 pts and at 100° 59 4 pts (Otto Graham)Sol in 3 pts H₂O at ord temp and 3 pts boiling H₂O (Bergmann) in 3 33 pts hot or cold H₂O (Fourcroy) in 3 pts at 15° and 1 68 pts at 110 (M R and P)Sol in 3 5 pts H₂O at 0° and in less than 1 pt hot H₂O (Schubarth) 100 pts H₂O at 17 5° dissolve 30 7 33 0 pts KCl (Ure's Dict)100 pts H₂O dissolve 35 405 pts KCl at 15° and solution has sp gr = 1 1809 (Michel and Krafft A ch (3) 41 478)100 pts H₂O dissolve at

18° 30° 40° 57°

33 6 37 8 40 1 45 0 pts KCl

(Gerardin, A ch (4) 5 139)

100 pts H₂O dissolve 33 06-32 08 pts KCl at 15 6° and sp gr of solution = 1 171 (Page and Keightley, Chem Soc (2) 10 566)Solubility in 100 pts H₂O at t°

t°	Pts KCl	t°	Pts KCl	t°	Pts KCl
0	28 5	17	33 9	34	38 5
1	28 7	18	34 2	35	38 7
2	29 0	19	34 4	36	39 0
3	29 3	20	34 7	37	39 3
4	29 5	21	35 0	38	39 6
5	30 0	22	35 3	39	39 9
6	30 5	23	35 5	40	40 1
7	31 0	24	35 8	41	40 3
8	31 5	25	36 1	42	40 6
9	31 7	26	36 4	43	40 9
10	32 0	27	36 6	44	41 2
11	32 3	28	36 9	45	41 5
12	32 5	29	37 2	46	41 7
13	32 8	30	37 4	47	42 0
14	33 1	31	37 7	48	42 3
15	33 4	32	38 0	49	42 5
16	33 6	33	38 2	50	42 8

Solubility in 100 pts, etc—*Continued*

t°	Pts KCl	t°	Pts KCl	t°	Pts KCl
51	43 1	71	48 5	91	54 1
52	43 4	72	48 8	92	54 4
53	43 6	73	49 1	93	54 6
54	43 9	74	49 4	94	54 9
55	44 2	75	49 6	95	55 2
56	44 4	76	49 9	96	55 5
57	44 7	77	50 2	97	55 7
58	44 9	78	50 5	98	56 0
59	45 2	79	50 8	99	56 3
60	45 5	80	51 0	100	56 6
61	45 8	81	51 3	101	56 9
62	46 1	82	51 5	102	57 2
63	46 3	83	51 8	103	57 4
64	46 6	84	52 1	104	57 7
65	46 9	85	52 4	105	58 0
66	47 2	86	52 6	106	58 2
67	47 5	87	52 9	107	58 5
68	47 7	88	53 2	107 65	58 5
69	48 0	89	53 5		
70	48 3	90	53 8		

(Mulder, calculated from his own and other observations, Scheik Verhandel 1864 41)

Solubility in 100 pts H₂O at t°

t°	Pts KCl	t°	Pts KCl	t°	Pts KCl
-11°	24 46	25 7	36 10	64 95	47 17
-6 4	25 78	29 25	37 31	71 65	48 76
0	27 9	38 0	39 71	74 25	49 27
+3 9	29 37	41 45	40 67	80 75	51 24
9 4	30 84	46 15	42 34	86 6	52 53
11 4	32 19	48 8	42 86	91 4	53 49
14 95	32 66	55 1	44 51		
19 0	34 32	60 55	45 90		

(Coppet, A ch (5) 30 414)

Solubility is represented by a straight line, of which the formula is $28.51 + 0.2837t$ (Coppet)

100 pts H₂O dissolve 29.33 pts KCl at 4°, 45.5 pts at 60° (Andreu, J pr (2) 29 456)

100 pts H₂O dissolve at

0° 100° 130° 180°

29.2 56.5 66 78 pts KCl

(Tilden and Shenstone, Lond, R Soc Proc 35 345)

Solubility of KCl in 100 pts H₂O at high temp

t	Pts KCl	t	Pts KCl	t	Pts KCl
125	59 6	147	70 8	180	77 5
133	69 3	175	75 2		

(Tilden and Shenstone, Phil Trans 1884 23)

If solubility S=pts KCl in 100 pts solution, $S=20.5+0.1445t$ from -90° to 110° (Étard, C R 98 1432)

Sat KCl+Aq contains at

142° 150° 175° 180°
38.6 38.8 41.2 41.8% KCl

190° 200° 242° 732° (mpt)
43.2 42.9 47.6 100% KCl

(Étard, A ch 1894, (7) 2 256)

100 g H₂O dissolve 0.488 gram-equivalent KCl at 25° (van't Hoff and Meyerhoffer, Z phys Ch 1904, 49 315)

Solubility of KCl in H₂O at t°

G KCl per 100 G H₂O

t°	KCl	Sp gr
0 70	28 29	1 1540
19 55	34 37	1 1738
32 80	38 32	1 1839
59 85	45 84	1 1980
74 80	49 58	1 2032
89 45	53 38	1 2069
108 0*	58 11	1 2118

* Bpt of sat solution

(Berkeley, Phil Trans Roy Soc 1904, 203, A 189)

Solubility of KCl in 100 g H₂O at t°

t	g KCl	t	g KCl
+18 5	33 3	-4 5	25 9
11 5	31 2	-9	23 9
10	30 8	-8 5	21 5
7 5	29 8	-8	20 0
2 5	28 4	-7	17 5
0	27 5	-6	15 7
-1	27 2	-5 5	14 3

(Meusser, Z anorg 1905, 44 80)

Sat KCl+Aq at 25° contains 26.46% KCl (Foot, Am Ch J 1906, 35 238)

28.01 g KCl are contained in 100 g solution sat at 30° (de Waal, Dissert 1910)

36.12 g KCl are sol in 100 g H₂O at 25° (Amadori and Pampalini, Rend Acc Line 1911, V 20 473)

4.272 g mol are contained in 1 l solution sat at 25° (Hitz Z anorg 1911, 73 274)

Solubility of KBr at 6°=23.06%, 28.4°=26.91%, 62.6°=31.57° (Suss, Z Krist 1912, 51 262)

Solubility at 22°=25.68% (Bronstedt, Z phys Ch 1912, 80 208)

100 mol H₂O dissolve at

19.3° 29.7° 40.1° 54.5°
8.2 8.99 9.75 10.39 mol KCl

(Sudhaus, Miner Jahrb Beil-Bd 1914, 37 18)

KCl+Aq sat at 16° has sp gr = 1 077
(Stolba, J pr 97 503)

Sp gr of KCl+Aq at 17 5°

% KCl	Sp gr	% KCl	Sp gr	% KCl	Sp gr
1	1 0062	9	1 0586	17	1 1152
2	1 0125	10	1 0655	18	1 1225
3	1 0189	11	1 0725	19	1 1298
4	1 0254	12	1 0795	20	1 1372
5	1 0319	13	1 0866	21	1 1446
6	1 0385	14	1 0937	22	1 1521
7	1 0451	15	1 1008	23	1 1596
8	1 0518	16	1 1080	24	1 1673

(Schiff, A 110 76)

Sp gr of KCl+Aq at 19 5°

% KCl	Sp gr	% KCl	Sp gr
5 98	1 0382	21 31	1 1436
11 27	1 0733	25 133	1 1720
16 27	1 1075		

(Kremers, Pogg 95 119)

Sp gr of KCl+Aq at 15°

% KCl	Sp gr	% KCl	Sp gr	% KCl	Sp gr
1	1 00650	10	1 06580	19	1 12894
2	1 01300	11	1 07271	20	1 13608
3	1 01950	12	1 07962	21	1 14348
4	1 02600	13	1 08654	22	1 15088
5	1 03250	14	1 09345	23	1 15828
6	1 03916	15	1 10036	24	1 16568
7	1 04582	16	1 10750	24 9*	1 17234
8	1 05248	17	1 11465		
9	1 05914	18	1 12179		

* Mother liquor

(Gerlach, Z anal 8 281)

Sp gr of KCl+Aq at 20°, containing mols
KCl to 100 mols H₂O

Mols KCl	Sp gr	Mols KCl	Sp gr
0 5	1 01310	4 0	1 09415
1 0	1 02568	5 0	1 11445
2 0	1 04959		

(Nicol, Phil Mag (5) 16 122)

Sp gr of KCl+Aq at 18°

% KCl	Sp gr	% KCl	Sp gr	% KCl	Sp gr
5	1 0308	15	1 0978	25	1 1408
10	1 0638	20	1 1335		

(Kohlrausch, W Ann 1879 1)

Sp gr of KCl+Aq at 0° S=pts salt in 100
pts of solution, S₁=mols salt in 100
mols solution

S	S ₁	Sp gr
20 7840	5 954	1 1489
17 7214	4 940	1 1258
14 4707	3 922	1 1018
11 0757	2 918	1 0769
7 5440	1 931	1 0521
4 4968	1 123	1 0308

(Charpy, A ch (6) 29 23)

Sp gr of KCl+Aq at 25°

Concentration of KCl+Aq	Sp gr
1-normal	1 0466
1/2- "	1 0235
1/4- "	1 0117
1/8- "	1 0059

(Wagner, Z phys Ch 1890, 5 36)

KCl+Aq containing 5 05% KCl has sp gr
20°/20°=1 0327

KCl+Aq containing 20 55% KCl has sp
gr 20°/20°=1 1393

(Le Blanc and Rohland, Z phys Ch 1896,
19 272)

Sp gr of KCl+Aq

g KCl in 1000 g of solution	Sp gr 16°/16°
0	1 000000
0 7140	1 000464
1 5042	1 000975
3 0724	1 001991
8 3165	1 005391

(Dyken, Z phys Ch 1897, 24 109)

Sp gr of KCl+Aq at 20 1°, when p=per
cent strength of solution, d=observed
density, and w=volume conc in g per
cc $\left(\frac{pd}{100}\right) = w$

p	d	w
36 43	1 853	0 43171
31 12	1 1554	0 35954
24 79	1 1215	0 27887
18 06	1 0866	0 19610
13 17	1 0617	0 13980
8 412	1 0386	0 08736
6 610	1 0297	0 06806
4 419	1 0193	0 4505
3 456	1 0148	0 03507
1 197	1 0040	0 01202

(Barnes, J phys Ch 1898, 2 544)

Sp gr of KCl+Aq at t°

t°	Normality of KCl+Aq	g KCl in 100 g of solution	Sp gr t°/4°
20 5	3 74	23 93	1 1617
"	2 65	17 66	1 1166
"	1 87	12 82	1 0829
"	0 93	6 64	1 0424

(Oppenheimer, Z phys Ch 1898, 27 450)

Sp gr of KCl+Aq at 18°/4°

g KCl in 100 g of solution	Sp gr
0 24963	1 0003
0 12459	0 9995
0 08342	0 99929
0 062343	0 99912

(Jahn, Z phys Ch 1900, 33 559)

KCl+Aq containing 1 pt KCl in 58 923 pts H₂O at 17° has sp gr = 1 0096 (Hittorf, Z phys Ch 1902, 39 628)

Sp gr 20°/4° of a normal solution of KCl = 1 04443 (Haigh, J Am Chem Soc 1912, 34 1151)

Sp gr of sat KCl+Aq at t°

t°	g KCl sol in 100 g H ₂ O	Sp gr
-10°	24 98	1 139
0	28 50	1 156
10	31 23	1 168
20	34 11	1 177
30	37 28	1 183
40	40 12	1 190
50	42 86	1 195
60	45 48	1 199
70	48 30	1 203

(Tschernaj, J Russ phys Chem Soc 1912, 44 1565)

Sp gr of dil KCl+Aq at 20 004°

Conc = g equiv KCl per l at 20 004°
Sp gr compared with H₂O at 20 004° = 1

Conc	Sp gr
0 0000	1 000,000,0
0 0001	1 000,004,8
0 0002	1 000,009,7
0 0005	1 000,024,2
0 0010	1 000,048,5
0 0026	1 000,097,1
0 0050	1 000,242,6
0 0100	1 000,483,6

(Lamb and Lee, J Am Chem Soc, 1913, 35 1687)

KCl+Aq containing 10% KCl boils at 101 1°, containing 20%, at 103 4° (Gerlach)
Sat KCl+Aq containing 52 7 pts KCl to 100 pts H₂O forms a crust at 107 7°, highest temp observed, 108 5° (Gerlach, Z anal 26 426)

B-pt of KCl+Aq containing pts KCl to 100 pts H₂O G=according to Gerlach (Z anal 26 438), L=according to Legrand (A ch (2) 59 420)

B pt	G	L	B pt	G	L
100 5°	4 9	4 7	105°	36 2	37 8
101 0	9 2	9 0	105 5	39 3	41 0
101 5	13 1	13 2	106	42 4	44 2
102	16 7	17 1	106 5	45 5	47 4
102 5	20 1	20 9	107	48 4	50 5
103	23 4	24 5	107 5	51 5	53 7
103 5	26 7	28 0	108	54 5	56 9
104	29 9	31 4	108 3		59 4
104 5	33 1	34 6	108 5	57 4	

Precipitated from aqueous solution by HCl +Aq Much less sol in very dil HCl+Aq than in H₂O (Fresenius)

Nearly insol in conc HCl+Aq
100 cc sat HCl+Aq dissolve 1 9 g KCl at 17° (Ditte, A ch 1881, (5) 24 226)

Solubility of KCl in HCl+Aq at 0°

G per 100 cc of solution	
HCl	KCl
0 0	25 73
1 42	22 69
2 41	20 84
2 59	20 51
4 05	17 71
8 39	11 93
12 40	7 46
14 95	5 60
23 88	1 49
54 20	1 52

(Engel, A ch 1888, (6) 33 377)

Solubility of KCl in HCl+Aq

t	Concentration of HCl g mol per 1000 g H ₂ O	Wt KCl per 1000 g H ₂ O	Mol solubility
0	0	283 55	3 81
"	1/4	267 25	3 59
"	1/2	250 00	3 36
"	1	214 25	2 88
25	0	359 25	4 82
"	1/4	341 55	4 59
"	1/2	324 30	4 35
"	1	289 60	3 89

(Armstrong and Eyre, Proc R Soc 1910 (A) 84 127)

100 g sat HCl+Aq dissolve 19 g KCl at 20° (Stoltzenberg, B 1912, 45 2248)

Solubility in HCl+Aq at 25°

Millimols HCl in 10 ccm	Millimols KCl in 10 ccm
	42 72
5 66	37 49
10 20	33 79
15 90	28 68
20 94	24 74
32 52	17 39

(Herz, Z anorg 1912, 73 275)

Solubility of KCl in HBr+Aq at 25°

Millimols HBr in 10 ccm	Millimols KCl in 10 ccm
	42 72
6 61	37 80
34 15	19 57

(Herz, Z anorg 1912, 73 275)

Sol in sat NH_4Cl +Aq with pptn of NH_4Cl When action has ceased, the solution at 18 75° contains 31 6% of the mixed salt, or 100 pts H_2O dissolve 46 1 pts of the mixed salt, viz, 16 27 pts KCl and 29 83 pts NH_4Cl (Karsten)

Solubility of KCl in NH_4Cl +Aq at 25°

Dissolved in 1000 mols H_2O	
Mols KCl	Mol NH_4Cl
74 2	23 8
67 9	32 5
61 4	52 2
55 5	65 9
50 2	74 4
43 0	96 3
37 6	110 0
37 0	107 5
37 5	109 4
22 6	118 2

(Biltz, Z anorg 1911, 71 174)

See also NH_4Cl

Sol in sat BaCl_2 +Aq with pptn of BaCl_2 until a state of equilibrium is reached, when 100 pts H_2O at 16 8° dissolve 45 9 pts mixed salts, viz 18 2 pts BaCl_2 and 27 7 pts KCl

See also BaCl_2

Solubility of KCl in MgCl_2 +Aq of given percentage composition

t°	30%	21 2%	15%	11%
10	1 9%	5 3%	9 9%	14 3%
20	2 6	6 5	11 3	15 9
30	3 4	7 6	12 7	17 5
40	4 2	8 8	14 2	19 0
50	5 0	10 0	15 6	20 5
60	5 8	11 2	17 0	21 9
70	6 5	12 4	18 3	23 2
80	7 3	13 6	19 5	24 5
90	8 1	14 7	20 8	25 8
100	8 9	15 9	22 1	27 1

(Precht and Wittgen, B 14 1667)

Solubility of KCl+NaCl in 20% MgCl_2 +Aq

t°	% KCl	% NaCl	t°	% KCl	% NaCl
10	4 2	5 7	60	8 9	6 3
20	5 1	5 8	70	9 9	6 4
30	6 0	5 9	80	10 9	6 6
40	6 9	6 0	90	11 9	6 7
50	7 9	6 1	100	13 0	6 9

(P and W)

Sol in sat KNO_3 +Aq with pptn of KNO_3

1 litre of the solution contains

at 14 5°		at 25 2	
Mol KCl	Mol KNO_3	Mol KCl	Mol KNO_3
3 865	0 0	4 18	0 0
3 810	0 204	4 11	0 136
3 782	0 318	4 07	0 318
3 710	0 615	3 93	0 902
3 667	0 818	3 85	1 212
3 629	0 910	3 81	1 397
3 597	1 176	3 70	1 805
3 582	1 220		

(Touren, C R 1900, 130 909)

Solubility of KCl in KNO_3 +Aq

t°	Concentration of KNO_3 in g mol per 1000 g H_2O	Wt KCl in 1000 g H_2O	Mol solubility
0	0	283 55	3 81
"	$\frac{1}{4}$	284 25	3 81
"	$\frac{1}{2}$	283 60	3 81
"	1	287 60	3 86
25	0	364 15	4 89
"	$\frac{1}{4}$	355 00	4 90
"	$\frac{1}{2}$	361 65	4 96
"	1	358 80	4 81
"	$1\frac{1}{2}$	355 20	4 77

(Armstrong and Eyre, Proc R Soc 1910 [A], 84 127)

See also KNO_3

Sol in sat $\text{NaNO}_3 + \text{Aq}$ without causing pptn (See NaNO_3)
Sol in sat $\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ without causing pptn

Solubility in $\text{KBr} + \text{Aq}$ at 25°

1 litre of the solution contains

Mol KBr	Mol KCl
0 0	4 18
0 49	3 85
0 85	3 58
1 31	3 19
1 78	2 91
2 25	2 58
2 69	2 33

(Touren, C R 1900, 130 1252)

See also KBr

100 pts H_2O dissolve 133.2 pts KI and 10.4 pts KCl at 21.5° , no matter how prepared (Rudorff, B 6 484)

100 pts $\text{KCl} + \text{Aq}$ sat at $15-16^\circ$ contain 25.26-25.37 pts KCl 100 pts $\text{KCl} + \text{KI} + \text{Aq}$ sat at $15-16^\circ$ contain 57.80 pts of the two salts KCl is pptd by KI (v Hauer, J pr 98 137)

Solubility in $\text{KI} + \text{Aq}$ at t°

t°	Sat solution contains		
	% KCl	% KI	% total salt
0	4.8	50.8	56.6
8	5.1	51.1	56.2
18			57.9
30	4.2	54.6	58.8
41	4.7	55.0	59.7
49	5.7	56.0	61.7
60			62.5
75	4.4	59.5	63.9
82	5.0	59.6	64.6
96			66.2
102			66.8
140		63.3	
155	7.6	64.8	72.4
182	8.7	65.4	74.1
190	8.6	66.0	74.6
245	10.0	66.5	76.5

(Étard, A ch 1894, (7) 3 231)

Solubility of $\text{KCl} + \text{KI}$ in H_2O at 25°

C per 100 g H_2O

KCl	KI	KCl	KI
0	149.26	19.64	68.22
4.06	144.03	23.75	43.89
7.63	137.79	29.56	23.83
11.36	132.60	31.38	14.83
11.74	133.90	33.68	7.00
15.10	105.91	36.12	0.00

(Amadori and Pampanini, Att Acc Linc 1911, 20, II 475)

Solubility of KCl in $\text{KOH} + \text{Aq}$ at 0°

G per 100 cc solution

KCl	KOH
26.83	0.0
23.44	1.33
21.39	2.64
17.39	5.56
13.89	8.46
10.91	11.23
8.64	13.83
6.78	16.43
4.74	19.72

(Engel, Bull Soc 1891, (3) 6 16)

Solubility in $\text{KOH} + \text{Aq}$ at 20°

G KOH in 1 litre	G KCl in 1 litre	Sp gr	Degrees Baumé
10	293	1.185	22.5
20	285	1.185	22.5
30	276	1.190	23.0
40	265	1.192	23.0
50	255	1.195	23.5
60	245	1.200	24.0
70	236	1.200	24.0
80	226	1.205	24.5
90	219	1.205	24.5
100	211	1.210	25.0
110	205	1.210	25.0
120	199	1.215	25.5
130	192	1.215	25.5
140	185	1.220	26.0
150	178	1.225	26.5
160	171	1.225	26.5
170	165	1.230	27.0
180	159	1.235	27.5
190	153	1.240	28.0
200	148	1.245	28.5
210	142	1.250	29.0
220	137	1.255	29.5
230	133	1.260	30.0
240	128	1.265	30.5
250	124	1.270	30.8
260	120	1.275	31.3
270	115	1.280	31.7
280	112	1.285	32.0
290	108	1.290	32.5
300	104	1.295	33.0
310	100	1.300	33.5
320	96	1.305	34.0
330	93	1.310	34.2
340	89	1.315	34.6
350	85	1.320	35.0
360	81	1.325	35.5
370	78	1.330	36.0
380	74	1.335	36.3
390	71	1.340	36.7
400	68	1.345	37.1
410	64	1.350	37.5

Solubility in KOH+Aq at 20°—Continued

G KOH in 1 litre	G KCl in 1 litre	Sp gr	Degrees Baumé
420	61	1 355	38 0
430	58	1 360	38 5
440	55	1 365	38 9
450	53	1 370	39 2
460	50	1 375	39 5
470	47	1 380	40 0
480	44	1 385	40 2
490	42	1 390	40 6
500	40	1 397	41 0
510	38	1 405	41 5
520	35	1 410	42 0
530	33	1 415	42 3
540	31	1 420	42 6
550	29	1 425	43 0
560	27	1 430	43 5
570	25	1 435	43 7
580	24	1 440	44 0
590	23	1 445	44 3
600	22	1 450	44 6
610	21	1 455	45 0
620	20	1 460	45 5
630	18	1 465	45 9
640	17	1 470	46 2
650	16	1 475	46 5
660	15	1 480	46 8
670	15	1 485	47 0
680	15	1 490	47 5
690	15	1 495	47 9
700	14	1 500	48 2
710	14	1 505	48 5
720	13	1 510	48 8
730	13	1 515	49 1
740	13	1 520	49 5
750	13	1 525	49 7
760	12	1 530	50 0
770	12	1 535	50 3
780	12	1 540	50 6
790	11	1 545	51 0
800	11	1 550	51 3
810	10	1 560	51 5
820	10	1 565	51 8
830	9	1 570	52 2
840	9	1 575	52 6
850	9	1 580	53 0

(Winteler, Z Elektrochem, 1900, 7 360)

KCl+NaCl

100 pts KCl+NaCl+Aq sat at 13–16° contain 30 18 pts of the two salts (v Hauer)

100 pts H₂O dissolve 13 92 pts KCl and 30 65 pts NaCl at 15 6°, and solution has sp gr = 1 233 (Page and Keightley)

100 pts H₂O dissolve 10 11 pts KCl, 32 15 pts NaCl, and 4 69 pts K₂SO₄, and solution has sp gr = 1 250 (P and K)

100 pts H₂O dissolve 29 9 pts NaCl and 15 7 pts KCl at 18 8° (Rudorff)

Solubility of KCl+NaCl in H₂O at t° 100 pts H₂O dissolve pts KCl and pts NaCl

t°	Pts KCl	Pts NaCl	t°	Pts KCl	Pts NaCl
10	12 5	29 7	60	24 6	27 2
20	14 7	29 2	70	27 3	26 8
30	17 2	28 7	80	30 0	26 4
40	19 5	28 2	90	32 9	26 1
50	22 0	27 7	100	34 7	25 8

(Precht and Wittgen, B 14 1667)

100 pts H₂O dissolve 13 99 pts KCl+30 54 pts NaCl=44 53 pts mixed salts at 20° (Nicol, Phil Mag (5) 31 385)

Solubility of KCl in NaCl+Aq at 20°

G per 100 g H ₂ O	
NaCl	KCl
0 0	34 52
6 5	29 37
13 0	4 71
19 5	0 42

(Nicol, Phil Mag 1891, 31 369)

Solubility of KCl+NaCl at t°

t°	G per 100 g H ₂ O	
	KCl	NaCl
25	15 8	14 5
"	29 0	31 3
80	30 0	25 2
"	26 4	34 0

(Soch, J phys Ch 1898, 2 46)

Solubility of KCl+NaCl at °

G salts in 100 g H ₂ O		
NaCl	KCl	Solid phase
9 89	28 34	KCl
18 35	22 75	"
29 88	16 28	KCl+NaCl
31 57	10 91	NaCl
33 17	5 65	"

(Uyeda, Mem Col Sc Kyoto, 1910, 2 245)

100 g H₂O sat with NaCl dissolve 0 216 gram-equivalent KCl at 25°

100 g H₂O sat with K₂SO₄ dissolve 0 466 gram-equivalent KCl at 25° (Euler, Z phys Ch 1904, 49 315)

Solubility in NaCl+Aq at 20°, 30°, 40° and 91° Tables given in the original show that each salt diminishes the solubility of the other (Leather, Chem Soc 1915, 108 (2) 13)

Solubility of KCl+NaCl in HCl+Aq at 25°

% HCl	% NaCl	% KCl
0	19 95	10 90
8 61	10 65	7 58
17 16	3 56	3 80
20 65	2 03	2 86
32 73	0 18	1 27

(Hicks, J Am Chem Soc 1915, 37 846)

See also under NaCl

KCl+SrCl₂

100 pts H₂O dissolve 11 2 pts KCl and 48 6 pts SrCl₂ at 14 5° (v Hauer)

If SrCl₂+Aq sat at 14 5 is sat with KCl at same temp, 100 pts H₂O dissolve

KCl	33 2	11 2	50 7
SrCl ₂		48 6	
		59 8	

(Mulder, Scheik Verhandel 1864)

KCl+(NH₄)₂SO₄

Sat solution of KCl+(NH₄)₂SO₄ at b-pt when cooled to 14° has different composition from sat solution of (NH₄)Cl and K₂SO₄, and its composition is changed by warming it with either KCl or (NH₄)₂SO₄ (Rudorff)

KCl+K₂SO₄

100 pts H₂O contain the following amounts salt at 18 75° (1) sat with KCl alone, (2) sat first with KCl then with K₂SO₄, (3) sat with K₂SO₄ and KCl together, (4) sat first with K SO₄ then with KCl, (5) sat with K₂SO₄ alone

	1	2	3	4	5
KCl	34 5	32 96	33 12	33 12	10 9
K ₂ SO ₄		1 79	1 75	1 83	

(Karsten)

100 pts H₂O sat with both K₂SO₄ and KCl contain the following amounts

	At 14 8		
KCl	33 5	28 2	10 3
K ₂ SO ₄		2 0	

	At 14 8		
KCl	33 6	27 9	10 4
K SO ₄		2 3	

	At 16 1		
KCl	33 6	27 1	10 4
K ₂ SO ₄		3 3	

(Kopp, A 34 264)

Sat K₂SO₄+Aq dissolves KCl only with pptn of K₂SO₄, but sat KCl+Aq dissolves some K₂SO₄ without any separation (Karsten)

Solubility of KCl+K₂SO₄ 100 pts H₂O dissolve at t°

t	Pts KCl	Pts K ₂ SO ₄	t°	Pts KCl	Pts K ₂ SO ₄
10	30 9	1 32	60	43 8	1 94
20	33 4	1 43	70	46 5	2 06
30	36 1	1 57	80	49 2	2 21
40	38 7	1 68	90	52 0	2 38
50	41 3	1 82	100	54 5	2 53

(Precht and Wittgen)

100 g H₂O dissolve 34 76 g KCl+2 93 g K₂SO₄ at 25° (Van't Hoff and Meyerhoffer, Z phys Ch 1898, 27 75)

Sol in 20% KC₂H₃O₂+Aq (Stromeyer) Quickly attacked by liquid NO₂ in the presence of traces of moisture, with evolution of Cl₂ (Frankland, Chem Soc 1901, 79 1361)

Sl sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 829)

Easily sol in liquid HF (Franklin, Z anorg 1905, 46 2)

100 g hydrazine dissolves 8 5 pts KCl at 12 5-13° (de Bruyn, R t c 1899, 18 297)

100 g anhyd hydroxylamine dissolve 12 3 g KCl at 17-18° (de Bruyn, Z phys Ch 1892, 10 782)

100 pts alcohol of 0 900 sp gr dissolve 4 62 pts 0 872 1 66 pts 0 834 0 38 pt 0 817 0 00 pt KCl (Kirwan)

Sol in 48 pts boiling alcohol (Wenzel)

Insol in absolute alcohol containing LiCl (Mitscherlich)

At 15°, 100 pts alcohol of p percentage by volume (S=sp gr) dissolve pts KCl as follows

p	10	20	30	40
S	0 984	0 972	0 958	0 940
KCl	19 8	14 7	10 7	7 7

p	50	60	80
S	0 918	0 896	0 848
KCl	5 0	2 8	0 45

(Schiff, A 118 365)

100 pts of a mixture of 40% alcohol with 60% H₂O dissolve 9 2 pts KCl at 15° (Schiff)

Insol in absolute alcohol or in 96% alcohol at 15° or below At 20°, 100 pts of the latter dissolve 0 04 pt, at 25°, 0 06 pt, at 30°, 0 20 pt KCl Dilute alcohol dissolves less KCl than the contained H₂O would dissolve by itself

Solubility in dil alcohol D = sp gr of alcohol, S = solubility in 100 pts alcohol at t°

D = 0.9904		D = 0.9848		D = 0.9793		D = 0.9726	
t°	S	t	S	t°	S	t°	S
0	23.2	4	20.9	4	16.4	3	12.2
4	24.8	20	25.5	21	20.3	5	12.7
22	29.4	27	26.6	28	22.0	16	15.4
25	30.2	30	27.5	43	25.6	20	16.1
34	32.8	37	29.0			25	17.3
52	37.5	60	35.2			34	19.0

D = 0.9573		D = 0.9390		D = 0.8967		D = 0.8244	
t°	S	t°	S	t°	S	t°	S
10	8.8	2	4.2	12	2.87	4	0.00
11	9.0	7	5.1	31	4.35	15	0.00
17	10.3	16	6.4	47	4.88	20	0.04
30	12.5	30	8.5	65	5.65	25	0.06
40	13.9	38	9.6			32	0.20
60	16.7	57	11.3				

(Gerardin, A ch (4) 5 140)

Solubility of KCl in dil alcohol at 14.5°

Sp gr	100 ccm contain		
	Alcohol	Water	KCl
1.1720		88.10	29.10
1.1542		85.78	26.85
1.1365	2.79	84.00	24.67
1.1075	4.98	79.63	20.56
1.1085	10.56	75.24	17.24
1.0545	15.57	70.52	14.27
1.0455	20.66	67.05	13.25
0.9695	24.25	50.18	6.35
0.9315	40.42	40.60	3.82
0.8448	48.73	15.55	0.30

(Bodlander, Z phys Ch 7 316)

Solubility of KCl in ethyl alcohol

(G KCl per 100 g alcohol + Aq)

Wt % alcohol	at 30°		Wt % alcohol	at 40°	
	at 30	at 40		at 30°	at 40°
0	38.9	41.8	43.1	11.1	13.1
5.28	33.9	35.9	55.9	6.8	8.2
9.43	30.2	33.3	65.9	3.6	4.1
16.9	24.9	27.6	78.1	1.3	1.6
25.1	19.2	21.8	86.2	0.4	0.5
34.1	15.6	17.2			

(Bathrick, J phys Ch 1896, 1 160)

Solubility of KCl in ethyl alcohol at 0°

Concentration of alcohol Mol g alcohol per 1000 g H ₂ O	Solubility in 1000 g H ₂ O	Molecular solubility
0.25	285.15	3.80
0.50	277.95	3.73
1.00	271.10	3.64
3.00	265.50	3.45
	208.80	2.81

(Armstrong and Eyre, Proc Roy Soc 1910, (A) 84 127)

Solubility of KCl in ethyl alcohol + Aq at 25°

Wt % alcohol	G KCl per 100 cc sat solution	Wt % alcohol	G KCl per 100 cc sat solution
0	31.18	60	4.18
10	23.93	70	2.27
20	17.89	80	0.93
30	13.27	90	0.31
40	9.40	100	0.08
50	6.26		

(McIntosh, J phys Ch 1903, 7 350)

100 pts absolute methyl alcohol dissolve 0.5 pt at 18.5°, 100 pts absolute ethyl alcohol dissolve 0.034 pt at 18.5° (de Bruyn, Z phys Ch 10 783)
100 pts 40% wood alcohol dissolve 9.2 pts KCl (Schiff)

Solubility of KCl in methyl alcohol + Aq at 25°

P = % by wt of alcohol in alcohol + Aq
S = Sp gr alcohol + Aq sat with KCl
L = millimols KCl in 100 ccm of the solution

P	S 25°/4	L
0	1.1782	417.4
10.6	1.125	329
30.8	1.033	183
47.1	0.9679	102
64.0	0.9064	46.1
78.1	0.8607	20.6
98.9	0.8242	9.9
100	0.7937	5.7

(Herz and Anders, Z anorg 1907, 55 273)

Solubility of KCl in methyl alcohol

t°	Concentration of alcohol Mol g alcohol per 1000 g H ₂ O	Solubility 1 in 1000 g H ₂ O	Molecular solubility
0		283 55	3 81
"	0 25	280 00	3 76
"	0 50	276 35	3 71
"	1 00	267 85	3 60
"	3 00	238 10	3 18
25		364 15	4 89
"	0 25	361 90	4 86
"	0 50	357 10	4 79
"	1 00	348 70	4 67
"	3 00	324 15	4 35

(Armstrong and Eyre, Proc Roy Soc 1910
(A) 84 127)

At room temp 1 pt by weight is sol in
200 pts methyl alcohol, D₁₅ 0 7990
750 " ethyl " D₁₅ 0 8035

Insol in propyl alcohol (Rohland, Z
anorg 1899, 18 325)
100 g methyl alcohol dissolve 0 53 g KCl
at 25°
100 g ethyl alcohol dissolve 0 022 g KCl
at 25°
100 g propyl alcohol dissolve 0 004 g KCl
at 25°
100 g isoamyl alcohol dissolve 0 0008 g
KCl at 25°

(Turner and Bissett, Chem Soc 1913, 103
1909)

Insol in propyl alcohol (Schlamp, Z
phys Ch 1894, 14 276)

Solubility of KCl in propyl alcohol

t	Concentration of alcohol Mol g per 1000 g H ₂ O	Solubility in 1000 g H ₂ O	Molecular solubility
0		283 55	3 81
"	0 25	274 10	3 68
"	0 50	265 45	3 56
"	1 00	248 0	3 33
25		365 10	4 90
"	0 25	355 40	4 77
"	0 50	347 70	4 67
"	1 00	331 50	4 45

(Armstrong and Eyre, Proc Roy Soc 1910,
(A) 84 127)

Insol in fusel-oil (Gooch, Am Ch J 9
53)

Very sl sol in mixture of equal pts ab-
solute alcohol and ether (Berzelius)

500 mg KCl treated with 10 g of above
mixture yield only 0 3 mg to the liquid
(Lawrence Smith, Am J Sci 16 56)

Insol in acetone (Krug and M'Elroy, J
Anal Ch 6 184, Eidmann, C C 1899, II
1014)

Solubility of KCl in acetone+Aq at t°

t°	% acetone	100 g of the solution contain		
		G H ₂ O	G acetone	G KCl
30	0	72 73	0 00	27 27
	5	71 15	3 74	25 11
	9 09	69 62	6 96	23 42
	20	64 88	16 22	18 90
	30	59 49	25 45	15 06
	40	53 17	35 52	11 31
	50	45 98	45 98	8 04
	60	37 97	56 91	5 12
	70	29 22	68 18	2 60
	80	19 82	79 43	0 76
	90	9 98	89 88	0 13
	100	0 00	100 00	0 00
40	0	71 31	0 00	28 69
	5	69 62	3 67	26 72
	9 09	67 88	6 79	25 33
	15	65 15	11 51	32 34
	20	62 97	15 75	21 28
	30	59 81	25 45	14 74
	40	53 17	35 52	11 31
	50	45 98	45 98	8 04
	60	37 97	56 91	5 12
	70	29 22	68 18	2 60
	80	19 82	79 43	0 76
	90	9 98	89 88	0 13
	100	0 00	100 00	0 00

Since there is but one liquid phase here,
these figures represent the solubility of KCl in
acetone+Aq at 30° and 40°

(Snell, J phys Chem 1898, 2 484)

The addition of KCl to mixtures of acetone
and H₂O will cause a division into
two layers. The following table gives
the temp at which sat solutions of KCl
in acetone+Aq of varying concentra-
tions separate into two layers and also
the compositions of the sat solutions of
KCl in acetone+Aq

% acetone	Temp of division	100 g of solution contain		
		G H ₂ O	G acetone	G KCl
26	46 5°			
30	40 0	59 36	25 44	15 20
40	34 2	53 21	35 47	11 32
50	32 6	45 97	45 97	8 06
60	33 3	37 86	56 80	5 34
70	35 5	29 09	68 25	2 66
75	39 0			
80	45 6	19 80	79 20	1 00

(Snell)

The following table gives the compositions of the solutions of KCl in acetone+Aq at the points at which the solution just divides into two layers Temp = 40°

100 g of the solution contain		
G H ₂ O	G acetone	G KCl
56 68	28 63	14 68
53 05	35 67	11 29
50 34	39 82	9 83
47 60	43 83	8 58
44 35	48 36	7 29
42 68	50 75	6 57
38 53	56 26	5 21
36 59	58 84	4 57
32 37	64 18	3 45
30 62	66 43	2 95
28 12	69 45	2 44

(Snell)

The addition of KCl to aqueous acetone causes the separation of the liquid into two layers The following table gives the composition of these layers at 40°

Upper layer contains per 100 g of solution		
G H ₂ O	G acetone	G KCl
55 20	31 82	12 99
54 27	36 69	12 03
53 27	35 44	11 29
51 69	37 76	10 55
51 23	48 50	10 27
50 34	39 88	9 77
49 08	41 67	9 26
48 02	43 18	8 79
47 62	43 73	8 64
46 49	45 34	8 17
45 65	46 52	7 83
45 64	46 57	7 79
58 99	25 24	15 77

Lower layer contains per 100 g of solution

G H ₂ O	G acetone	G KCl
28 14	69 42	2 44
29 45	67 83	2 72
30 96	65 97	3 07
31 83	64 83	3 33
32 64	63 79	3 56
34 07	62 01	3 92
35 27	60 49	4 24
37 44	57 67	4 89
38 00	56 96	5 04
38 68	56 17	5 25
39 98	54 36	5 66
40 41	53 78	5 81
23 66	74 91	1 43

(Snell)

Solubility in acetone+Aq at 20°
A = ccm acetone in 100 ccm acetone+Aq
KCl = millimols KCl in 100 ccm of the solution

A	KCl
0	410 5
10	351 7
20	286 6
30	223 7
40	166 5
50	115 4
60	71 2
70	38 5
80	12 9
90	2 0
100	

(Herz and Knoch, Z anorg 1904, 41 317)

Solubility of KCl in glycerine+Aq at 25°

G = g glycerine in 100 g glycerine+Aq
KCl = millimols KCl in 100 cc of the solution

G	KCl	Sp gr
0	424 5	1 1800
13 28	383 4	1 1848
25 98	339 3	1 1935
45 36	271 4	1 2106
54 23	238 5	1 2189
83 84	149 0	1 2590
100	110 6	1 2860

(Herz and Knoch, Z anorg 1905, 45 267)

Insol in CS₂ (Baeyer, Arctowski, Z anorg 1894, 6 257)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Solubility of KCl in organic compounds +Aq at 25°

Compound	G comp per l H ₂ O	C KCl per 100 g sat solution
Water		26 89
Acetaldehyde	11 01	27 05
Paraldehyde	11 07	26 42
Glycerol	13 01	25 58
Glycol	15 51	26 43
"	62 05	25 26
Mannitol	45 53	24 86
"	136 59	24 46

(Armstrong and Eyre, Proc Roy Soc 1913, A, 88 234)

Solubility in pyridine+Aq at 10°

Solvent		100 g of the solution contain g KCl
H ₂ O	Pyridine	
100	0	23 79
90	10	19 76
80	20	16 37
70	30	13 19
60	40	10 05
50	50	6 34
40	60	3 335
30	70	1 245
20	80	0 24
10	90	0 039
0	100	

(Schroeder, J pr 1908, (2) 77 268)

Insol in anhydrous pyridine and in 97% pyridine+Aq

Very sl sol in 95% pyridine+Aq
Sl sol in 93% pyridine+Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

100 ccm of a sat solution of KCl in furfural at 25° contain 0 085 pts by wt KCl (Walden, Z phys Ch 1906, 55 713)

100 g H₂O dissolve 246 5 g sugar+44 8 g KCl at 31 25°, 100 g sat solution contain 62 28 g sugar+11 33 g KCl (Kohler, Z Ver Zuckerind, 1897, 47 447)

Solubility in glucose+Aq at 25°

Concentration of glucose in 9 mol per 1000 g H ₂ O	Solubility in 1000 g H ₂ O	Molecular solubility
	362 70	4 86
0 25	366 10	4 91
0 50	369 85	4 96
1 0	376 25	5 04
3 0	402 25	5 39

(Armstrong and Eyre, Proc Roy Soc 1910, 84 127)

Potassium manganic chloride, K₂MnCl₅

Sol in H₂O, less sol in NH₄Cl+Aq, un stable (Neuman, M 1894, 15 492)

Potassium rhodium chloride

See Chlororhodite, potassium

Potassium ruthenium sesquichloride

See Chlororuthenite, potassium

Potassium ruthenium trichloride

See Chlororuthenate, potassium

Potassium tellurium chloride

See Chlorotellurate, potassium

Potassium thallic chloride, 3KCl, 11Cl₃+2H₂O

Sol in H₂O Not decomp by boiling H₂O (Rammelsberg)

Potassium thorium chloride, KCl, 2ThCl₄+18H₂O

Deliquescent, sol in H₂O and alcohol (Berzelius)

Potassium tin (stannous) chloride (Potassium chlorostannite), KCl, SnCl₂+H₂O

Decomp by H₂O, sol in hot HCl or KCl+Aq (Remsen and Richardson, Am Ch J 14 90)

2KCl, SnCl₂+H₂O Partially decomp by dissolving in H₂O (Rammelsberg, Pogg 94 507)

+2H₂O Very sol in hot, and but slightly in cold HCl+Aq or KCl+Aq (Remsen and Richardson)

4KCl, SnCl₂+3H₂O (Poggiale, C R 20 1182)

Does not exist (Remsen and Richardson)

Potassium tin (stannic) chloride, 2KCl, SnCl₄

See Chlorostannate, potassium

Potassium tungsten chloride, K₂(OH)WCl₅

Decomp by moisture Insol in organic solvents (Olsson, B 1913, 46 581)

K₃W₂Cl₇ Sol in H₂O Nearly insol in most organic solvents (Olsson)

Potassium uranium chloride, UCl₄, 2KCl

Very hygroscopic, sol in H₂O with decomp, sol in acetic acid Decomp by alcohol Nearly insol in ether (Aloy, Bull Soc 1899, (3) 21 264)

Potassium uranyl chloride, K₂(UO₂)Cl₄

Very sol in H₂O Moderately sol in dil alcohol (Aloy, Dissert 1901)

+2H₂O Very sol in H₂O and alcohol (Arfvedson)

Sol in H₂O, with decomp and separation of KCl, unless H₂O is acidulated with HCl (Peligot, A ch (3) 5 37)

Solubility in H₂O at t°

t°	100 pts of the solution contain			Solid phase
	1 ts UO ₂	Pts Cl	Pts K	
0 8	38 57	13 59	3 86	UO ₂ Cl ₂ 2KCl 2H ₂ O +KCl
14 9	33 71	13 51		
17 5	37 36	14 50	5 27	
25 0	35 01	15 26		
41 5	35 27	15 92	7 39	
50 0	34 18	16 56		
60 0	34 19	17 25	9 14	UO ₂ Cl ₂ 2KCl 2H ₂ O
71 5	33 55	17 44	9 28	
78 5	35 26	18 24	9 95	

(Rimbach, B 1904, 37 463)

Potassium uranyl chloride is decomp by H_2O at temp below 60° . Above 60° , it is sol in H_2O without decomp

Potassium vanadium chloride, $VK_2Cl_5 + H_2O$

Difficultly sol in H_2O and alcohol (Stahler, B 1904, 37 4412)

Potassium yttrium chloride

Sol in H_2O with evolution of heat

Potassium zinc chloride, $2KCl, ZnCl_2$

Very deliquescent Sol in 1 pt cold, and in all proportions of hot H_2O (Pierre, A ch (3) 16 248)

+ H_2O Not very deliquescent Can be recryst (Ephraim, Z anorg 1908, 59 58)

$KCl, ZnCl_2 + 2H_2O$ Not deliquescent Cannot be recryst without decomp (Ephraim)

Potassium chloriodide, KCl_2I

Very unstable (Wells and Wheeler, Sill Am J 143 475)

KCl_2I Sol in H_2O with decomp Ether dissolves out ICl_3 (Filhol, J Pharm 25 433)

Potassium fluoride, KF or K_2F_2

Very deliquescent Very sol in H_2O SI sol in HF+Aq Easily sol in conc $KC_2H_3O_2$ +Aq Insol in alcohol (Berzelius) Sol in dilute alcohol (Stromeyer, A 100 83)

Sp gr of aqueous solution of KF at 18° containing—

	5	10	20	30	40% KF
	1.041	1.084	1.117	1.272	1.378

(Kohlrausch, W Ann 1879 1)

Solubility in HF+Aq at 21°

(G per 100 g H_2O)

HF	KF	HF	KF
0 0	96 3	13 95	31 4
1 21	72 0	15 98	33 4
1 61	61 0	17 69	35 6
3 73	40 4	20 68	38 4
4 03	32 5	28 60	46 9
6 05	30 4	41 98	61 8
9 25	29 9	53 71	74 8
11 36	29 6	74 20	105 0
12 50	30 5	119 20	169 5

(Ditte, C R 1896, 123 1282)

Easily sol in liquid HF (Franklin, Z anorg 1905, 46 2)

Very sl sol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

KF will "salt out" acetone from aqueous solution The table shows the composition of the solutions at the points at which inhomogeneous solutions of KF , acetone and H_2O just become homogeneous at 20°

100 g of the solution contain

G KF	G H_2O	G acetone	G KF	G H_2O	G acetone
5 75	58 91	35 34	0 61	31 95	67 44
5 00	56 28	38 72	0 50	29 92	69 58
3 84	52 25	43 91	28 42	69 76	1 82
3 06	49 05	47 89	25 74	71 24	3 02
2 61	46 84	50 55	22 35	72 99	4 66
2 22	44 79	52 99	20 28	73 80	5 90
14 95	73 66	11 39	18 71	74 10	7 19
11 46	70 77	17 77	16 31	73 97	9 72
9 17	67 30	23 53	12 40	72 01	15 59
7 72	64 01	28 27	33 86	65 73	0 397
7 07	62 03	30 90	29 97	68 54	1 50
6 43	60 50	33 07	22 05	73 41	4 54
1 38	40 55	58 06	17 82	74 01	8 16
0 979	36 42	62 60	14 34	73 29	12 37
0 693	32 69	66 61	44 24	55 52	0 240
0 57	31 50	67 93	33 34	65 66	1 00
0 89	35 74	63 36	29 86	68 54	1 60
0 75	33 84	65 41	24 38	72 16	3 45

At the first quadruple point where the hydrate, acetone, water and vapor are in equilibrium the upper layer contains 98% acetone, while the lower layer contains in 100 g, 46.3 g KF . A sat solution of KF will thus dehydrate acetone to the extent of 98%

(Frankforter and Cohen, J Am Chem Soc 1914, 36 1115)

Similar data are given for KF in ethyl and propyl alcohol by Frankforter and Frary (J phys Ch 1913, 17 402)

+ $2H_2O$ Very deliquescent (Guntz, A ch (6) 3 20)

Sat aq solution at 18° contains 45.3% KF (de Forcrand, C R 1911, 152 1210)

Sp gr of solution sat at $18^\circ = 1.502$, and contains 48% KF (Mylius and Funk, B 1897, 30 1718)

+ $4H_2O$ Not deliquescent (de Forcrand, C R 1911, 152 1075)

Sat aq solution at 18° contains 35.96% KF (de Forcrand, C R 1911, 152 1210)

Potassium hydrogen fluoride, $KF, HF = KHF_2$

Easily sol in H_2O SI sol in H_2O containing HF Easily sol in conc $KC_2H_3O_2$ + Aq Sol in dil alcohol, but insol in absolute alcohol

$KF, 2HF$ Deliquescent Decomp by H_2O with absorption of heat (Moissan, C R 106 547)

$KF, 3HF$ As above (Moissan)

Potassium manganic fluoride

See Fluomanganate, potassium

Potassium scandium fluoride, K_2ScF_6

Sol in H_2O Decomp by acids (R J Meyer, Z anorg 1914, 86 275)

Potassium silicon fluoride

See Fluosilicate, potassium

Potassium tantalum fluoride

See Fluotantalate, potassium

Potassium tellurium fluoride, KF, TeF_4

Decomp by H_2O (Hogbom, Bull Soc (2) 35 60)

Potassium thallic fluoride, $2TlF_3, KF$

Decomp by moisture Insol in HF (Gewecke, A 1909, 366 226)

Potassium thorium fluoride, $2KF, ThF_4 + 4H_2O$

Nearly insol in H_2O Sol in $HF + Aq$
 KF, ThF_4 Precipitate (Chydenius)

Potassium tin (stannous) fluoride, $2KF, 3SnF_2 + H_2O$

Sol in H_2O (Wagner, B 19 896)

Potassium tin (stannic) fluoride

See Fluostannate, potassium

Potassium titanium tetrafluoride

See Fluotitanate, potassium

Potassium titanium sesquifluoride, $4KF, 11F_6$

Precipitate Very sl sol in H_2O Sol in dil acids (Piccini, C R 97 1064)

See also Fluosessquititanate, potassium

Potassium titanyl fluoride

See Fluoxypertitanate, potassium

Potassium tungstyl fluoride

See Fluoxytungstate, potassium

Potassium uranium fluoride, KF, UFl_4

Insol in H_2O and dil acids Difficultly sol in conc $HCl + Aq$ Sol in conc H_2SO_4 (Bolton, J B 1866 212)

Potassium uranyl fluoride

See Fluoxyuranate, potassium

Potassium vanadium sesquifluoride

See Fluovanadate, potassium

Potassium vanadium tetrafluoride (?)

Easily sol in H_2O Insol in alcohol (Berzelius)

Potassium zinc fluoride, KF, ZnF

Sol in H_2O (R Wagner)

$2KF, ZnF_2$ Sol in H_2O (Berzelius)

Potassium zirconium fluoride

See Fluozirconate, potassium

Potassium fluoride hydrogen peroxide, KF, H_2O_2

Not hygroscopic Very sol in H_2O Is not decomp at 70° and only partially so at 110° (Tanatar, Z anorg 1901, 28 255)

Potassium fluoride vanadic acid

See Fluoxyvanadate, potassium

Potassium hydride, KH

Decomp by H_2O Insol in oil of turpentine, benzene, ether and CS_2 (Moissan, C R 1902, 134 18)

Potassium hydrosulphide, KSH

Very deliquescent, and sol in H_2O with gradual decomp Crystallizes with $\frac{1}{2}H_2O$ Sol in alcohol

Potassium hydroxide, KOH

Very deliquescent, and sol in H_2O with evolution of much heat 100 pts KOH , exposed over H_2O at $16-20^\circ$ take up 460 pts H_2O in 56 days (Mulder)

1 pt KOH dissolves in 0.5 pt cold H_2O (Lowitz) in 0.47 pt cold H_2O (Bineau C R 41 509) in 1 pt H_2O (Abl)

Solubility of KOH in H_2O at t°

t°	G KOH per 100 g		Solid phase
	H_2O	solution	
—22	3 7	3 6	Ice
—20 7	22 5	18 4	
—65 2	44 5	30 8	
—36 2	36 2	26 6	$KOH 4H_2O$
—32 7	77 94	43 8	
—33	80	44 4	
—23 2	85	45 9	$KOH 4H_2O + KOH 2H_2O$
0	97	49 2	
10	103	50 7	
15	107	51 7	$KOH 2H_2O + KOH H_2O$
20	112	52 8	
30	126	55 76	
32 5	135	57 44	$KOH H_2O$
50	140	58 33	
100	178	64 03	
125	213	68 06	
143	311 7	75 73	

(Pickering, Chem Soc 1893, 63 908)

100 pts KOH are sol in 93.4 pts H_2O at 15° or 100 pts H_2O dissolve 107 pts KOH at 15° Sp gr = 1.5355 at 15°

All higher values found in solubility tables are incorrect (Ferchland, Z anorg 1902, 30 133)

100 g sat aq solution at 15° contain 50.48 g KOH (de Forcrand, C R 1909, 149 719)

Sat KOH+Aq boils at 157.7° (Griffiths), 340° (Gerlach)

B-pt of KOH+Aq containing pts KOH to 100 pts H₂O

B-pt	Pts KOH	B pt	Pts KOH
105°	20 5	215°	210 5
110	34 5	220	219 8
115	46 25	225	230 0
120	57 5	230	240 9
125	67 5	235	251 9
130	76 8	240	263 1
135	85 0	245	274 4
140	92 5	250	285 7
145	99 8	255	298 5
150	106 5	260	312 5
155	114 05	265	328 0
160	121 7	270	343 5
165	129 35	275	359 0
170	137 0	280	375 0
175	144 8	285	391 0
180	152 6	290	408 2
185	160 4	295	425 5
190	168 2	300	444 4
195	176 5	310	484 0
200	185 0	320	526 3
205	193 5	330	571 5
210	202 0	340	623 6

(Gerlach, Z anal 26 464)

Sp gr and b-pt of KOH+Aq according to Dalton

% K ₂ O	Sp gr	B pt	% K ₂ O	Sp gr	B pt
4 7	1 06	100 56°	36 8	1 44	123 89°
9 5	1 11	101 11	39 6	1 47	129 44
13 0	1 15	101 66	42 9	1 52	135 56
16 2	1 19	103 33	46 7	1 60	143 33
19 5	1 23	104 44	51 2	1 68	160 00
23 4	1 28	106 66	56 8	1 78	188 22
26 3	1 33	109 44	63 6	1 88	215 56
29 4	1 36	112 22	72 4	2 00	315 56
32 4	1 39	115 56	84 0	2 2	red heat
34 4	1 42	118 89	100	2 4	

Sp gr of KOH+Aq at 15

% K ₂ O	Sp gr	% K ₂ O	Sp gr	% K ₂ O	Sp gr
0 568	1 0050	10 750	1 1059	20 935	1 2268
1 697	1 0153	11 882	1 1182	21 500	1 2342
2 829	1 0260	13 013	1 1308	22 632	1 2493
3 961	1 0369	14 145	1 1437	23 764	1 2648
5 002	1 0478	15 277	1 1568	24 895	1 2805
6 224	1 0589	16 408	1 1702	26 027	1 2966
7 355	1 0703	17 540	1 1839	27 158	1 3131
8 487	1 0819	18 671	1 1979	28 290	1 3300
9 619	1 0938	19 803	1 2122		

(Zimmerman N J Pharm 18 2 5)

Sp gr of KOH+Aq

% K ₂ O	Sp gr	% K ₂ O	Sp gr	% K ₂ O	Sp gr
2 44	1 02	23 14	1 22	37 97	1 42
4 77	1 04	24 77	1 24	40 17	1 44
7 02	1 06	26 34	1 26	42 31	1 46
9 20	1 08	27 86	1 28	44 40	1 48
11 28	1 10	29 34	1 30	46 45	1 50
13 30	1 12	30 74	1 32	48 46	1 52
15 38	1 14	32 14	1 34	50 09	1 54
17 40	1 16	33 46	1 36	51 58	1 56
19 34	1 18	34 74	1 38	53 06	1 58
21 25	1 20	36 99	1 40		

(Richter)

Sp gr of KOH+Aq at 15° a=sp gr if % is K₂O, b=sp gr if % is KOH

%	a	b	%	a	b
1	1 010	1 009	31	1 370	1 300
2	1 020	1 017	32	1 385	1 311
3	1 030	1 025	33	1 403	1 324
4	1 039	1 033	34	1 418	1 336
5	1 048	1 041	35	1 431	1 349
6	1 058	1 049	36	1 445	1 361
7	1 068	1 058	37	1 460	1 374
8	1 078	1 065	38	1 475	1 387
9	1 089	1 074	39	1 490	1 400
10	1 099	1 083	40	1 504	1 411
11	1 110	1 092	41	1 522	1 425
12	1 121	1 110	42	1 539	1 438
13	1 132	1 111	43	1 564	1 450
14	1 143	1 119	44	1 570	1 462
15	1 154	1 128	45	1 584	1 472
16	1 166	1 137	46	1 600	1 488
17	1 178	1 146	47	1 615	1 499
18	1 190	1 155	48	1 630	1 511
19	1 202	1 166	49	1 645	1 527
20	1 215	1 177	50	1 660	1 539
21	1 230	1 188	51	1 676	1 552
22	1 242	1 198	52	1 690	1 565
23	1 256	1 209	53	1 705	1 578
24	1 270	1 220	54	1 720	1 590
25	1 285	1 230	55	1 733	1 604
26	1 300	1 241	56	1 746	1 618
27	1 312	1 252	57	1 762	1 630
28	1 326	1 264	58	1 780	1 641
29	1 340	1 278	59	1 795	1 655
30	1 355	1 288	60	1 810	1 667

(Calculated by Gerlach, Z anal 8 279, after Zimmermann, N J Pharm 18, 2 5, and Schiff, A 107 300)

Sp gr of KOH+Aq at 15°

% KOH	Sp gr	% KOH	Sp gr
4 2	1 0382	21 0	1 2008
8 4	1 0776	25 2	1 2439
12 6	1 1177	29 4	1 2880
16 8	1 1588		

(Kohlrausch, W Ann 1879 1)

Sp gr of KOH+Aq at 15°

% KOH	Sp gr	% KOH	Sp gr
10	1 077	50	1 539
20	1 175	60	1 667
30	1 288	70	1 790
40	1 411		

(Gerlach, Z anal 27 275, calculated from Schiff, A 107 300)

Sp gr of K₂O+Aq at 15°

% K ₂ O	Sp gr	% K ₂ O	Sp gr
5	1 054	30	1 358
10	1 111	35	1 428
15	1 171	40	1 500
20	1 231	45	1 576
25	1 294		

(Hager, Adjumenta varia, Leipsic, 1876)

Sp gr of KOH+Aq at 20° containing 2 mols KOH to 100 mols H₂O=1 05325 (Nicol, Phil Mag (5) 16 122)

Sp gr of KOH+Aq at 15°

% KOH	Sp gr	% KOH	Sp gr	% KOH	Sp gr
52	1 53822	34	1 33313	16	1 14925
51	1 52622	33	1 32236	15	1 13955
50	1 51430	32	1 31166	14	1 12991
49	1 50245	31	1 30102	13	1 12031
48	1 49067	30	1 29046	12	1 11076
47	1 47896	29	1 27997	11	1 10127
46	1 46733	28	1 26954	10	1 09183
45	1 45577	27	1 25918	9	1 08240
44	1 44429	26	1 24888	8	1 07302
43	1 43289	25	1 23866	7	1 06371
42	1 42150	24	1 22849	6	1 05443
41	1 41025	23	1 21838	5	1 04517
40	1 39906	22	1 20834	4	1 03593
39	1 38793	21	1 19837	3	1 02671
38	1 37686	20	1 18839	2	1 01752
37	1 36586	19	1 17855	1	1 00834
36	1 35485	18	1 16875	0	0 99918
35	1 34396	17	1 15898		

(Pickering, Phil Mag 1894, (5) 37 375)

Sp gr of N solution at 18°/4°=1 0481 (Loomis, W Ann 1896, 60 55)

Sp gr of KOH+Aq

% KOH	6 87	12 10
Sp gr 20°/20°	1 0601	1 1025

(Le Blanc and Rohland, Z phys Ch 1896, 19 272)

KOH+Aq containing equal pts of KOH and H₂O freezes at -54° (Guyton-Morveau, Gm-K 2, 1 18)

KOH is completely miscible with NaOH and with RbOH in both the liquid and the solid states (Hevesy, Z phys Ch 1910, 73 667)

Insol in liquid NH₃ (Franklin, Am Ch J 1898, 20 828)

Abundantly sol in strong alcohol or wood-spirit

See below under KOH+2H₂O

Readily sol in glycerine

Sol in not less than 25 pts of ether (Boullay) Sol in much more than 25 pts of ether (Connell)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Insol in acetone Readily sol in fusel oil

Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Sol in aqueous solution of mannite (Favre, A ch (3) 11 76)

The composition of the hydrates formed by KOH at different dilutions is calculated from determinations of the lowering of the fr-pt produced by KOH and of the conductivity and sp gr of KOH+Aq (Jones, Am Ch J 1905, 34 337)

+H₂O

+2H₂O Very deliquescent, and sol in H₂O with absorption of much heat

100 g sat solution in H₂O at 30° contain 55 75 g anhyd KOH (de Waal, Dissert 1910)

Solubility of KOH+2H₂O in alcohol+Aq at 30°

% KOH	% alcohol	% H ₂ O
55 75	0	44 25
54 81	0 43	44 76
		*
31 0	57 50	11 50
25 99	65 07	5 94
27 67	69 92	2 41
27 20	73 01	negative
26 25	81 98	"

*Separates into two layers

(de Waal, Dissert, 1910)

+4H₂O

Potassium hydrogen titanium diimide,
 $Ti(NH)NK$

Decomp by H_2O and alcohol Insol in all ord indifferent organic solvents (Ruff, B 1912, 45 1371)

Potassium iodide, KI

Deliquescent only in very moist air Very sol in H_2O with absorption of heat

The temp of H_2O can be lowered 24° by dissolving KI (Baup)

140 pts KI dissolved in 100 pts H_2O at 10.8° lower the temp 22.5° (Rudorff, Pogg 136 276)

100 pts H_2O dissolve 126.6 pts KI at 0° (Kremers), 127.8 pts KI at 0° (Mulder), 127.9 pts KI at 0° (Gerardin)

By boiling, 100 pts H_2O dissolve 221 pts KI at 120° (Baup), 222.2 pts KI at 120° (Gay-Lussac), 222.6 pts KI at 118.4° (Mulder), 223.58 pts KI at 117° (Legrand), 223.6 pts KI at 117° (Gerardin)

Between these temps the solubility increases proportional to temp

Sol in 0.735 pt H_2O at 12.5° in 0.709 pt H_2O at 16° in 0.7 pt H_2O at 18° in 0.45 pt H_2O at 120° (Graham Otto)

100 pts KI + Aq sat at 15.16° contain 58.07 pts KI (v Hauer J pr 98, 137)

100 pts H_2O at 12.5° dissolve 136 pts KI at 16° 141 pts KI (Baup)

100 pts H_2O at 18° dissolve 143 pts KI at 120° 271 pts (Gay Lussac)

Sol in 0.79 pt H_2O at 0° in 0.70 pt H_2O at 20° in 0.63 pt H_2O at 48° in 0.57 pt H_2O at 60° in 0.53 pt H_2O at 80° in 0.51 pt H_2O at 100° (Kremers Pogg 97 15)

Sol in 0.71 pt H_2O at 15° (Eder, Dingl 221 89)

Solubility of KI in 100 pts H_2O at t°

t°	Pts KI	t°	Pts KI	t	Pts KI
0	127.9	19	143.4	38	159
1	128.7	20	144.2	39	160
2	129.6	21	145.1	40	160
3	130.4	22	145.9	41	161
4	131.2	23	146.7	42	162
5	132.1	24	147.5	43	163
6	132.9	25	148.3	44	164
7	133.7	26	149.1	45	164
8	134.5	27	149.9	46	165
9	135.3	28	150.7	47	166
10	136.1	29	151.5	48	167
11	137.0	30	152.3	49	168
12	137.8	31	153	50	168
13	138.6	32	154	51	169
14	139.4	33	155	52	170
15	140.2	34	156	53	171
16	141.0	35	156	54	172
17	141.8	36	157	55	172
18	142.6	37	158	56	173

Solubility of KI in 100 pts, etc—Continued

t°	Pts KI	t°	Pts KI	t°	Pts KI
57	174	78	191	99	208
58	175	79	192	100	209
59	175	80	192	101	210
60	176	81	193	102	211
61	177	82	194	103	212
62	178	83	195	104	213
63	179	84	196	105	213
64	180	85	197	106	214
65	180	86	197	107	215
66	181	87	198	108	216
67	182	88	199	109	217
68	183	89	200	110	218
69	184	90	201	111	219
70	184	91	202	112	220
71	185	92	202	113	220
72	186	93	203	114	221
73	187	94	204	115	222
74	188	95	205	116	223
75	188	96	206	117	223.6
76	189	97	207		
77	190	98	208		

(Mulder, calculated from his own and other observations, Scheik Verhandel 1864 63)

Solubility of KI in 100 pts H_2O at t°

t°	Pts KI	t	Pts KI	t°	Pts KI
-22.65	107.2	21.05	143.3	71.1	183.5
-22.35	106.6	25.6	146.6	74.75	185.6
-16.8	111.1	29.1	149.6	81.6	192.0
-11.35	116.3	37.3	156.7	86.35	194.6
-5.9	120.4	42.3	160.3	93.5	200.3
0	126.1	45.75	163.6	100.7	205.6
+3.25	130.1	51.8	167.6	110.2	216.1
9.55	134.0	55.05	169.1	113.7	218.8
12.75	137.1	60.55	173.4		
12.9	137.9	65.0	178.3		

(Coppet, A ch (5) 30 417)

Solubility is represented by a straight line of the formula $126.23 + 0.8088t$ (Coppet)

Solubility of KI in 100 pts H_2O at high temp

t°	Pts KI	t	Pts KI
124	233.9	144	264.6
133	249.3	175	310.4

(Tilden and Shenstone, Phil Trans 1884 23)

If solubility S = pts KI in 100 pts solution, $S = 55.8 + 0.122t$ from 0° to 165° (Étard, C R 98 1432)

Sat KI+Aq contains % KI at t°

t°	% KI	t°	% KI
-21	50.7	78	64.8
-21	51.0	96	66.9
-21	51.2	150	70.6
-19	52.2	151	70.9
-15	53.2	175	71.6
-9	54.5	176	72.7
0	56.9	190	73.8
+21	59.3	193	74.5
44	60.8	213	75.7
72	64.3		

(Étard, A ch 1894, (7) 2, 542)

Solubility of KI in 100 g H₂O at t°

t°	g KI	t	g KI
-1	122.2	-11.5	64.7
-5	119.8	-9.5	51.5
-4	117.4	-7	42.6
-10	115.1	-6	34.4
-14	75.8	-5	25.7

(Meusser, Z anorg 1905, 44 80)

102.70 pts by weight are contained in 100 cc KI+Aq sat at 25°, or 59.54 pts in 100 g of solution, sp gr = 1.7254

94.05 pts by weight are contained in 100 cc KI+Aq sat at 0°, or 56.34 pts in 100 g of solution, sp gr = 1.6699 (Walden, Z phys Ch 1906, 55 715)

Solubility of KI in H₂O at low temperatures

t	% KI	Solid phase	t	% KI	Solid phase
-12.5	38	Ice	-22	52.1	KI
-15	41.2	"	-20	52.6	"
-17	54.6	"	-15	53.5	"
-20	48	"	-10	54.5	"
-22	55.1	"	-5	55.4	"
-23	51.9	" + KI	0	56.4	"

(Kremann and Kershbaum, Z anorg 1907, 56 218)

149.26 g KI dissolve in 100 g H₂O at 25° (Amadori and Pampunni, Rend Acc Line 1911, V, 20 473)

60.39 g in 100 g KI+Aq sat at 25° (Parsons and Whittemore, J Am Chem Soc 1911, 33 1934)

56.1 g in 100 g KI+Aq sat at 0°, 60.35 g in 100 g KI+Aq sat at 30° (Van Dam and Donk, Chem Weekbl 1911, 8 848)

Sp gr of KI+Aq at 21°

% KI	Sp gr	% KI	Sp gr	% KI	Sp gr
1	1.0075	21	1.1807	41	1.4224
2	1.0151	22	1.1911	42	1.4371
3	1.0227	23	1.2016	43	1.4520
4	1.0305	24	1.2122	44	1.4671
5	1.0384	25	1.2229	45	1.4825
6	1.0464	26	1.2336	46	1.4982
7	1.0545	27	1.2445	47	1.5142
8	1.0627	28	1.2556	48	1.5305
9	1.0710	29	1.2699	49	1.5471
10	1.0793	30	1.2784	50	1.5640
11	1.0877	31	1.2899	51	1.5810
12	1.0962	32	1.3017	52	1.5984
13	1.1048	33	1.3138	53	1.6162
14	1.1136	34	1.3262	54	1.6343
15	1.1226	35	1.3389	55	1.6528
16	1.1318	36	1.3519	56	1.6717
17	1.1412	37	1.3653	57	1.6911
18	1.1508	38	1.3791	58	1.7109
19	1.1605	39	1.3933	59	1.7311
20	1.1705	40	1.4079	60	1.7517

(Schiff, A 110 75)

Sp gr of KI+Aq, S=according to Schiff (A 108 340) at 21°, K=according to Kremers (Pogg 96 62), interpolated by Gerlach (Z anal 8 285)

5 10 15 20 25 30% KI,
S 1.038 1.079 1.123 1.171 1.219
K 1.038 1.078 1.120 1.166 1.218 1.271

35 40 45 50 55 60% KI
S 1.483
K 1.331 1.396 1.469 1.546 1.636 1.734

Sp gr of KI+Aq at 18°

% KI	Sp gr	% KI	Sp gr	% KI	Sp gr
5	1.0363	30	1.273	55	1.630
10	1.0762	40	1.3966		
20	1.1679	50	1.545		

(Kohlrausch, W Ann 1879 1)

Sp gr of KI+Aq at 18°

% KI	Sp gr
1.044	1.0062
5.0	1.0363

(Giotrian, W Ann 1883, 18 191)

Sp gr at 16°/4° of KI+Aq containing 32.4875% KI = 1.30238 (Schonrock, Z phys Ch 1893, 11 781)

KI+Aq containing 9.35% KI has sp gr 20°/20° = 1.0726

KI+Aq containing 11.35% KI has sp gr 20°/20° = 1.0892 (Le Blanc and Rohland, Z phys Ch 1896, 19 278)

B-pt of KI+Aq containing pts KI to 100
pts H₂O

B pt	Pts KI	B pt	Pts KI	B pt	Pts KI
101°	15	108°	111 5	115	185°
102	30	109	123	116	195
103	45	110	134	117	205
104	60	111	145	118	215
105	74	112	155	118 5	220
106	87	113	165		
107	99 5	114	175		

(Gerlach, Z anal **26** 439)

Sat KI+Aq boils at 119° (Kremers)

Sat KI+Aq forms a crust at 117 5°, and contains 210 pts KI to 100 pts H₂O, highest temp observed, 118 5° (Gerlach, Z anal **26** 426)

Solubility of KI in I₂+Aq at 25°

KI mol /l	I g atoms/l
6 15	0 00
6 23	3 64
6 40	11 11
6 36	13 16
6 33	13 2
6 24	17 03

(Abegg, Z anorg 1906, **50** 428)

Solubility of KI+I₂ in H₂O at 25°

% KI	% I	Sold phase	% KI	% I	Sold phase
29 45	64 34	KI+KI ₃	25 88	68 79	KI ₃ +I ₂
28 91	63 88	"	25 57	69 01	"
26 84	66 54	KI ₃ +KI ₇	27 86	66 56	KI ₃
27 18	67 14	"	27 27	66 91	"
27 14	66 60	"	26 95	67 17	KI ₇
			25 71	67 91	"

(Foote and Chalker, Am Ch J 1908, **39** 564)

See also under Iodine

KI+Aq sat at 14 5° containing 139 8 pts KI to 100 pts H₂O dissolves 1 0 pt K₂SO₄ with separation of 2 2 pts KI, so that solution contains 137 6 pts KI and 1 0 pt K₂SO₄ to 100 pts H₂O (Mulder, Rotterdam, **1864**)

100 pts H₂O dissolve 86 3 pts KI and 2 1 pts Na₂SO₄ at 14 5° (Mulder, J B **1866** 67)

Sol in AsCl₃, SnCl₄ and POCl₃ (Walden, Z anorg 190C, **25** 214)

Attacked by dry liquid NO₂ with liberation of I₂ (Frankland, Chem Soc 1901, **79** 1361)

Sol in liqnd SO₂ (Walden, B 1899, **32** 2864)

Solubility in SO₂ decreases with rise of temp (Walden, Z phys Ch 1903, **42** 456)
Insol in liqnd CO₂ (Buchner, Z phys Ch 1906, **54** 674)

Very easily sol in liqnd NH₃ (Franklin, Am Ch J 1898, **20** 829)

Hydrazine dissolves 135 7 pts KI at 12 5-13° (de Bruyn, R t c 1899, **18** 297)

100 pts alcohol of 0 85 sp gr dissolve 18 pts KI at 12 5° 100 pts absolute alcohol dissolve 2 5 pts KI at 13 5° Much more sol in hot alcohol (Baup)

100 pts alcohol of D sp gr at 0° dissolve at 18°—

D 0 9904 0 9851 0 9726 0 9665 0 9528

130 5 119 4 100 1 89 9 76 9 pts KI,

D 0 9390 0 9088 0 8464 0 8322

66 4 48 2 11 4 6 2 pts KI

That is, aqueous alcohol dissolves approximately the same amount of KI that the water present in the alcohol would dissolve, and it is therefore probable that KI is insol in strictly absolute alcohol (Gerardin)

Solubility in 100 pts alcohol of 0 9496 sp gr at

8° 13° 25° 46° 55° 62°
67 4 69 2 75 1 84 7 87 5 90 2 pts KI
(Gerardin, A ch (4) **5** 155)

Sol in 68 3 pts absolute alcohol (Eder, Dingl **221** 89), in 370 pts ether (sp gr 0 729), (Eder, l c), in 120 pts alcohol-ether (1 l), (Eder, l c)

Sol in 10-12 pts 90% alcohol, and 40 pts absolute alcohol (Hager, Comm **1883**)

100 pts absolute methyl alcohol dissolve 16 5 pts at 20 5°, 100 pts absolute ethyl alcohol dissolve 1 75 pts at 20 5° (de Bruyn, Z phys Ch **10** 783)

Solubility of KI in methyl alcohol+Aq at 25°

P = % by wt of alcohol in alcohol+Aq

S = Sp gr of alcohol+Aq sat with KI

L = millimols KI in 100 ccm of the solution

P	S 25°/4°	I
0	1 7213	620
10 6	1 634	555
30 8	1 460	431
47 1	1 325	335
64 0	1 185	243
78 1	1 066	169
98 9	0 9700	113
100	0 9018	80

(Herz and Anders, Z anorg 1907, **55** 274)

Solubility of KI in CH_3OH

G = g KI in 100 g of the solution
 t_1 = temp of complete solution
 t_2 = temp at which salt begins to separate out

G	t_1	t_2
8 64		266°
12 95	0°	
14 2	20	
14 6		262
14 97	25	
19 2	85	256
26 8	115	242
28 9	144	229
29 6	188	196
33 0		

(Centnerszwer, Z phys Ch 1910, 72 432)

Solubility of KI in methyl alcohol at t°

t°	g KI in 100 g alcohol	t°	g KI in 100 g alcohol
15	14 50	180	30 7
30	16 20	200	29 1
50	18 9	220	27 5
80	22 5	240	24 8
100	25 0	245	22 6
120	27 2	247	21 0
140	29 2	250	13 8
160	30 6	252 5*	7 6

*Critical temp of solution

(Tyrer, Chem Soc 1910, 97 626)

At room temp 1 pt KI by weight is sol in

6 pts methyl alcohol D^{15} 0 799016 " ethyl " D^{15} 0 8322219 " propyl " D^{15} 0 8160

(Rohlund, Z anorg 1898, 18 325)

Solubility in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the solvent

G = g KI in 10 ccm of the solution

S = Sp gr of the sat solution at 25°

P	G	S $25^\circ/4$
0 00	0 155	0 8015
4 37	0 191	0 8041
10 40	0 225	0 8071
41 02	0 494	0 8295
80 69	1 013	0 8794
84 77	1 072	0 8795
91 25	1 184	0 8908
100 00	1 316	0 9018

(Herz and Kuhn, Z anorg 1908, 60 155)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent

G = g KI in 10 ccm of the solution

S = Sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	1 316	0 9018
11 11	1 096	0 8823
23 8	0 854	0 8629
65 2	0 262	0 8187
91 8	0 060	0 8045
93 75	0 058	0 8041
100	0 043	0 8041

(Herz and Kuhn)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent

G = g KI in 10 ccm of the solution

S = Sp gr of the sat solution

P	G	S $25^\circ/4^\circ$
0	0 155	0 8015
8 1	0 146	0 7983
17 85	0 137	0 7991
56 6	0 075	0 7988
88 6	0 052	0 8022
91 2	0 049	0 8027
95 2	0 044	0 8029
100	0 043	0 8041

(Herz and Kuhn)

100 g methyl alcohol dissolve 18 04 g KI at 25° 100 g ethyl alcohol dissolve 2 16 g KI at 25° 100 g propyl alcohol dissolve 0 43 g KI at 25° 100 g isomyl alcohol dissolve 0 09 g KI at 25°

(Turner and Bissett, Chem Soc 1913, 103 1909)

0 457 g is sol in 100 g propyl alcohol (Schlump, Z phys Ch 1894, 14 276)

Alcoholic solution can be mixed with $\frac{1}{2}$ vol ether without pptn100 g 95% formic acid dissolve 38 2 g KI at $18 5^\circ$ (Aschan, Chem Ztg 1913, 37 1113)

Solubility in organic solvents at t°

C = pts by wt of KI in 100 ccm of the sat solution

L = no of litres which at the saturation temp hold in solution 1 mol KI

S = sp gr of the solution at t°, referred to H₂O at t°

p = pts by wt of KI in 100 g of the solution

Solvent	t°	C	L	S	p
Water	25°	102 70	0 182	1 7254	59 54
	0°	94 05	0 177	1 6699	56 32
Methyl alcohol	25°	13 48	1 231	0 9003	14 97
	25°	14 26			
	0°	11 61	1 430	0 8064	12 05
Ethyl alcohol	25°	1 520	10 92		--
	0°	1 197	13 87		
Glycol	25°	45 85	0 362		
	25°	47 23	0 351		
	0°	43 28	0 383	1 3954	31 03
Acetonitrile	25°	1 551	10 70		
	25°	1 590	10 44	0 7936	2 003
	0°	1 852	9 00	0 8198	2 259
Propionitrile	25°	0 316	52 53	0 7821	0 404
	25°	0 355	46 76		
	0°	0 344	48 26	0 8005	0 429
	0°	0 412	40 29		
Benzonitrile	25°	0 051	325 5	1 0076	0 050
Nitromethane	25°	0 349	47 56	1 1367	0 307
	25°	0 289	57 44		
	0°	0 366	45 36	1 1627	0 315
	0°	0 314	52 87		
Nitrobenzene	25°	0 0019	87 40		
Acetone	25°	1 038	16 0	0 7968	1 302
	0°	1 732	9 58	0 8227	2 105
Furfural	25°	5 93	2 80	1 2014	4 94
	0°	15 10	1 10		
Benzaldehyde	25°	0 343	48 4	1 0446	0 328
Sacetylaldehyde	25°	0 549	30 24	1 1373	0 483
	0°	1 257	13 21	1 1501	1 093
Amisaldehyde	25°	0 720	23 06	1 1180	0 644
	0°	1 520	10 92	1 1223	1 355
Ethyl acetate	25°	0 0013	12 80		
Methyl cyan acetate	25°	2 459	6 75	1 1358	2 165
	0°	3 256	5 10	1 1521	2 827
Ethyl cyan acetate	25°	0 888	18 7	1 0579	0 839
	25°	1 090	15 23	1 0678	1 021

(Walden, Z phys Ch 1906, 55 715)

Insol in CS₂ (Arctowski, Z anorg 1894, 6 257)

Sol in benzonitrile (Naumann, B 1914, 47 1369)

Difficultly sol in methyl acetate (Naumann, B 1909, 42 3789)

Sol in ethyl acetate (Casaseca, C R 30 821)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Insol in ethylamine (Shinn, J phys Chem 1907, 11 538)

100 pts acetone dissolve 2 930 pts KI at 25° (Krug and M'Elroy, J Anal Ch 6 184)

Sol in acetone, insol in methylal (Eidmann, C C 1899 11 1014)

3 08 pts sol in 100 pts acetone at -2 5°

2 38 " " " 100 " " +22°

1 21 " " " 100 " " 56°

0 26 " " " 100 " pyridine " 10°

0 11 " " " 100 " " 119°

(Laszczyński, B 1894, 27 2287)

Freely sol in glycerine Insol in acetic acid (Berthemot)

Sol in 3 pts glycerine, insol in olive oil (Cap and Garot)

100 g glycerol dissolve 40 g KI at 15 5° (Ossendowski, Pharm J 1907, 79 575)

Potassium triiodide, KI₃

Very deliquescent, very sol in H₂O and alcohol (Johnson, Chem Soc 1877, 1 249)

Solution of I in KI contains this salt (see KI) Decomp by heat or shaking with CS₂, ether, chloroform Sol in alcohol, from which CS₂ does not remove I (Jorgensen, J pr (2) 2 247)

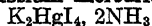
Potassium periodide

Solubility determinations show that the compds KI₃ and KI₇ are the only periodides of potassium which form solids at 25°

See under KI+I (Foote and Chalker, Am Ch J 1908, 39 566)

KI₇ See above

Potassium mercuric iodide ammonia,



(Peters, Z anorg 1912, 77 188)

Potassium silver iodide, KI, AgI

Sol in KI+Aq Sol in hot alcohol (Boullay, A ch 34 377)

2KI, AgI, Sol in KI+Aq Decomp by H₂O (Boullay)

Hygroscopic (Hellwig, Z anorg 1900, 25 180)

3KI, AgI Decomp by H₂O (Ditte, C R 93, 415)

KI, 2AgI Sol in methylethylketone (Marsh, Chem Soc 1913, 103 783)

Potassium silver polyiodide, AgK₃I₁₂, 3KI+5H₂O

Very deliquescent (Johnson, Chem Soc 33 183)

Potassium tellurium iodide

See Iodotellurate, potassium

Potassium thallic iodide, KI, TI₃

Decomp by H₂O Can be crystallized from alcohol (Willm)

3KI, 2TI₃+3H₂O Partially decomp by H₂O (Rammelsberg)

Potassium (tin) stannous iodide, KI, SnI₂+1½H₂O

When treated with a small quantity of H₂O, KI dissolves out, but when more H₂O is added, the substance is completely dissolved More sol in warm than cold alcohol (Boullay)

Potassium zinc iodide, KI, ZnI_2
 Very deliquescent (Rammelsberg, Pogg 3 665)
 $K_2ZnI_4 + 2H_2O$ Hygroscopic (Ephraim, anorg 1910, 67 382)

Potassium iodide sulphur dioxide, KI, SO_2
 (Péchar, C R 1900, 130 1188)
 $KI, 4SO_2$ (Walden, Z phys Ch 1903, 2 439)
 $KI, 14SO_2$ (Walden)

Potassium nitride, K_2N
 Decomps violently by H_2O (H Davy)

Potassium ruthenium dihydronitrosobromide,
 $Ru_2H_2NOBr_3, 2HBr, 3KBr$
 Ppt (Brizard, A ch 1900, (7) 21 362)

Potassium ruthenium nitrosobromide,
 $Ru_2H_2NOCl_3, 3KCl, 2HCl$
 Sl sol in H_2O (Brizard, C R 1899, 129 16)

Potassium suboxide
 Decomposes H_2O
 Does not exist (Lupton, Chem Soc 1876, 565)

Potassium oxide, K_2O
 Very sol in H_2O with much heat
 See Potassium hydroxide

Potassium dioxide, K_2O_2
 Deliquescent Sol in H_2O
 Forms compound $K O_2, 2H_2O_2$ (Schone, 193 241)

Potassium peroxide, K_2O_4
 Deliquescent Very sol with decomp in H_2O

Potassium silicon oxyfluoride, $SiF_2(OK)_2$ and $SiO(F)OK$
 (Schiff and Beechi, A Suppl 4 33)

Potassium tantalum oxyfluoride, $K_4Ta_4O_5F_{14}$
 Insol in boiling water Easily sol in $HF + q$ (Marignac, A ch (4) 9 268)

Potassium phosphide, KP_3
 Decomps by H_2O (Joannis, C C 1894, 1 834)
 KP_6 Easily decomp by H_2O (Hugot, R 1895, 121 208)

Potassium hydrogen phosphide, PH_2K
 Decomps by H_2O (Joannis, C R 1894, 19 558)

Potassium phosphoselenide, $KSeP = K_2Se, P_2Se$
 Sol in cold H_2O with rapid decomp Sol in alcohol with slight decomp (Hahn, J pr 3 430)

Potassium phosphotriselenide, $2K_2Se, P_2Se_3$
 Deliquescent Decomps violently with H_2O Sol in alcohol or ether, or in a mixture of the two, with slight decomp, but decomp gradually on the air (Hahn, J pr 93 430)

Potassium phosphopentaseelenide, $K_4P_2Se_5 = 2K_2Se, P_2Se_5$
 Deliquescent, immediately decomp by H_2O , alcohol, or ether (Hahn)

Potassium phosphosulphide, $4K_2S_2, P_2S_3$
 Deliquescent Sol in H_2O with decomp

Potassium selenide, K_2Se
 Sol in H_2O with subsequent decomp on the air
 Insol in liqnd NH_3 , sol in air free H_2O to a colorless liqnd (Hugot, C R 1899, 129 299)
 $+2H_2O$ Sol in H_2O with decomp (Clever, Z anorg 1895, 10 143)
 $+9, 14$, or $19H_2O$ (Fabre, C R 102 613)

Potassium tetraselenide, K_2Se_4
 Easily sol in H_2O Decomps on standing Sol in liqnd NH_3 (Hugot, C R 1899, 129 299)

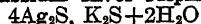
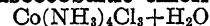
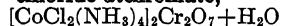
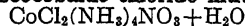
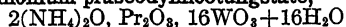
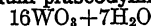
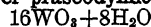
Potassium monosulphide, K_2S
 Deliquescent Sol in H_2O and alcohol H_2O solution decomp on air
 Sol in 10 pts glycerine (Cap and Garot, J Pharm (3) 26 81)
 Moderately sol in liqnd NH_3 (Franklin, Am Ch J 1898, 20 829)
 Insol in acetone and in methylal (Eidmann, C C 1899, II 1014)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)
 $+5H_2O$ (Schone, Pogg 131 380)
 All potassium sulphides are sol in glycerine, insol in ether and ethyl acetate

Potassium disulphide, K_2S_2
 Sol in H_2O and alcohol, with gradual decomp

Potassium trisulphide, K_2S_3
 Sol in H_2O and alcohol, with gradual decomp on the air

Potassium tetrasulphide, K_2S_4
 Sol in H_2O and alcohol
 $+2H_2O$ Sol in H_2O Sl sol in alcohol
 $+8H_2O$ Sol in H_2O Alcohol takes out water (Schone)

Potassium pentasulphide, K_2S_5
 Sol in H_2O and alcohol

Potassium palladium sulphide*See Sulphopalladate, potassium***Potassium platinum sulphide***See Sulphoplatinate, potassium***Potassium silver sulphide,**Decomp by H_2O (Ditte, C R 1895, **120** 91)**Potassium rhodium sulphide, $3K_2S, Rh_2S_3$** Decomp by H_2O (Leidie)**Potassium tellurium sulphide***See Sulphotellurate, potassium***Potassium thallium sulphide, K_2S, Tl_2S_3** Not decomposed by H_2O , or hot NH_4OH , or $KOH + Aq$ Decomp by HCl or moderately conc $H_2SO_4 + Aq$ Hot $HNO_3 + Aq$ decomp with separation of S (Schneider, J pr **110** 168)**Potassium tin (stannic) sulphide***See Sulphostannate, potassium***Potassium zinc sulphide, $K_2S, 3ZnS$** Not attacked by H_2O , but easily decomp by the most dil acids (Schneider, J pr (2) **8** 29)**Potassium telluride, K_2Te** Sol in H_2O (Demargay, Bull Soc (2) **40** 99)Sol in H_2O and liquid NH_3 (Hugot, C R 1899, **129** 388)**Praseocobaltic chloride,**Easily sol in H_2O Dil $HCl + Aq$ dissolves traces, conc $HCl + Aq$ dissolves more Sol in $NH_4OH + Aq$ with decomp Sol in conc H_2SO_4 without decomp Sl sol in dil $H_2SO_4 + Aq$ (Rose)**— mercuric chloride, $Co(NH_3)_4Cl_3, HgCl_2$** Sl sol in cold H_2O , insol in $HgCl_2 + Aq$ (Vortmann, B **15** 1892)**— chloride dichromate,**Scarcely sol in cold, easily sol in warm H_2O (Vortmann, B **15** 1897)**Praseocobaltic chloride nitrate,**Much less sol in H_2O than the chloride Precipitated from aqueous solution by dil $HNO_3 + Aq$ (Vortmann, B **15** 1896)**Praseodymicitungstic acid****Ammonium praseodymicitungstate,**Very sl sol in H_2O Decomp by acids and alkalis (E F Smith, J Am Chem Soc 1904, **26** 1478)**Barium praseodymicitungstate, $4BaO, Pr_2O_3,$** Ppt Insol in H_2O
 $6BaO, Pr_2O_3, 16WO_3 + 9H_2O$ Ppt (E F Smith)**Silver praseodymicitungstate, $4Ag_2O, Pr_2O_3,$** Insol in H_2O (E F Smith)**Praseodymium, Pr****Praseodymium bromide, $PrBr_3 + 6H_2O$** Very sol in H_2O , sol in HBr (von Schule Z anorg 1898, **18** 353)**Praseodymium carbide, PrC_2** Decomp by H_2O , insol in conc HNO_3 decomp by dil HNO_3 (Moissan, C R 1900, **131** 597)**Praseodymium chloride, $PrCl_3$** Very sol in H_2O Insol in PCl_3 or $SnCl_4$ Sol in alcohol Insol in ether and most organic solvents (Matignon, C R 1902, **134** 427)2 14 g $PrCl_3$ dissolve in 100 g pyridine a 15° (Matignon, Int Cong App Chem 1909 **2** 53)100 g H_2O dissolve 334.2 g $PrCl_3 + 7H_2O$ or 103.9 g of the anhydrous salt at 13° The aqueous solution sat at 14° has a sp gr $16^\circ/16^\circ = 1.687$ At 100°, the solubility in H_2O is unlimited (Matignon A ch 1906, (8) **8** 388)Sol in conc HCl (von Schule, Z anorg 1898, **18** 352)100 pts of a solution of the salt in $HCl + Ac$ contain at 13° 41.05 pts of anhydrous salt and 7.25 pts HCl Sp gr of this solution a 16° = 1.574 (Matignon, A ch 1906, (8) **8** 388)**Praseodymium hydride, PrH_3 (?)**(Muthmann, A 1904, **331** 59)**Praseodymium hydroxide**Sol in citric acid (Baskerville, J Am Chem Soc 1904, **26** 49)**Praseodymium nitride, PrN** Decomp in moist air with evolution of NH_3 (Muthmann, A 1904, **331** 59)

Praseodymium oxide, Pr₂O₃

Easily sol in H₂O (v Welsbach, M 8 477)

Decomp by heating in the air (Scheele, Z anorg 1898, 17 322)

Praseodymium monoperoxide, Pr(OH)₂ H₂O

(Melkoff, Chem Soc 1902, 82 (2) 140)

Praseodymium superoxide, Pr(OH) (OOH)

Ppt (Melkoff, C C 1902, I 172)

Praseodymium trisuperoxide, Pr(OOH)₃

Ppt (Melkoff)

Praseodymium peroxide, Pr₄O₇

Sol in acids with evolution of O (v Welsbach)

Praseodymium oxysulphide, Pr₂SO₂

(Biltz, Z anorg 1911, 71 436)

Praseodymium disulphide, PrS₂

Decomp by heat (Biltz, Z anorg 1911, 71 437)

Purpureocobaltic salts

For other purpureocobaltic salts, see—

Chloropurpureocobaltic salts

Bromopurpureocobaltic salts

Nitratopurpureocobaltic salts

Sulphatopurpureocobaltic salts

Purpureocobaltic cobaltcyanide,

Co(NH₃)₅Co(CN)₆+1½H₂O

Insol in H₂O

— **ferricyanide, Co(NH₃)₅Fe(CN)₆**

Insol in cold H₂O Probably belongs to roseo series

— **mercuric hydroxychloride,**

CoN₅H₁₁(HgCl)₃(HgOH)Cl₃

Ppt (Vortmann and Morgulis, B 22 2645)

CoN₅H₁₁(HgOH)Cl₃ Ppt (V and M)

— **mercuriodide, basic,**

CoN₅H₁₁(HgI₂)₂(HgOH)₃I₃

Ppt Sl sol in acids Sol in KI+Aq (Vortmann and Borsbach, B 23 2804)

— **molybdate, Co₂O₃(NH₃)₁₀, 7MoO₃+3H₂O (?)**

Insol in H₂O or dil HC₂H₃O₂+Aq (Carnot, C R 109 109)

— **sulphate**

See Sulphatopurpureocobaltic salts

— **tungstate, Co(NH₃)₅O(WO₄)**

Scarcely sol in cold or hot H₂O (Gibbs)

Co₂O₃(NH₃)₁₀, 10WO₃+9H₂O (?) Insol

in H₂O, or dil HC₂H₃O₂+Aq, or NH₄OH+Aq (Carnot, C R 109 147)

Purpureocobaltic vanadate, Co₂O₃(NH₃)₁₀, 5V₂O₅+9H₂O (?)

Ppt Insol in H₂O (Carnot, C R 109 147)

Purpureocobaltic octamine salts

See Octamine cobaltic purpureo salts

Pyrosulphuric acid, H₂S₂O₇

See Disulphuric acid

Radium, Ra

Radium A

More sol than Radium B and C in all solvents, sol even in organic solvents especially CS₂ (Ramstedt, Le Radium, 1913, 10 159)

Radium B

More quickly sol than Radium C in H₂O and acids, less quickly sol in alkaline solutions, very sl sol in organic solvents (Ramstedt, Le Radium, 1913, 10 159)

Radium C

Sol in common acids, less so in alkaline solutions and in H₂O, only very sl sol in organic solvents (Ramstedt, Le Radium, 1913, 10 159, Chem Soc 1913, 104 (2) 659)

Radium bromide

Less sol in H₂O than corresponding Ba comp (Curie, Dissert 1903)

Radium chloride

Less sol in H₂O than corresponding Ba comp (Curie, Dissert 1903)

Radium emanation

Coefficient of absorption for H₂O = 0.245 at 3°, 0.23 at 20°, 0.17 at 40°, 0.135 at 60°, 0.12 at 70°, 0.12 at 80° (Hofmann, Phys Zeit 1905, 6 339)

Solubility in H₂O at t°

Coefficient of solubility = conc of the emanation in the liquid conc of the emanation in the gas

t°	Coefficient of solubility
0	0 506
4 3	0 424
5 7	0 398
10 0	0 340
14 0	0 303
17 6	0 280
20 0	0 245
26 8	0 206
31 6	0 193
39 1	0 160

Coefficient of solubility in sea-water of sp gr at 14° = 1.022 is 0.255

(Bovle, Phil Mag 1911, (6) 22 850)

Solubility in H ₂ O					
Temp	0 5°	17 5°	35°	41°	51°
Sol	0 526	0 283	0 183	0 161	0 138
Temp	60°	74°	79°	82°	91°
Sol	0 127	0 112	0 111	0 111	0 108

(Kofler, M 1913, 34 389)

Coefficient of solubility of radium emanation at 14° in various solvents

Ethyl alcohol	7 34
Amyl alcohol	9 31
Toluene	13 7
Sea water	0 255
Mercury	0

(Boyle, Phil Mag 1911, (6) 22 851)

Coefficient of solubility emanation of radium in various solvents at t°

Solvents	t=18°	t=0°	t=-18°
Ethyl acetate	7 35	9 41	13 6
Acetone	6 30	7 99	10 8
Absolute alcohol	6 17	8 28	11 4
Aniline	3 80	4 43	
Benzene	12 82	16 54 at 3°	
Chloroform	15 08	20 5	28 5
Cyclohexane	18 04 at 80°		
Water	0 285	0 52	
Ether	15 08	20 09	29 1
Glycerine	0 21		
Hexane	16 56	23 4	35 2
Paraffine oil	9 2	12 6	
Carbon-bisulphide	23 14	33 4	50 3
Toluene	13 24	18 4	27
Xylene	12 75		

(Ramstedt, Le Radium, 1911, 8 255)

Solubility in various oils, etc., at t°

Rape oil		Poppy seed oil		Oil of turpentine	
t°	Solubility	t°	Solubility	t°	Solubility
-3	51 2	-5	50 5	-21	42 5
10	35 3	16	30 2	0	23 1
20	26 1	40	19 1	18	16 6
100	6 2	65	12 4	50	7 5
200	3 3	90	8 4	6 5	4 08

Solubility in 10% dammar resin in oil of turpentine = 16 7 at 18°

Solubility in 5% colophony in amyl alcohol = 11 2 at 20°

Solubility in amyl alcohol = 10 6 at 18°

Solubility in 20% colophony in amyl alcohol = 11 1 at 20°

(Curie, Thesis 1910)

Coefficient of absorption for petroleum =	
22 70	at -21°
12 87	at +3°
9 55	at 20°
8 13	at 40°
7 01	at 60°

(Hofmann, Phys Zeit 1905, 6 339)

Rhodicyanhydric acid, H₃Rh(CN)₃

Not known in the free state

Potassium rhodicyanide, K₃Rh(CN)₃

Sol in H₂O Easily decomp by acids
Very sol in H₂O (Leidié, C R 1900, 130 89)

Rhodium, Rh

Insol in all acids, including aqua regia
Rhodium "sponge" is sol in HNO₃+Aq, and somewhat in HCl+Aq when exposed to air

Rhodium ammonia compounds

See—

Bromopurpleorhodium comps,
BrRh(NH₃)₅X₂

Chloropurpleorhodium comps,
ClRh(NH₃)₅X₂

Iodopurpleorhodium comps,
IRh(NH₃)₅X₂

Luteorhodium comps, Rh(NH₃)₅X₃

Nitratopurpleorhodium comps,
(NO₃)Rh(NH₃)₅X₂

Roseorhodium comps, Rh(NH₃)₅(OH₂)X₃

Xanthorhodium comps, (NO₂)Rh(NH₃)₅X₂

Rhodium tribromide, RhBr₃+2H₂O

Very sol in H₂O (Goloubkine, Chem Soc 1911, 100 (2) 45)

Rhodium rubidium bromide

See Bromorhodite, rubidium

Rhodium sodium bromide

See Bromorhodite, sodium

Rhodium dichloride, RhCl₂ (?)

Insol in H₂O, HCl, or HNO₃+Aq Not attacked by boiling KOH or K₂CO₃+Aq (Fellenberg)

Decomp by boiling KOH+Aq (Berzelius)

Does not exist (Leidié, C R 106 1076)

Rhodium trichloride, RhCl₃

Insol in acids, even aqua regia When boiled for a long time with KOH+Aq, it becomes sl sol in HCl+Aq

Insol in H₂O and acids, sol in alkalis+Aq (Leidié, C R 1899, 129 1251)

+4H₂O Very sl deliquescent Easily sol in H₂O, HCl+Aq, or alcohol Insol in ether Decomp by H₂SO₄ only when boiling (Claus, J pr 80 282)

No definite amount of crystal H_2O (Leidie ch (6) 17 271)

rhodium chloride with MCl

See Chlororhodite, M

rhodium dihydroxide, $\text{RhO}_2 \cdot 2\text{H}_2\text{O}$, or
Rhodium rhodate, $\text{Rh}_2\text{O}_3 \cdot \text{RhO}_3 + 6\text{H}_2\text{O}$

Sol in $\text{HCl} + \text{Aq}$

rhodium sesquihydroxide, $\text{Rh}_2\text{O}_3 \cdot \text{H}_2\text{O}$

Only sl sol in conc $\text{HCl} + \text{Aq}$ (Claus)
 $+ 2\text{H}_2\text{O}$ Easily sol in HCl , H_2SO_4 , H_2SO_3 ,
 INO_3 , or $\text{HSCN} + \text{Aq}$, also when moist, in
 $\text{ICl}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sol in conc $\text{KOH} + \text{Aq}$, very
l sol in H_3BO_3 , H_3PO_4 , $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$, and HCN
 $- \text{Aq}$ Sol in acid alkali oxalates $+ \text{Aq}$
Leidie, C R 107 234)

rhodium triiodide, RhI_3

Ppt (Goloubkine, Chem Soc 1911, 100
2) 45)

rhodium monoxide, RhO

Not attacked by acids (Deville and De-
ray, A ch (3) 61 83)

rhodium sesquioxide, Rh_2O_3

Insol in H_2O , boiling $\text{KOH} + \text{Aq}$, or any
acid, even aqua regia (Claus)

rhodium dioxide, RhO_2

Insol in all acids or alkalies

rhodium trioxide, RhO_3

"Rhodic acid" Known only in solution of
Potassium rhodate," which is very easily
ecomp (Claus)

rhodium oxybromide, $\text{Rh}(\text{OH})_2\text{Br} + 2\text{H}_2\text{O}$

Sol in H_2O (Goloubkine, Chem Soc
911, 100 (2) 45)

rhodium monosulphide, RhS

Insol in aqua regia

rhodium sesquisulphide, Rh_2S_3

Sol in alkali sulphides $+ \text{Aq}$ (Debray, C
t 97 1332)

Insol in alkali sulphides $+ \text{Aq}$ Not at-
tacked by HNO_3 , aqua regia, or $\text{Br}_2 + \text{Aq}$
Leidie, Bull Soc (2) 50 664)

rhodium sodium sulphide, $3\text{Na}_2\text{S} \cdot \text{Rh}_2\text{S}_3$

Decomp by H_2O (Leidie)

rhodium sesquisulphydride, $\text{Rh}_2\text{S}_6\text{H}_6$

Easily sol in aqua regia or $\text{Br}_2 + \text{Aq}$ Insol
in alkali sulphides $+ \text{Aq}$ or acids (Leidie,
Bull Soc (2) 50 664)

Rhodochromium bromide,

$\text{HOCr}_2(\text{NH}_3)_{10}\text{Br}_5 + \text{H}_2\text{O}$

Rather difficultly sol in H_2O Decomp by
boiling or standing Sol in $\text{NH}_4\text{OH} + \text{Aq}$
or $\text{NaOH} + \text{Aq}$ Insol in dil $\text{HBr} + \text{Aq}$,
 $\text{KBr} + \text{Aq}$, or alcohol (Jorgensen, J pr (2)
25 321)

— **bromide, basic**, $\text{HOCr}_2(\text{NH}_3)_{10}(\text{OH})\text{Br}_4$
 $+ \text{H}_2\text{O}$

Sl sol in H_2O Sol in NH_4OH or $\text{NaOH} +$
 Aq Insol in alcohol (Jorgensen)

— **bromoplatinate**, $\text{HOCr}_2(\text{NH}_3)_{10}\text{Br}_3\text{PtBr}_5$,
 $\text{HOCr}_2(\text{NH}_3)_{10}\text{Br}_3(\text{PtBr}_5)_2 + 4\text{H}_2\text{O}$

Ppt (Jorgensen)

— **chloraurate**, $\text{HOCr}_2(\text{NH}_3)_{10}\text{Cl}_3(\text{AuCl}_4)_2$
 $+ 2\text{H}_2\text{O}$

Difficultly sol but not insol in H_2O (Jor-
gensen)

— **chloride**, $\text{HOCr}_2(\text{NH}_3)_{10}\text{Cl}_5 + \text{H}_2\text{O}$

Sol in about 40 pts of cold H_2O Insol in
cold dil $\text{HCl} + \text{Aq}$, $\text{NH}_4\text{Cl} + \text{Aq}$, or alcohol
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen, J pr (2)
25 321)

— **chloriodide, basic**,
 $\text{HOCr}_2(\text{NH}_3)_{10}(\text{OH})\text{Cl}_2\text{I}_2$

Sl sol in cold H_2O , insol in alcohol
(Jorgensen)

— **chloroplatinate**, $\text{HOCr}_2(\text{NH}_3)_{10}\text{Cl}_3\text{PtCl}_5$,
 $\text{HOCr}_2(\text{NH}_3)_{10}\text{Cl}(\text{PtCl}_5)_2 + 4\text{H}_2\text{O}$

Precipitate (Jorgensen)

— **dithionate**, $[\text{HOCr}(\text{NH}_3)_{10}]_2(\text{S}_2\text{O}_8)_5 +$
 $2\text{H}_2\text{O}$

Nearly insol in H_2O

— **dithionate, basic**,
 $\text{HOCr}(\text{NH}_3)_{10}\text{OH}(\text{S}_2\text{O}_6)_2 + \text{H}_2\text{O}$

Insol in H_2O , cold $\text{NH}_4\text{OH} + \text{Aq}$, or
 $\text{NaOH} + \text{Aq}$

— **iodide**, $\text{HOCr}_2(\text{NH}_3)_{10}\text{I}_5 + \text{H}_2\text{O}$

Very difficultly sol in H_2O Insol in very
dil $\text{HI} + \text{Aq}$ or alcohol Sl sol in NH_4OH or
 $\text{KOH} + \text{Aq}$ (Jorgensen)

— **nitrate**, $\text{HOCr}_2(\text{NH}_3)_{10}(\text{NO}_3)$

Rather difficultly sol in H_2O , from which
it is precipitated by a few drops of $\text{HNO}_3 +$
 Aq Sol in hot dil $\text{NH}_4\text{OH} + \text{Aq}$

— **nitrate chloroplatinate**,
 $\text{HOCr}_2(\text{NH}_3)_{10}(\text{NO}_3)(\text{PtCl}_5) + 4\text{H}_2\text{O}$

Precipitate (Jorgensen)

Rhodochromium sulphate,

$[\text{HOCr}_2(\text{NH}_3)_{10}]_2(\text{SO}_4)_5 + 2\text{H}_2\text{O}$

Very sl sol in cold H_2O Easily sol in
cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$

Almost insol in a mixture of 3 vols H_2O , 1 vol alcohol, and $\frac{1}{3}$ vol dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Jørgensen)

Rhodonitrous acid

Ammonium rhodonitrite, $(\text{NH}_4)_3\text{Rh}_2(\text{NO}_2)_{12}$

Nearly insol in cold, sl sol in hot H_2O
Insol in conc NH_4Cl or $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$
Insol in alcohol (Leidié, C R 111 108)

Barium rhodonitrite, $\text{Ba}_3\text{Rh}_2(\text{NO}_2)_{12}$

Sl sol in cold, more easily in hot H_2O (Lamy)
 $+12\text{H}_2\text{O}$ Sol in 50 pts H_2O at 16° , and 6.5 pts at 100° (Leidié, C R 111 108)

Potassium rhodonitrite, $\text{K}_3\text{Rh}_2(\text{NO}_2)_{12}$

Nearly insol in cold, verv sl sol in boiling H_2O Completely insol in $\text{KNO}_3 + \text{Aq}$, and in $\text{KCl} + \text{Aq}$ (30% KCl), or $\text{KC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (50% $\text{KC}_2\text{H}_3\text{O}_2$) Insol in alcohol (Leidié, C R 111 106)

Sodium rhodonitrite, $\text{Na}_3\text{Rh}_2(\text{NO}_2)_{12}$

Sol in $2\frac{1}{2}$ pts H_2O at 17° , and 1 pt at 100° Insol in alcohol Decomp by $\text{HCl} + \text{Aq}$ (Leidié, C R 111 107)

Rhodosochromium bromide

Sol in H_2O , insol in dil $\text{HBr} + \text{Aq}$ (1) (Jørgensen, J pr (2) 45 260)

— chloraurate, $\text{Cr}_2(\text{NH}_3)_6(\text{HO})_3\text{Cl}_3$, $2\text{AuCl}_3 + 2\text{H}_2\text{O}$

Not insol in cold H_2O (Jørgensen)

— chloride, $\text{Cr}_2(\text{NH}_3)_6(\text{HO})_3\text{Cl}_3 + 2\text{H}_2\text{O}$

Sol in 10.6 pts H_2O at 18° , decomp by boiling Pptd by $\frac{1}{2}$ to 1 vol dil $\text{HCl} + \text{Aq}$ Sol in cold dil $\text{NH}_4\text{OH} + \text{Aq}$ (Jørgensen, J pr (2) 45 260)

— chloroplatinate, $2\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3\text{Cl}_3$, $3\text{PtCl}_4 + 6\text{H}_2\text{O}$

Insol in H_2O (Jørgensen)

$\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3\text{Cl}_3$, $2\text{PtCl}_4 + 2\text{H}_2\text{O}$ Insol in 95% alcohol (Jørgensen)

— chromate, $[\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3]_2(\text{CrO}_4)_3 + 7\text{H}_2\text{O}$ (Jørgensen)

Very sl sol in H_2O (Jørgensen)

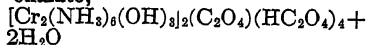
— iodide, $\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3\text{I}_3 + 2\text{H}_2\text{O}$

Sol in H_2O Insol in dil $\text{HI} + \text{Aq}$ (Jørgensen)

— nitrate, $\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3(\text{NO}_3)_3 + \text{H}_2\text{O}$

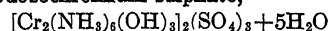
Much less sol in cold H_2O than the chloride Insol in dil $\text{HNO}_3 + \text{Aq}$ (Jørgensen)

— oxalate,



Sol in cold H_2O , but not very easily (Jørgensen)

Rhodosochromium sulphate,



Very sl sol in cold H_2O Easily sol in dil $\text{NH}_4\text{Cl} + \text{Aq}$ (Jørgensen)

$[\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3]\text{SO}_4$, $\text{HSO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$ Decomp by H_2O into H_2SO_4 and above compound (Jørgensen)

— persulphide, $[\text{Cr}_2(\text{NH}_3)_6(\text{OH})_3]_2\text{S}_{11} + 4\text{H}_2\text{O}$

Ppt Insol in H_2O (Jørgensen)

Rhodosulphuric acid

Potassium rhodosulphate, $\text{K}_3\text{Rh}_2(\text{SO}_4)_6$

Two modifications

(a) Slowly sol in cold, easily in hot H_2O

(b) Insol in H_2O

Does not exist (Leidié, C R 107 234)

Sodium rhodosulphate

Insol in H_2O , HCl , HNO_3 , or aqua regia (Claus)

Does not exist (Leidié)

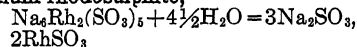
$\text{Na}_2\text{Rh}_2(\text{SO}_4)_4$ Insol in H_2O (Seubert and Kobbé, B 23 2560)

Rhodosulphurous acid

Potassium rhodosulphite, $\text{K}_3\text{Rh}_2(\text{SO}_3)_6 + 6\text{H}_2\text{O}$

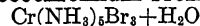
Nearly insol in H_2O Slowly sol in acids Not decomp by boiling $\text{KOH} + \text{Aq}$ (Claus)

Sodium rhodosulphite,



Insol in cold, very sl sol in hot H_2O Easily sol in $\text{HNO}_3 + \text{Aq}$ (Seubert and Kobbé, B 23 2558)

Roseochromium bromide,



Easily sol in H_2O Insol in $\text{HBr} + \text{Aq}$ (Christensen, J pr (2) 23 26)

— bromochromate, $\text{Cr}(\text{NH}_3)_5\text{Br}(\text{CrO}_4)$

Somewhat sol in H_2O , but decomp on standing (Jørgensen, J pr (2) 25 398)

— bromoplatinate, $\text{Cr}(\text{NH}_3)_5\text{Br}(\text{PtBr}_6) + 2\text{H}_2\text{O}$

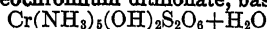
Precipitate Difficultly sol in H_2O (Christensen, l c)

— chloride, $\text{Cr}(\text{NH}_3)_5\text{Cl} + \text{H}_2\text{O}$

Easily sol in H_2O with subsequent decomp Insol in alcohol (Christensen, J pr (2) 23 26)

— mercuric chloride, $\text{Cr}(\text{NH}_3)_5\text{Cl}_3$, $3\text{HgCl}_2 + 2\text{H}_2\text{O}$

Sl sol in H_2O Sol in dil $\text{HCl} + \text{Aq}$ with decomposition (Christensen, l c)

roseochromium dithionate, basic,

Easily sol in very dil HCl + Aq (Jorgensen, J pr (2) 25 308)

— **iodide**, $\text{Cr}(\text{NH}_3)_5\text{I}_3$

Easily sol in H_2O , decomp by boiling (Christensen, l c)

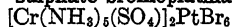
— **nitrate**, $\text{Cr}(\text{NH}_3)_5(\text{NO}_3)_3 + \text{H}_2\text{O}$

Rather easily sol in H_2O (Christensen, c)

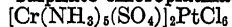
$\text{Cr}(\text{NH}_3)_5(\text{NO}_3)_3(\text{OH}_2)_2$, HNO_3 Decomp y H_2O or alcohol (Jorgensen, J pr (2) 44 3)

— **sulphate**, $[\text{Cr}(\text{NH}_3)_5]_2(\text{SO}_4)_3 + 5\text{H}_2\text{O}$

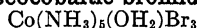
Easily sol in H_2O Precipitated by alcohol (Christensen, l c)

— **sulphate bromoplatinate**,

Difficultly sol in H_2O (Christensen, l c)

— **sulphate chloroplatinate**,

Difficultly sol in H_2O (Christensen, l c)

roseocobaltic bromide,

Sol in H_2O , insol in HBr + Aq (Jorgensen, J pr (2) 31 49)

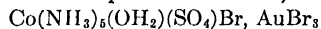
— **bromoplatinate**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Br}_3$, $\text{PtBr}_4 + \text{H}_2\text{O}$

Somewhat sol in H_2O or dil alcohol Insol n strong alcohol (Jorgensen)

$2\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Br}_3$, $3\text{PtBr}_4 + 4\text{H}_2\text{O}$ Ppt (Jorgensen)

— **bromosulphate**,

Sol in H_2O (Krok)

— **bromosulphate bromaurate**,— **carbonate**

Vcay sol in H_2O

— **chloraurate**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$, AuCl_3

Moderately sol in cold H_2O

— **chloride**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$

Sol in 4 8 pts H_2O at 10° , but decomp n heating

100 pts H_2O dissolve 16 12 pts at 0° , and 4 87 pts at 16° (Kurnakoff, J russ Soc 24 269)

Sl sol in 1000 pts fuming HCl + Aq, more asily in 20% HCl + Aq (Rose)

Roseocobaltic mercuric chloride,

More easily sol in solvents than the anhydrous purpureo salt (Carstanjen)

$\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$, HgCl_2 Sol in HCl + Aq with decomp into above salt (Jorgensen)

— **chloroplatinate**,

Decomp by H_2O (Jorgensen)

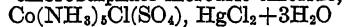
$2\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$, $\text{PtCl}_4 + 2\text{H}_2\text{O}$ Decomp by H_2O

$2\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Cl}_3$, $3\text{PtCl}_4 + 6\text{H}_2\text{O}$ Not difficultly sol in warm H_2O (Gibbs)

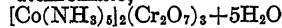
$\text{Co}(\text{NH}_3)_5\text{Cl}_3$, $\text{PtCl}_4 + \text{H}_2\text{O}$ (Gibbs)

— **chlorosulphate**, $\text{Co}(\text{NH}_3)_5\text{Cl}(\text{SO}_4)$

Easily sol in H_2O

— **chlorosulphate mercuric chloride**,

Sol in hot H_2O , and can be recrystallized without decomp (Krok)

— **dichromate**,

Can be recrystallized out of weak acetic acid

— **cobalticyanide**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{Co}(\text{CN})_5$

Nearly absolutely insol in cold H_2O (Jorgensen)

+ H_2O (Gibbs and Gentile)

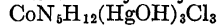
— **dithionate**, $\text{Co}(\text{NH}_3)_5(\text{S}_2\text{O}_6)(\text{OH})$

Decomp by H_2O (Rammelsberg, Pogg 58 296)

$\text{Co}(\text{NH}_3)_5(\text{OH}_2)(\text{S}_2\text{O}_6) + 2\text{H}_2\text{O}$ Ppt (Jorgensen)

— **hydroxide**, $\text{Co}(\text{NH}_3)_5(\text{OH})_3$

Known only in aqueous solution

— **mercuric hydroxylchloride**,

Ppt Sol in dil acids (Vortmann and Morgulis, B 22 2646)

$\text{CoN}_5\text{H}_{12}(\text{HgOH})_3\text{Cl}_2(\text{OH})$ Ppt Sol in dil acids (Vortmann and Morgulis)

— **iodide**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{I}_3$

Less sol in H_2O than bromide Insol in HI + Aq (Jorgensen)

— **iodosulphate**, $\text{Co}(\text{NH}_3)_5(\text{OH}_2)\text{I}(\text{SO}_4)$

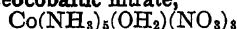
Easily sol in H_2O (Krok)

— **mercuriodide**, $[\text{CoN}_5\text{H}_{13}](\text{HgI})_3\text{I}_6$

Ppt (Vortmann and Borsbach, B 23 2805)

$\text{CoN}_5\text{H}_{13}(\text{HgI})_2\text{I}_3$ Ppt (Vortmann and Borsbach)

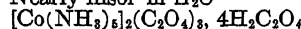
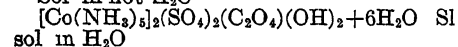
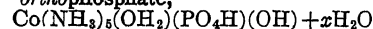
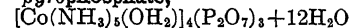
$\text{CoN}_5\text{H}_{13}(\text{HgI})_2\text{I}_2(\text{OH})$ Ppt

Roseocobaltic nitrate,

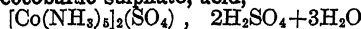
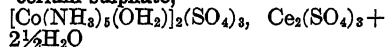
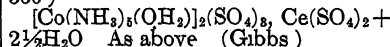
Three modifications

 α Sol in 20 pts H_2O at 15° (Jorgensen) β Known only in solution Insol in cold $\text{HNO}_3 + \text{Aq}$ (Gibbs) γ Easily sol in hot H_2O (Gibbs) (Purpureo salt?)
 $\text{Co}(\text{NH}_3)_5(\text{OH}_2)(\text{NO}_3)_3, \text{HNO}_3$ Decomp
by H_2O or alcohol (Jörgensen, J pr (2) 44
63)
nitrate chloroplatinate,

Ppt (Jorgensen)

nitratosulphate,Sl sol in cold, easily in hot H_2O **oxalate,** $[\text{Co}(\text{NH}_3)_5(\text{OH}_2)]_2(\text{C}_2\text{O}_4)_3 + 2\text{H}_2\text{O}$ Nearly insol in H_2O **oxalochloroplatinate,**Sol in hot H_2O **oxalosulphate,** $[\text{Co}(\text{NH}_3)_5]_2(\text{SO}_4)_2\text{C}_2\text{O}_4, \text{H}_2\text{C}_2\text{O}_4 + 2\text{H}_2\text{O}$ Sol in hot H_2O **orthophosphate,**Nearly insol in H_2O
 $[\text{Co}(\text{NH}_3)_5(\text{OH}_2)]_2(\text{PO}_4\text{H})_3 + 4\text{H}_2\text{O}$ Very
sl sol in cold H_2O , easily in H_2O containing
 HCl (Jorgensen)
pyrophosphate,Insol in H_2O (Jorgensen)
 $\text{Co}(\text{NH}_3)_5(\text{OH}_2)(\text{P}_2\text{O}_7\text{Na}_2) + 12\text{H}_2\text{O}$ Nearly
insol in cold, easily sol in hot H_2O containing
 NH_4OH (Jörgensen, J pr (2) 23 252)
sulphate, $[\text{Co}(\text{NH}_3)_5(\text{OH}_2)]_3(\text{SO}_4)_3 + 3\text{H}_2\text{O}$

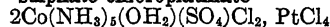
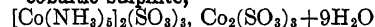
Three modifications

 α Sl sol in cold H_2O Sol in 58 pts at
 27° (Gibbs), 83 5 pts at 20° , and 94 6 pts
at 17° (Jorgensen), more easily sol in hot
 H_2O , and still more easily in $\text{NH}_4\text{OH} + \text{Aq}$
 β Sol in 1-2 pts H_2O (Gibbs)
 γ Less sol than luteosulphate (Jorgensen)
+ $2\text{H}_2\text{O}$ Easily sol in H_2O (Vortmann)
Roseocobaltic sulphate, acid,(Fremy), or $4[\text{Co}(\text{NH}_3)_5]_2(\text{SO}_4)_3, 9\text{H}_2\text{SO}_4 + 11\text{H}_2\text{O}$ (Jorgensen)
 More easily sol in H_2O than neutral sulphate, into which it is converted by recrystallization Sol in about 13 pts H_2O (Jorgensen)
cerium sulphate,
 Sl sol in cold, practically insol in boiling H_2O Sol in acids (Gibbs, Am Ch J 15 560)
**sulphate chloraurate**

Three modifications

 α $\text{Co}(\text{NH}_3)_5(\text{OH}_2)(\text{SO}_4)\text{Cl}$, AuCl_3 Ppt (Jorgensen)

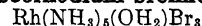
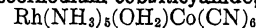
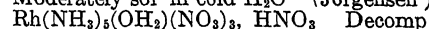
 β $\text{Co}(\text{NH}_3)_5(\text{SO}_4)$, $\text{AuCl}_3 + 2\text{H}_2\text{O}$ Sl sol in cold H_2O (Gibbs)

 γ As above Can be recrystallized from hot H_2O
sulphate chloroplatinate
 Three modifications, all difficultly sol in hot or cold H_2O (Jörgensen)
sulphite, $[\text{Co}(\text{NH}_3)_5(\text{OH}_2)]_2(\text{SO}_3)_3 + \text{H}_2\text{O}$
 Sl sol in cold, decomp by hot H_2O (Gibbs)
cobaltic sulphite,
 Insol in cold, decomp by hot H_2O (Kunzel)
Roseocobaltic octamine compounds

See Roseotetramine cobaltic compounds

Roseoiridium compounds

See Irdoaquopentamine compounds

Roseorhodium bromide,
 Sol in cold H_2O (Jörgensen, J pr (2) 34 394)
Roseorhodium cobalticyanide,Scarcely sol in H_2O **iodosulphate,** $\text{Rh}(\text{NH}_3)_5(\text{OH}_2)\text{I}(\text{SO}_4)$
 Very sl sol in H_2O , easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Jorgensen)
nitrate, $\text{Rh}(\text{NH}_3)_5(\text{OH})(\text{NO}_3)_3$ Moderately sol in cold H_2O (Jorgensen)

by H_2O or alcohol (Jorgensen, J pr (2) 44 63)

Roseorhodium nitrate chloroplatinate,
 $[\text{Rh}(\text{NH}_3)_5(\text{OH}_2)(\text{NO}_3)]_2\text{PtCl}_6 + 2\text{H}_2\text{O}$
 Ppt (Jorgensen)

— **orthophosphate,**
 $[\text{Rh}(\text{NH}_3)_5(\text{OH}_2)]_2(\text{HPO}_4)_3 + 4\text{H}_2\text{O}$
 Very sl sol in H_2O

— **sodium pyrophosphate,**
 $[\text{Rh}(\text{NH}_3)_5(\text{OH}_2)]_2\text{Na}_2\text{P}_2\text{O}_7 + 23\text{H}_2\text{O}$
 Ppt Very sl sol in cold H_2O Easily sol in very dil acids

— **sulphate,**
 $[\text{Rh}(\text{NH}_3)_5(\text{OH}_2)]_2(\text{SO}_4)_3 + 3\text{H}_2\text{O}$
 Very sl sol in cold, much more in hot H_2O

— **sulphate chloroplatinate,**
 $\text{Rh}(\text{NH}_3)_5(\text{OH}_2)(\text{SO}_4)\text{PtCl}_6$
 Ppt Nearly insol in H_2O or alcohol

Roseotetramine cobaltic bromide,
 $\text{Co}(\text{NH}_3)_4(\text{OH}_2)_2\text{Br}_2$
 Sol in H_2O , insol in $\text{HBr} + \text{Aq}$ Nearly insol in alcohol (Jorgensen, Z anorg 2 295)

— — **chloride,** $\text{Co}(\text{NH}_3)_4(\text{OH}_2)_2\text{Cl}_2$
 Easily sol in H_2O , insol in conc $\text{HCl} + \text{Aq}$, sol in sat $\text{HgCl}_2 + \text{Aq}$ (Jorgensen)

— — **cobalticyanide,**
 $\text{Co}(\text{NH}_3)_4(\text{OH}_2)_2\text{Co}(\text{CN})_6$
 (Jorgensen)

— — **oxalate sulphate,**
 $[\text{Co}(\text{NH}_3)_4(\text{OH}_2)]_2(\text{SO}_4)_2\text{C}_2\text{O}_4$
 Ppt (Jorgensen)

— — **pyrophosphate,**
 $[\text{Co}(\text{NH}_3)_4(\text{OH}_2)]_2(\text{P}_2\text{O}_7)_3 + 6\text{H}_2\text{O}$
 Nearly insol in H_2O , but easily sol in very dil acids + Aq (Jorgensen)

— — **sulphate,**
 $[\text{Co}(\text{NH}_3)_4(\text{OH})]_2(\text{SO}_4)_3 + 3\text{H}_2\text{O}$
 Sol in about 35 pts H_2O , and more easily by addition of dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Jorgensen)

— — **sulphate bromaurate,**
 $[\text{Co}(\text{NH}_3)_4(\text{OH}_2)]_2(\text{SO}_4)_2\text{AuBr}_4$
 Sl sol in cold H_2O , insol in alcohol (Jorgensen)

— — **sulphate chloroplatinate,**
 $[\text{Co}(\text{NH}_3)_4(\text{OH})]_2(\text{SO}_4)_2\text{PtCl}_6$
 As the bromaurate (Jorgensen)

Rubidium, Rb_2

Decomp H_2O with violence Insol in hydrocarbons Sol in liquid NH_3 (Seely, C N 23 169), (Franklin, Am Ch J 1898, 20 829)

Rubidium acetylide acetylene RbC_2 , C_2H_2

Very hygroscopic Insol in CCl_4 and in ether (Moissan, C R 1903, 136 1220)

Rubidium amalgam, RbHg_{12}

Stable in contact with Hg below 0° Above 0° the composition of the amalgam varies Can be cryst from Hg without decomp below 0° (Kerp, Z anorg 1900 25 68)

Rubidium amide, RbNH_2

Very deliquescent Violently decomp by H_2O , less violently acted on by alcohol (Titherley, Chem Soc 1897, 71 470)

Rubidium ammonia, RbNH_3

Decomp by H_2O Very sol in liquid NH_3 (Moissan, C R 1903, 136 1178)

Rubidium azoimide, RbN_3

Sl hygroscopic Stable in aq solution
 107 1 pts are sol in 100 pts H_2O at 16°
 114 1 " " " 100 " H_2O " 17°
 0 182 " " " 100 " abs alcohol at 16°

Insol in pure ether (Curtius, J pr 1898, (2) 58 281)

Rubidium bromide, RbBr

100 pts H_2O dissolve 98 pts at 5° , 104.8 pts at 16° (Reissig, A 127 33)

Solubility in H_2O

100 pts of the solution contain at

0 5° 5 0° 16 0°
 47 26 49 50 51 17 pts RbBr

39 7° 57 5° 113 5°
 56 87 60 39 67 24 pts RbBr

(Rumbach, B 1905, 38 1557)

Sp gr of RbBr containing g equiv RbBr per l

C equiv RbBr	Sp gr 6 / 6	Sp gr 18 / 18	Sp gr 30 / 30
0 508	1 06448	1 06389	1 06326
1 020	1 12931	1 12799	1 12626
2 031	1 25622	1 25366	1 25187
4 072	1 50574	1 50107	1 49870

(Clausen, W Ann 1914, (4) 44 1070)

RbBr+Aq containing 6.60% RbBr has
sp gr $20^{\circ}/20^{\circ}=1.0525$

RbBr+Aq containing 14.36% RbBr has
sp gr $20^{\circ}/20^{\circ}=1.1226$

(Le Blanc and Rohland, Z phys Ch 1896,
19 279)

Sol in acetone (Eidmann, C C 1899,
II 1014)

Difficultly sol in acetone (Naumann,
B 1904, 37 4328)

Insol in methyl acetate (Naumann, B
1909, 42 3790)

Rubidium tribromide, RbBr₃

Very sol in H₂O, decomp by alcohol
and ether (Wells and Wheeler, Sil Am J
143 475)

Rubidium ruthenium bromide

See Bromoruthenate and bromoruthenite,
rubidium

Rubidium selenium bromide

See Bromoselenate, rubidium

Rubidium tellurium bromide

See Bromotellurate, rubidium

Rubidium thallic bromide, RbBr, TlBr₃+H₂O

Recryst from H₂O unchanged (Pratt,
Am J Sci 1895, (3) 49 403)

3RbBr, TlBr₃+H₂O Very sol in H₂O
(Pratt)

Rubidium stannic bromide

See Bromostannate, rubidium

Rubidium bromochloride, RbBr₂Cl

Easily decomp, even by H₂O (Wells and
Wheeler)

RbBrCl₂ Sol in H₂O, decomp by alcohol
and ether (Wells and Wheeler)

Rubidium bromochloriodide, RbBrClI

Sol in H₂O and alcohol Decomp by ether
(Wells and Wheeler)

Rubidium bromiodide, RbBr₂I

Very sol in H₂O Sat solution contains
about 44% RbBr₂I, and sp gr = 3.84 (Wells
and Wheeler)

Rubidium carbide, Rb₂C₂

Decomp violently by H₂O (Moissan,
C R 1903, 136 1221)

Rubidium chloride, RbCl

100 pts H₂O dissolve 76.38 pts at 1°, 82.89
pts at 7° (Bunsen)

Solubility in H₂O at t°
100 pts of the solution contain pts RbCl

t°	Pts RbCl
0 4	43 61
15 5	46 56
57 3	53 71
114 9	59 48

(Rimbach, B 1902, 35 1304)

Solubility of RbCl in H₂O at t°

t°	G RbCl per 100 g		t°	G RbCl per 100 g	
	H ₂ O	Solution		H ₂ O	Solution
0	77 0	43 5	60	115 5	53 6
10	84 4	45 8	70	121 4	54 8
20	91 1	47 7	80	127 2	56 0
30	97 6	49 4	90	133 1	57 1
40	103 5	50 9	100	138 9	58 9
50	109 3	52 2	112 9	146 6	59 5

(Berkeley, Phil Trans Roy Soc 1904, 203,
A 189)

Sat RbCl+Aq at 25° contains 48.57%
RbCl (Foote, Am Ch J 1906, 35 242)

Sp gr of RbCl+Aq containing in 100 pts
H₂O

13 14 25 88 33 13 pts RbCl
1 1066 1 2156 1 2675 sp gr

(Tammann, W Ann 24 1885)

A normal solution of RbCl has sp gr at
25° = 1.0610 (Wagner, Z phys Ch 1890,
5 39)

RbCl+Aq containing 6.64% RbCl has
sp gr $20^{\circ}/20^{\circ}=1.0502$

RbCl+Aq containing 10.59% RbCl has
sp gr $20^{\circ}/20^{\circ}=1.0815$ (Le Blanc and Roh-
land, Z phys Ch 1896, 19 278)

Sp gr $20^{\circ}/4^{\circ}$ of a normal solution of RbCl
= 1.085405 (Hagb, J Am Chem Soc
1912, 34 1151)

Sp gr of RbCl+Aq sat at t°

t°	Sp gr	t°	Sp gr
0 55	1 4409	60 25	1 5558
18 7	1 4865	75 15	1 5746
31 5	1 5118	89 35	1 5905
44 7	1 5348	114*	1 6148

* Boiling point

(Berkeley)

Sp gr of RbCl containing g equiv RbCl
per l

G equiv RbCl	Sp gr 6°/6°	Sp gr 18°/18°	Sp gr 30°/30°
0 5123	1 06410	1 04538	1 04503
1 001	1 08916	1 08810	1 08749
2 073	1 18200	1 17959	1 17828
3 984	1 34334	1 33967	1 33757

(Clausen, W Ann 1914, (4) 44 1069)

Very sl sol in liquid NH_3 (Franklin, Am J 1898, 20 829)

Solubility in alcohols at 25°

- 100 g methyl alcohol dissolve 1.41 g
- 100 g ethyl alcohol dissolve 0.078 g
- 100 g propyl alcohol dissolve 0.015 g
- 100 g isoamyl alcohol dissolve 0.0025 g

(Turner and Bissett, Chem Soc 1913, 103 909)

Insol in anhydrous pyridine and in 97% pyridine + Aq. Very sl sol in 95% pyridine + Aq, sl sol in 93% pyridine + Aq (Kahnberg, J Am Chem Soc 1908, 30 1107). Insol in methyl acetate (Naumann, B 909, 42 3790), acetone, (Naumann, B 1904, 7 4329), (Eidmann, C C 1899, II 1014)

rubidium ruthenium trichloride

See Chlororuthenite, rubidium

rubidium ruthenium tetrachloride

See Chlororuthenate, rubidium

rubidium oxyruthenium chloride,
 $\text{Rb}_2\text{RuO}_2\text{Cl}_4$

Ppt, decomp by H_2O , sol in cold HCl (Howe, J Am Chem Soc 1901, 23 779)

rubidium tellurium chloride

See Chlorotellurate, rubidium

rubidium thallic chloride, 2RbCl , $\text{TiCl}_3 + \text{H}_2\text{O}$

Can be recryst from H_2O without change (Pratt, Am J Sci 1895, (3) 49 399)

3RbCl , TiCl_3 . Crystallizes from HCl solution (Neumann, A 244 348)

+ H_2O . Very sol in cold H_2O (Pratt, Am J Sci 1895, (3) 49 398)

+ $2\text{H}_2\text{O}$. Efflorescent in dry air. Sol in 5 pts H_2O at 18°, and 16 pts at 100° (Godefroy, Zeitschr d allgem oesterr apotheker 1880 No 9)

rubidium stannic chloride

See Chlorostannate, rubidium

rubidium titanium chloride, 2RbCl , $\text{TiCl}_3 + \text{H}_2\text{O}$

Sol in H_2O (Stahler, B 1904, 37 4408)

rubidium tungsten chloride, $\text{Rb}_4\text{W}_2\text{Cl}_6$

Sl sol in cold, more sol in hot H_2O

Sol in very dil NaOH + Aq

Nearly insol in most organic solvents (Olsson, B 1913, 46 574)

rubidium uranous chloride, Rb_2UCl_6

As K salt (Aloy, Bull Soc 1899, (3) 21 64)

Rubidium uranyl chloride, 2RbCl , $(\text{UO}_2)\text{Cl}_2 + 2\text{H}_2\text{O}$

Solubility in H_2O

100 pts of the solution contain at

- 24 8° 80 3°
- 57 8 65 73 pts UO_2Cl_2 , 2RbCl

(Rumbach, B 1904, 37 467)

Rubidium vanadium chloride, $\text{Rb}_2\text{VCl}_5 + \text{H}_2\text{O}$

Sl sol in H_2O and alcohol

Decomp by H_2O on standing so that it dissolves (Stahler, B 1904, 37 4411)

Rubidium zinc chloride, 2RbCl , ZnCl_2

Easily sol in H_2O and HCl + Aq (Godefroy, B 8 9)

Rubidium chloride selenium dioxide, RbCl , $2\text{SeO}_2 + 2\text{H}_2\text{O}$

Sol in H_2O (Muthmann, B 1893, 26 1013)

Rubidium chloriodide, RbCl_2I

Properties are similar to those of RbBrClI (Wells)

RbCl_2I . Sol in alcohol, not attacked by ether (Wells and Wheeler, Sill Am J 144 42)

Sol in POCl_3 (Walden, Z anorg 1900, 25 212)

Nearly insol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Very stable, sl sol in H_2O at 0°, only very sl sol in HCl (Erdmann, Arch Pharm 1894, 232 32) (C C 1894, I 670)

Rubidium fluoride, RbF

Very sol in H_2O (Eggeling, Z anorg 1905, 46 174)

100 g H_2O dissolve 130.6 g RbF at 18° (de Forcrand, C R 1911, 152 1210)

Sol in dil HF (Pennington, J Am Chem Soc 1896, 18 57)

Insol in liquid NH_3 (Core, Am Ch J 1898, 20 829)

Rubidium hydrogen fluoride, RbF , HF

Very deliquescent

Insol in alcohol and ether (Chabrie, C R 1905, 140 91)

Very hygroscopic. Sol in H_2O (Eggeling, Z anorg 1905, 46 175)

RbF , 2HF . Very sl sol in H_2O (Eggeling, Z anorg 1905, 46 176)

Rubidium silicon fluoride

See Fluosilicate, rubidium

Rubidium tantalum fluoride

See Fluotantalate, rubidium

Rubidium uranyl fluoride, 4RbF , $\text{UO}_2\text{F}_2 + 6\text{H}_2\text{O}$

(Ditte, C R 91 115)

Rubidium hydride, RbH

Decomp by H_2O with evolution of H_2 (Moissan, C R 1903, 136 589)

Rubidium hydroxide, RbOH

Deliquescent, and very sol in H_2O Sol in alcohol (Bunsen)

Sat RbOH + Aq contains 64.17% RbOH at 15° (de Forcrand, C R 1909, 149 1344)

Rubidium iodide, RbI

100 pts H_2O dissolve 137.5 pts at 6.9°, 152 pts at 17.4° (Reissig, A 127 33)

Sat RbI + Aq at 25° contains 61.93% RbI (Foote and Chalker, Am Ch J 1908, 39 567)

Sp gr of RbI + Aq containing

5%	10%	cold sat	hot sat
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Sp gr 1.0353 1.0755 1.726 1.9629 (Erdmann, Arch Pharm 1894, 232 25)

Sp gr of RbI + Aq containing g equiv RbI per l.

G equiv RbI	Sp gr 6°/6°	Sp gr 18°/18°	Sp gr 30°/30°
0.510	1.08347	1.08268	1.08226
1.025	1.16751	1.16569	1.16433
2.025	1.33012	1.32637	1.32531
4.015	1.64781	1.64144	1.63780

(Mausen, W Ann 1914, (4) 44 1070)

Nearly insol in $AsBr_3$ (Walden, Z anorg 1902, 29 374)

Sol in $AsCl_3$ (Walden, Z anorg 1900, 25 214), liquid SO_2 (Walden, Z anorg 1902, 30 161), S_2Cl_2 (Walden, Z anorg 1900, 25 217), SO_2Cl_2 (Walden), $POCl_3$ (Walden)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

Solubility in organic solvents at t°

C = pts by wt of RbI in 100 ccm of the sat solution

L = no of litres which at the saturation temp hold in solution 1 mol RbI

Solvent	t°	C	L
Furfural	25°	4.93	4.31
Acetonitrile	25°	1.350	15.73
"	0°	1.478	14.36
Propionitrile	25°	0.305	69.61
"	0°	0.274	77.48
Nitromethane	25°	0.518	41.00
"	0°	0.567	37.44
Acetone	25°	0.674	31.5
"	0°	0.960	22.1

(Walden, Z phys Ch 1906, 55 718)

Rubidium triiodide, RbI₃

Very sol in H_2O Sol in about $\frac{1}{2}$ pt H_2O at 20°, sol in alcohol Decomp by ether (Wells and Wheller, Sill Am J 143 475)

Solubility determinations show that RbI₃ is the only polyiodide of rubidium formed at 25° RbI₇ and RbI₅ mentioned by Abegg and Hamburger, (Z anorg 50, 403) could not be obtained (Foote and Chalker, Am Ch J 1908, 39 567)

Rubidium silver iodide, 2RbI, AgI

Easily decomp by H_2O (Wells and Wheeler, Sill Am J 144 155)

RbI, AgI + $\frac{1}{2}H_2O$ (Marsh, Chem Soc 1913, 103 783)

RbI, 2AgI Not deliquescent

Very sol in acetone (Marsh, Chem Soc 1913, 103 783)

Rubidium tellurium iodide

See Iodotellurate, rubidium

Rubidium thallic iodide, RbI, TlI₃ + 2H₂O

Decomp by H_2O (Pratt, Am J Sci 1895, (3) 49 403)

Rubidium nitride,

Decomp by heat (Franz Fischer, B 1910, 43 1468)

See also Rubidium azonide

Rubidium dioxide, RbO₂

Decomp by H_2O (Erdmann, A 1897, 294 68)

Rubidium sulphide, Rb₂S + 4H₂O

Deliquescent, very sol in H_2O (Biltz, Z anorg 1906, 48 299)

Rubidium disulphide, Rb₂S₂

Anhydrous

Sol in H_2O

Very hygroscopic (Biltz, Z anorg 1906, 50 72)

+ H_2O From Rb₂S₂ + Aq

Hygroscopic (Biltz)

Rubidium trisulphide, Rb₂S₃

Anhydrous

Sol in H_2O

Hygroscopic (Biltz, Z anorg 1906, 50 75)

+ H_2O From Rb₂S₃ + Aq (Biltz)

Rubidium tetrasulphide, Rb₂S₄ + 2H₂O

Sol in H_2O (Biltz, Z anorg 1906, 48 304)

Rubidium pentasulphide, Rb₂S₅

Deliquescent Decomp by H_2O

Very easily sol in 70% alcohol

Insol in ether, ethyl sulphide or $CHCl_3$ (Biltz, B 1905, 38 127)

tubidium hydrogen sulphide, RbHS

Deliquescent, very sol in H_2O (Biltz, anorg 1906, 48 300)

tubidium copper tetrasulphide, RbCuS₄

Decomp very slowly in the air
Sl sol in H_2O
Very slowly decomp by cold conc, more rapidly by hot conc, and still more rapidly by dil HCl, H_2SO_4 and HNO_3 . Sl sol in alcohol (Biltz, B 1907, 40 978)

Ruthenic acid**Barium ruthenate, BaRuO₄ + H₂O**

Ppt (Debray and Joly, C R 106 1494)

Calcium ruthenate, CaRuO₄

Ppt

Magnesium ruthenate, MgRuO₄

Ppt

Potassium ruthenate, K₂RuO₄ + H₂O

Very sol in H_2O

Perruthenic acid**Potassium perruthenate, KRuO₄**

Sl sol in H_2O (Debray and Joly, C R 106 1494)

Sodium perruthenate, NaRuO₄ + H₂O

Sl sol in H_2O

Ruthenium, Ru

Not attacked by acids, except aqua regia, which dissolves it only very slightly (Claus, Jogg 65 218)

Ruthenium ammonium comps

See Ruthenodiamine comps, etc

Ruthenium tribromide, RuBr₃

Sol in H_2O . Solution decomposes slowly on standing, but rapidly on heating (Gutbier, Z anorg 1905, 45 178)

Ruthenium tribromide, ammonia,

$2RuBr_3, 7NH_3$

Sol in H_2O and ammonia with slight warming

Insol in alcohol (Gutbier, Z anorg 1905, 45 182)

Ruthenium dichloride, RuCl₂

Insol in acids, even in aqua regia. Sl attacked by acids. Traces are dissolved by boiling with conc KOH + Aq
+ xH_2O . Known only in aqueous solution (Claus, A 59 238)

Ruthenium trichloride, RuCl₃

Deliquescent. Sol in H_2O and alcohol, but solution is decomp by heating into Ru_2O_3 and HCl (Claus)

Pure $RuCl_3$ is insol in cold H_2O , mineral, or organic acids. Slowly decomp by boiling H_2O . Insol in CCl_4 , CS_2 , $CHCl_3$, PCl_3 , or ether. Slowly sol in hot absolute alcohol, but decomp into $Ru(OH)Cl_2$ by 95% alcohol (Joly, C R 114 292)

Hydroscopic

Sol in H_2O , decomp at 50°

Sol in alcohol (Gutbier, Z anorg 1905, 45 174)

See also Ruthenium nitrosochloride

Ruthenium tetrachloride, RuCl₄

Sol in H_2O and alcohol (Claus)

Ruthenium trichloride with MCl

See Chlororuthenite, M

Ruthenium tetrachloride with MCl

See Chlororuthenate, M

Ruthenium sesquihydroxide, Ru₂O₃H₃

Sol in acids, insol in alkalis. Less sol in NH_4OH + Aq than any other oxide of the Pt metals (Claus)

Ruthenium dihydroxide, RuO₄H₄ + 3H₂O

Sol in acids and alkalis (Claus, A 59 237)

Contains NO Joly, C R 107 994)

Ruthenium triiodide, RuI₃

Ppt (Claus)

Insol in H_2O , KI + Aq, and alcohol (Gutbier, Z anorg 1905, 45 181)

Ruthenium triiodide ammonia,

$2RuI_3, 7NH_3$

Sol in H_2O and ammonia with slight warming

Insol in alcohol (Gutbier, Z anorg 1905, 45 182)

Ruthenium nitrosochloride, RuCl₃(NO) + H₂O, and 5H₂O

Slowly sol in cold, easily in hot H_2O (Joly, C R 108 855)

Ruthenium dihydronitrosochloride,

$NO Ru_2H_2Cl_3, 2HCl$

Sol in H_2O (Brizard, A ch 1900, (7) 21 353)

Ruthenium silver nitrosochloride,

$NO Ru_2H_2Cl_3, 2HCl, 3AgCl$

Ppt (Brizard, A ch 1900, (7) 21, 357)

Ruthenium nitrososessquioxide, Ru₂O₃(NO)₂ + 2H₂O

Ppt (Joly, C R 108 854)

Ruthenium dihydronitrosohydroxide,
 $\text{NO Ru}_2\text{H}_2(\text{OH})_2 + 2\text{H}_2\text{O}$

Sl sol in cold H_2O with decomp (Brizard, A ch 1900, (7) 21 349)

Ruthenium dihydronitrosooxychloride,
 $\text{NO Ru}_2\text{H}_2\text{Cl}_2\text{OH} + 2\text{H}_2\text{O}$

Ppt (Brizard, A ch 1900, (7) 21 349)

Ruthenium monoxide, RuO

Insol in acids (Claus, A 59 236)

Ruthenium sesquioxide, Ru₂O₃

Insol in acids Mixture of Ru and RuO₂ (Debray and Joly, C R 106 1494)

See Ruthenium nitrosos sesquioxide

Ruthenium dioxide, RuO₂

Insol in acids (Debray and Joly)

Ruthenium trioxide, RuO₃

"Ruthenic acid" Known only in its salts

Ruthenium tetroxide, RuO₄

Rather difficultly and slowly sol in H_2O (Claus)

Decomp in aqueous solution into Ru₂O₃ + 2H₂O (Debray and Joly)

Ruthenium pentoxide, Ru₂O₅

(Debray and Joly, C R 106 1494)

+ 2H₂O Ppt (Debray and Joly)

Ruthenium heptoxide, Ru₂O₇

"Perruthenic acid" Known only in its salts

Ruthenium oxide, Ru₄O₉

(Debray and Joly)

Ruthenium oxychloride, Ru(OH)Cl₂

Very sol in H_2O , but decomp by an excess (Joly, C R 114 293)

Ruthenium silicide, RuSi

Insol in boiling acids, slowly attacked by a mixture of fused KHSO_4 and KNO_3 (Moissan, C R 1903, 137 231)

Ruthenium trisulphide, RuS₃

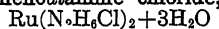
Ppt (Antony, Gazz ch 1900, 30 539)

Ruthenomonamine hydroxide,

See Ruthenosamine hydroxide

Ruthenodiamine carbonate,

Easily sol in H_2O Insol in alcohol (Claus)

Ruthenodiamine chloride,

Not very sol in cold, easily sol in hot H_2O
Insol in alcohol

See Ruthenonitrosodiamine comps

— mercuric chloride, $\text{Ru}(\text{N}_2\text{H}_5\text{Cl})_2, \text{HgCl}_2$

Nearly insol in cold, sol in hot H_2O (Gibbs, Sill Am J (2) 34, 350)

— chloroplatinate, $\text{Ru}(\text{N}_2\text{H}_5\text{Cl})_2, \text{PtCl}_4$

Sl sol in H_2O (Claus)

— hydroxide, $\text{Ru}(\text{N}_2\text{H}_5\text{OH})_2$

Known only in aqueous solution

— nitrate, $\text{Ru}(\text{N}_2\text{H}_5\text{NO}_3)_2 + 2\text{H}_2\text{O}$

Somewhat difficultly sol in cold, easily in hot H_2O Insol in alcohol

— sulphate, $\text{Ru}(\text{N}_2\text{H}_5)_2\text{SO}_4 + 4\text{H}_2\text{O}$

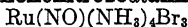
Moderately sol in H_2O Insol in alcohol (Claus)

Ruthenocyanhydric acid, H₄Ru(CN)₈

Easily sol in H_2O and alcohol Less sol in ether (Claus, J B 1855 444)

Potassium ruthenocyanide, K₄Ru(CN)₈ + 3H₂O

Sl efflorescent Very sol in H_2O , sl sol in dil alcohol (Claus)

Ruthenonitrosodiamine bromide,

Sl sol in H_2O (Joly, C R 111 969)

$\text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4\text{Br}_2$ Less sol than corresponding chloride (Joly, C R 108 300)

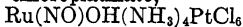
— chloride, $\text{Ru}(\text{NO})(\text{NH}_3)_4\text{Cl}_3$

Sl sol in H_2O (Joly, C R 111 969)

$\text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4\text{Cl}_2$ Sol in H_2O (Joly, C R 108 1300)

$\text{Ru}(\text{NO})(\text{NH}_3)_4\text{Cl}_3 + 2\text{H}_2\text{O} = \text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4\text{Cl}_2, \text{HCl} + \text{H}_2\text{O}$ (?)
Very sol in H_2O (Joly, C R 111 969)

— chloroplatinate,



Scarcely sol in boiling H_2O (Joly, C R 108 1300)

$\text{Ru}(\text{NO})(\text{NH}_3)_4\text{Cl}_3, \text{PtCl}_4$ Ppt (Joly, C R 111 969)

— iodide, $\text{Ru}(\text{NO})(\text{NH}_3)_4\text{I}_3$

Sl sol in H_2O (Joly, C R 111 969)

$\text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4\text{I}_2$ Less sol than the corresponding bromide (Joly, C R 108 1300)

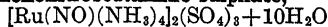
— nitrate, $\text{Ru}(\text{NO})(\text{NH}_3)_4(\text{NO}_3)_3$

More sol in H_2O than

$\text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4(\text{NO}_3)_2$ (Joly, C R 111 969)

$\text{Ru}(\text{NO})\text{OH}(\text{NH}_3)_4(\text{NO}_2)_2$ SI sol in cold H_2O , insol in conc $\text{HNO}_3 + \text{Aq}$ (Joly, C R 108 1300)

Ruthenonitrosodiamine sulphate,



SI sol in H_2O (Joly, C R 111 969)

$[\text{Ru}(\text{NO})(\text{NH}_3)_4]_2(\text{SO}_4)_6 \cdot \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$ Decomp by cold H_2O (Joly)

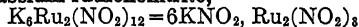
$\text{Ru}(\text{NO})(\text{OH})(\text{NH}_3)_4\text{SO}_4 + \text{H}_2\text{O}$ Most sol in H_2O of this class of salts (Joly, C R 108 1300)

Ruthenonitrous acid

Ammonium ruthenonitrite, $\text{RuH}_2(\text{NO}_2)_4 \cdot 3\text{NH}_4\text{NO}_2 + 2\text{H}_2\text{O}$

Easily sol in H_2O , practically insol in $\text{KCl} + \text{Aq}$ (Brizard, A ch 1900, (7) 21 368)

Potassium ruthenonitrite,



Easily sol in H_2O , alcohol, or ether (Gibbs, Sill Am J (2), 34 344)

SI sol in H_2O Easily sol in $\text{KNO}_2 + \text{Aq}$ (Claus)

$\text{K}_4\text{Ru}_2(\text{NO}_2)_{10} = \text{Ru}_2\text{O}_2(\text{N}_2\text{O}_3)_3, 4\text{KNO}_2$ Very sol in H_2O (Joly and Vèzes, C R 109 367)

$\text{K}_8\text{Ru}_2(\text{NO}_2)_{14} = \text{Ru}_2\text{O}_2(\text{N}_2\text{O}_3)_2, 8\text{KNO}_2$ SI sol in H_2O Sol in cold dil acids (Joly and Vèzes)

$\text{Ru}_2\text{H}_2(\text{NO}_2)_4, 3\text{KNO}_2 + 4\text{H}_2\text{O}$ Very sol in H_2O Aqueous solution decomp sl on ong boiling Almost insol in conc $\text{KCl} + \text{Aq}$ (Brizard, C R 1899, 129 216)

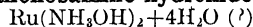
silver ruthenonitrite, $\text{NO Ru}_2\text{H}_2(\text{NO}_2)_4, 3\text{AgNO}_2 + 2\text{H}_2\text{O}$

Ppt (Brizard, A ch 1900, (7) 21 368)

Sodium ruthenonitrite, $\text{Ru}_2(\text{NO}_2)_6, 4\text{NaNO}_2 + 4\text{H}_2\text{O}$

Very sol in H_2O without decomp (Joly, C R 1894, 118 469)

Ruthenosamine hydroxide,



Very deliquescent, and sol in H_2O (Claus)

Samarium, Sm

The element has not been isolated

Samarium bromide, $\text{SmBr}_3 + 6\text{H}_2\text{O}$

Very deliquescent (Cleve)

Samarium carbide, SmC_2

Decomp by water and acids (Moissan, C R 1900, 131 925)

Samarium dichloride, SmCl_2

Decomp by H_2O with liberation of H_2 and formation of samarium oxide and samarium oxychloride Insol in $\text{CS}_2, \text{CHCl}_3$, benzene, abs alcohol, pyridine and toluene (Matignon, C R 1906, 142 85)

Samarium trichloride, SmCl_3

The anhydrous salt is very hygroscopic and easily sol in H_2O (Matignon, C R 1902, 134 1309)

Very sol in H_2O Very sol in abs alcohol 6.38 g are sol in 100 grams pyridine at ord temp, insol in quinoline (Matignon, A ch 1906, (8) 8 406)

$+3\text{H}_2\text{O}$ Deliquescent

Samarium chloride ammonia, $\text{SmCl}_3 + \text{NH}_3, +2\text{NH}_3, +3\text{NH}_3, +4\text{NH}_3, +5\text{NH}_3, +8\text{NH}_3, +9.5\text{NH}_3, +11.5\text{NH}_3$

(Matignon, C R 1905, 140 143)

Samarium fluoride, $\text{SmF}_3 + \frac{1}{2}\text{H}_2\text{O}$

Precipitate Insol in H_2O and dil acids, (Cleve)

Samarium iodide, SmI_3

(Matignon, A ch 1906, (8) 8 413)

Samarium hydroxide, $\text{Sm}_2(\text{OH})_8$

Insol in alkalis, easily sol in acids, and decomposes ammonium salts (Cleve, C N 51 145)

Samarium oxide, Sm_2O_3

Easily sol in acids (Cleve, C N 51 145)

Samarium peroxide, Sm_2O_8

Precipitate (Cleve)

Samarium oxychloride, SmOCl

(Matignon, A ch 1906, (8) 8 412)

Samarium sulphide, Sm_2S_3

(Matignon, A ch 1906, (8) 8 415)

Scandium, Sc

Element has not been isolated

Scandium bromide, $\text{Sc}_2\text{Br}_6 + 3\text{H}_2\text{O}$, and $+12\text{H}_2\text{O}$

(Crookes, Roy Soc Proc 1908, 80 A, 518)

Scandium chloride, $\text{Sc}_2\text{Cl}_6 + 3\text{H}_2\text{O}$, and $+12\text{H}_2\text{O}$

(Crookes, Roy Soc Proc 1908, 80 A, 518)

Scandium hydroxide

Easily sol in conc HNO_3 or $\text{HCl} + \text{Aq}$ (Crookes, Roy Soc Proc 1908, 80 A, 518)

Scandium oxide, Sc_2O_3

Easily sol by boiling with conc HNO_3 or $\text{HCl} + \text{Aq}$

Scandium sulphide, Sc_2S_3

Decomp by H_2O and by acids with evolution of H_2S (Wirth, Z anorg 1914, 87 5)

Selenantimonic acid**Sodium selenantimonate, $\text{Na}_3\text{SbSe}_4 + 9\text{H}_2\text{O}$**

Sol in 2 pts cold H_2O Insol in alcohol (Hofacker, A 107 6)

Sl sol in H_2O , unstable (Pouget, A ch 1899, (7) 18 562)

Selenantimonous acid**Potassium orthoselenantimonite, K_2SbSe_3**

Ppt Decomp by H_2O (Pouget, A ch 1899, (7) 18 560)

Potassium paraselenantimonite, $\text{K}_2\text{Sb}_2\text{Se}_7 + 3\text{H}_2\text{O}$

Sl sol in H_2O , unstable (Pouget, A ch 1899, (7) 18 560)

Sodium orthoselenantimonite, $\text{Na}_3\text{SbSe}_3 + 9\text{H}_2\text{O}$

Very sol in H_2O Aqueous solution on standing deposits red crystals of sodium selenantimonate, $\text{Na}_3\text{SbSe}_4 + 9\text{H}_2\text{O}$ (Pouget, A ch 1899, (7) 18 562)

Sodium paraselenantimonite, $\text{Na}_2\text{Sb}_2\text{Se}_7$

(Pouget, A ch 1899, (7) 18 561)

Selenic acid, H_2SeO_4

Very sol in H_2O with evolution of heat

If aqueous solution is evaporated at temp of 165° , acid has 2 524 sp gr, at temp of 267° , acid has 2 60 sp gr, at temp of 285° , acid has 2 625 sp gr Decomp to H_2SeO_3 at higher temp (Mitscherlich, Pogg 9 623)

By evaporation at 265° , acid of 2 609 sp gr containing 95% H_2SeO_4 is obtained. If brought at same temp in vacuo over H_2SO_4 , acid of 2 627 sp gr with 97 5% H_2SeO_4 is obtained (Fabian, A Suppl 1 243)

Sp gr of $\text{H}_2\text{SeO}_4 + \text{Aq}$

% H_2SeO_4	Sp gr	% H_2SeO_4	Sp gr
99 73	2 6083	90 0	2 3848
99 50	2 6051	89 0	2 3568
99 00	2 6975	88 0	2 3291
98 5	2 5863	87 0	2 3061
98 0	2 5767	86 0	2 2795
97 5	2 5695	85 0	2 5558
97 0	2 5601	84 0	2 2258
96 0	2 5388	83 0	2 1946
95 0	2 5163	82 0	2 1757
94 0	2 4925	81 0	2 1479
93 0	2 4596	80 0	2 1216
92 0	2 4322	79 0	2 0922
91 0	2 4081	73 50	1 9675

Sp gr of $\text{H}_2\text{SeO}_4 + \text{Aq}$ at 20° compared with H_2O at 4°

Wts corrected to vacuum

Sp gr	% H_2SeO_4	Sp gr	% H_2SeO_4	Sp gr	% H_2SeO_4
1 000		1 295	32 64	1 590	54 62
1 005	0 9	1 300	33 08	1 595	54 92
1 010	1 56	1 305	33 50	1 600	55 28
1 015	2 12	1 310	33 92	1 605	55 62
1 020	2 92	1 315	34 36	1 610	55 96
1 025	3 62	1 320	34 82	1 615	56 30
1 030	4 16	1 325	35 26	1 620	56 60
1 035	4 70	1 330	35 72	1 625	56 88
1 040	5 32	1 335	36 10	1 630	57 20
1 045	6 08	1 340	36 43	1 635	57 48
1 050	6 66	1 345	36 88	1 640	57 70
1 055	7 34	1 350	37 34	1 645	58 04
1 060	7 92	1 355	37 80	1 650	58 47
1 065	8 56	1 360	38 24	1 655	58 86
1 070	9 20	1 365	38 66	1 660	59 24
1 075	9 82	1 370	39 10	1 665	59 56
1 080	10 44	1 375	39 50	1 670	59 74
1 085	11 02	1 380	39 98	1 675	59 94
1 090	11 62	1 385	40 06	1 680	60 18
1 095	12 20	1 390	40 66	1 685	60 36
1 100	12 88	1 395	41 10	1 690	60 58
1 105	13 58	1 400	41 56	1 695	60 80
1 110	14 14	1 405	41 98	1 700	61 06
1 115	14 66	1 410	42 36	1 705	61 36
1 120	15 20	1 415	42 78	1 710	61 64
1 125	15 74	1 420	43 16	1 715	61 90
1 130	16 32	1 425	43 56	1 720	62 24
1 135	16 86	1 430	43 94	1 725	62 48
1 140	17 38	1 435	44 32	1 730	62 76
1 145	17 90	1 440	44 52	1 735	63 06
1 150	18 44	1 445	45 00	1 740	63 32
1 155	18 92	1 450	45 32	1 745	63 60
1 160	19 48	1 455	45 68	1 750	63 86
1 165	20 02	1 460	46 04	1 755	64 04
1 170	20 58	1 465	46 36	1 760	64 24
1 175	21 08	1 470	46 70	1 765	64 42
1 180	21 60	1 475	47 01	1 770	64 62
1 185	22 22	1 480	47 32	1 775	64 84
1 190	22 66	1 485	47 66	1 780	65 06
1 195	23 18	1 490	47 98	1 785	65 28
1 200	23 70	1 495	48 28	1 790	65 48
1 205	24 26	1 500	48 54	1 795	65 66
1 210	24 84	1 505	48 92	1 800	65 90
1 215	25 30	1 510	49 30	1 805	66 12
1 220	25 84	1 515	49 68	1 810	66 36
1 225	26 30	1 520	50 02	1 815	66 64
1 230	26 84	1 525	50 34	1 820	66 90
1 235	27 28	1 530	50 68	1 825	67 16
1 240	27 70	1 535	51 04	1 830	67 46
1 245	28 18	1 540	51 38	1 835	67 72
1 250	28 58	1 545	51 66	1 840	68 02
1 255	29 06	1 550	51 98	1 845	68 30
1 260	29 44	1 555	52 28	1 850	68 50
1 265	29 82	1 560	52 56	1 855	68 70
1 270	30 26	1 565	52 88	1 860	68 92
1 275	30 76	1 570	53 28	1 865	69 12
1 280	31 26	1 575	53 56	1 870	69 34
1 285	31 74	1 580	53 94	1 875	69 56
1 290	32 18	1 585	54 30	1 880	69 72

(Cameron and Macallan, Lond R Soc Proc

Sp gr of $\text{H}_2\text{SeO}_4 + \text{Aq}$ —Concluded

Sp	gr	% H_2SeO_4	Sp	gr	% H_2SeO_4	Sp	gr	% H_2SeO_4
1	.85	69 94	2	125	80 25	2	365	89 14
1	.90	70 14	2	130	80 42	2	370	89 30
1	.95	70 38	2	135	80 68	2	375	89 48
1	.00	70 64	2	140	80 74	2	380	89 60
1	.05	70 78	2	145	80 96	2	385	89 72
1	.10	71 00	2	150	81 14	2	390	89 84
1	.15	71 21	2	155	81 36	2	395	89 96
1	.20	71 38	2	160	81 60	2	400	90 10
1	.25	71 68	2	165	81 80	2	405	90 20
1	.30	72 00	2	170	82 02	2	410	90 30
1	.35	72 38	2	175	82 22	2	415	90 46
1	.40	72 66	2	180	82 44	2	420	90 74
1	.45	72 88	2	185	82 64	2	425	91 00
1	.50	73 12	2	190	82 78	2	430	91 24
1	.55	73 34	2	195	82 96	2	435	91 46
1	.60	73 54	2	200	83 10	2	440	91 70
1	.65	73 74	2	205	83 24	2	445	92 00
1	.70	73 98	2	210	83 44	2	450	92 28
1	.75	74 22	2	215	83 62	2	455	92 56
1	.80	74 44	2	220	83 78	2	460	92 85
1	.85	74 66	2	225	83 96	2	465	93 02
1	.90	74 86	2	230	84 14	2	470	93 20
1	.95	75 08	2	235	84 30	2	475	93 36
2	.00	75 28	2	240	84 48	2	480	93 68
2	.05	75 46	2	245	84 60	2	485	94 02
2	.10	75 66	2	250	84 82	2	490	94 32
2	.15	75 88	2	255	85 02	2	495	94 48
2	.20	76 06	2	260	85 26	2	500	94 64
2	.25	76 14	2	265	85 44	2	505	94 80
2	.30	76 48	2	270	85 60	2	510	94 96
2	.35	76 68	2	275	85 78	2	515	95 32
2	.40	76 84	2	280	85 96	2	520	95 58
2	.45	77 08	2	285	86 16	2	525	95 86
2	.50	77 36	2	290	86 38	2	530	96 10
2	.55	77 50	2	295	86 60	2	535	96 41
2	.60	77 62	2	300	86 82	2	540	96 68
2	.65	77 80	2	305	87 04	2	545	96 92
2	.70	78 06	2	310	87 26	2	550	97 12
2	.75	78 24	2	315	87 46	2	555	97 30
2	.80	78 48	2	320	87 66	2	560	97 48
2	.85	78 68	2	325	87 84	2	565	97 68
2	.90	78 84	2	330	88 00	2	570	97 94
2	.95	79 08	2	335	88 18	2	575	98 20
2	.00	79 28	2	340	88 34	2	580	98 46
2	.05	79 50	2	345	88 48	2	585	98 70
2	.10	79 68	2	350	88 66	2	590	99 04
2	.15	79 90	2	355	88 82	2	595	99 36
2	.20	80 10	2	360	88 98			

(L mer and Lenher J phys Chem 1909, 13 509)

sol in conc or fuming H_2SO_4
 insol in liquid NH_3 (Franklin, Am Ch
 J 398, 20 830)
 Decomp by alcohol
 H_2O (Cameron and Macallan, C N
 59 232)
 $2\text{H}_2\text{O}$, and $+6\text{H}_2\text{O}$ (?) (C and M)
 $4\text{H}_2\text{O}$ (Kremann and Hofmeier, M
 19 3, 29 1117)

Selenates

All the neutral and acid salts of H_2SeO_4 are
 sol in H_2O , except BaSeO_4 , SrSeO_4 , CaSeO_4 ,
 and PbSeO_4 , which are nearly or quite insol
 in H_2O or $\text{HNO}_3 + \text{Aq}$

Aluminum selenate, $\text{Al}_2(\text{SeO}_4)_3$

Resembles in every way aluminum sul-
 phate (Berzelius)

Aluminum ammonium selenate,
 $\text{Al}_2(\text{NH}_4)_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$

More sol in H_2O than the corresponding
 sulphate (Wohlwill, A 114 191)

Aluminum caesium selenate, $\text{Al}_2\text{Cs}_2(\text{SeO}_4)_4 +$
 $24\text{H}_2\text{O}$

(Peterson, B 9 1563)

Much more sol in H_2O than the corre-
 sponding sulphate (Fabre, C R 105 114)

Aluminum potassium selenate, $\text{Al}_2\text{K}_2(\text{SeO}_4)_4$
 $+ 24\text{H}_2\text{O}$

More sol in H_2O than common alum
 (Weber, Pogg 108 615)

Aluminum rubidium selenate, $\text{Al}_2\text{Rb}_2(\text{SeO}_4)_4$
 $+ 24\text{H}_2\text{O}$

(Peterson, B 9 1563)

Much more sol in H_2O than the corre-
 sponding sulphate (Fabre, C R 105 114)

Aluminum sodium selenate, $\text{Al}_2\text{Na}_2(\text{SeO}_4)_4 +$
 $24\text{H}_2\text{O}$

Sl efflorescent Very sol in H_2O (Wohl-
 will, A 114 191)

Aluminum thallium sulphate, $\text{Al}_2\text{Tl}_2(\text{SeO}_4)_4 +$
 $24\text{H}_2\text{O}$

Sol in H_2O (Fabre, C R 105 114)

Aluminum selenate potassium sulphate,
 $\text{Al}_2(\text{SeO}_4)_3, \text{K}_2\text{SO}_4 + 24\text{H}_2\text{O}$

Sol in H_2O (v Gerichten, A 168 222)

Ammonium selenate, $(\text{NH}_4)_2\text{SeO}_4$

Easily sol in H_2O
 100 g H_2O dissolve 117 g $(\text{NH}_4)_2\text{SeO}_4$ at
 7° , 164 g at 59° , 197 g at 100° (Tutton,
 Proc Roy Soc 1907, 79, A 351)
 Insol in liquid NH_3 (Franklin, Am Ch
 J 1898, 20 826)

Ammonium hydrogen selenate, NH_4HSeO_4
 Sol in H_2O (Topsoe)Ammonium cadmium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{CdSeO}_4 + 2\text{H}_2\text{O}$

Sol in H_2O (Topsoe, W A B 66, 2 2)
 $+ 6\text{H}_2\text{O}$ Efflorescent Very easily sol in
 H_2O (Topsoe)

Ammonium cerous selenate,
 $(\text{NH}_4)_2\text{Ce}_2(\text{SeO}_4)_4 + 9\text{H}_2\text{O}$
 Easily sol in H_2O (John)

Ammonium chromium selenate,
 $(\text{NH}_4)_2\text{Cr}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$
 Sol in H_2O (Fabre, C R 105 114)

Ammonium cobaltous selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{CoSeO}_4 + 6\text{H}_2\text{O}$
 Easily sol in H_2O (Topsoë)

Ammonium cupric selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{CuSeO}_4 + 6\text{H}_2\text{O}$
 Sol in H_2O (Topsoë)

Ammonium didymium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{D}_{12}(\text{SeO}_4)_3 + 6\text{H}_2\text{O}$
 Easily sol in H_2O (Cleve)
 $+10\text{H}_2\text{O}$ (Cleve, Bull Soc (2) 43 363)

Ammonium erbium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{Er}_2(\text{SeO}_4)_3 + 4\text{H}_2\text{O}$
 Easily sol in H_2O (Cleve)

Ammonium ferrous selenate, $(\text{NH}_4)_2\text{Fe}(\text{SeO}_4)_2$
 $+6\text{H}_2\text{O}$
 Easily sol in H_2O (Topsoë)
 $+2\text{H}_2\text{O}$

Ammonium lanthanum selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{La}_2(\text{SeO}_4)_3 + 9\text{H}_2\text{O}$
 Sol in H_2O (Cleve)

Ammonium magnesium selenate,
 $(\text{NH}_4)_2\text{Mg}(\text{SeO}_4)_2 + 6\text{H}_2\text{O}$
 Easily sol in H_2O (Topsoë)

Ammonium manganous selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{MnSeO}_4 + 6\text{H}_2\text{O}$
 Not deliquescent Easily sol in H_2O
 (Topsoë)

Ammonium nickel selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{NiSeO}_4 + 6\text{H}_2\text{O}$
 Sol in H_2O (Topsoë)

Ammonium samarium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{Sm}_2(\text{SeO}_4)_3 + 6\text{H}_2\text{O}$
 Easily sol in H_2O (Cleve)

Ammonium thallium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{Tl}_2(\text{SeO}_4)_3 + 8\text{H}_2\text{O}$
 Sol in H_2O (Fortin, C C 1903, II 706)

Ammonium uranyl selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $(\text{UO}_2)_2\text{SeO}_4 + 2\text{H}_2\text{O}$
 Easily sol in H_2O (Sendtner)

Ammonium yttrium selenate, $(\text{NH}_4)_2\text{SeO}_4$,
 $\text{Y}_2(\text{SeO}_4)_3 + 6\text{H}_2\text{O}$
 Very sol in H_2O (Cleve)

Ammonium zinc selenate,
 $(\text{NH}_4)_2\text{SeO}_4, \text{ZnSeO}_4 + 6\text{H}_2\text{O}$
 Sol in H_2O (Topsoë)

Antimony selenate
 Insol in H_2O Not very sol in acids Sol
 in H_2SeO_4 (Cameron and Macallan)

Barium selenate, BaSeO_4
 Somewhat more sol in H_2O and dil acids
 than BaSO_4 (Rose) 100 ccm H_2O dissolve
 11.8 mg in the cold, and 13.8 mg at 100°
 (Petersson, Z anal 12 287)
 Not decomp by H_2SO_4 Insol in HNO_3 +
 Aq (Berzeli) but decomp by solution of
 alkalis at ordinary temp
 Very slowly decomp by HCl + Aq (Rose,
 Pogg 95 426)

Bismuth selenate
 Insol in, and not decomp by cold or hot
 H_2O (Cameron and Macallan)

Cæsium selenate, Cs_2SeO_4
 Sol in H_2O (Petersson, B 9 1561)
 100 g H_2O at 12° dissolve 244.8 g Cs_2SeO_4
 (Tutton, Chem Soc 1897, 71 850)
 Sp gr of Cs_2SeO_4 + Aq at 20° compared
 with H_2O at 4° , containing

% Cs_2SeO_4	45.94	53.43
Sp gr	1.5841	1.7432

 (Tutton)

Cæsium hydrogen selenate, CsHSeO_4
 Ppt Very hygroscopic (Norris, Am Ch
 J 1901, 26 322)

Cæsium chromic selenate, $\text{Cs}_2\text{Cr}_2(\text{SeO}_4)_4 +$
 $24\text{H}_2\text{O}$
 Sol in H_2O (Fabre, C R 105 114)

Cæsium cobaltous selenate, $\text{Cs}_2\text{Co}(\text{SeO}_4)_2 +$
 $6\text{H}_2\text{O}$
 Sol in H_2O (Topsoë)

Cæsium indium selenate, $\text{CsIn}(\text{SeO}_4)_2 +$
 $12\text{H}_2\text{O}$
 Efflorescent, sol in H_2O (Mathews, J
 Am Chem Soc 1908, 30 215)

Cæsium iron (ferric) selenate, $\text{Cs}_2\text{Fe}_2(\text{SeO}_4)_3$
 $+24\text{H}_2\text{O}$
 Sl sol in H_2O (Roncighiolo, Gazz cl
 it 1905, 35 (2) 553)

Cæsium magnesium selenate, $\text{Cs}_2\text{MgSeO}_4$
 $\text{MgSeO}_4 + 6\text{H}_2\text{O}$
 (Tutton, Chem Soc 1905, 87, 1163)

Cæsium zinc selenate, $\text{Cs}_2\text{Zn}(\text{SeO}_4)_2 + 6\text{H}_2\text{O}$
 (Tutton, Zeit Kryst 1900, 33 14)

Cadmium selenate, $\text{CdSeO}_4 \cdot 2\text{H}_2\text{O}$
Very sol in H_2O (v Hauer, W A B 39 2 3)

Cadmium potassium selenate, $\text{CdSeO}_4 \cdot \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$
Sol in H_2O , can be recrystallized without comp (v Hauer, W A B 54 209)

Calcium selenate, $\text{CaSeO}_4 \cdot 2\text{H}_2\text{O}$
Less sol in hot than in cold H_2O (v Hauer, J pr 80 214)
Sat $\text{CaSeO}_4 + \text{Aq}$ contains at
- 1° +5° 20° 37° 67°
4 73 76 68 51% CaSeO_4
(Etard, A ch 1894, (7) 2 551)

Chromium selenate, $\text{Cr}_2(\text{SO}_4)_3 \cdot 6\text{H}_2\text{O}$, $9\text{H}_2\text{O}$, or $12\text{H}_2\text{O}$
More sol in cold than hot H_2O (Jolin)
+4 H_2O Very easily in cold, sl sol in hot
F O (Cingolani, C C 1908, I 1606)
Stable above 100°
+5 H_2O Stable at 92–100°
+7 H_2O Stable at 80–92°
+8 H_2O Stable at 50–78°
+10 H_2O Stable at 34–40°
+11 H_2O Stable at 12–28°
+12 H_2O Stable at 0–12° (Cingolani, C A 1908 2658)

Solubility of $\text{Ce}_2(\text{SeO}_4)_3$ in H_2O at t°
(salt calculated as anhydrous $\text{Ce}_2(\text{SO}_4)_3$ dissolved in 100 cc H_2O)

	Usng $\text{Ce}_2(\text{SeO}_4)_3$ +11 H_2O	Usng $\text{Ce}_2(\text{SeO}_4)_3$ +4 H_2O	t	Usng $\text{Ce}_2(\text{SeO}_4)_3$ +11 H_2O	Usng $\text{Ce}_2(\text{SeO}_4)_3$ +4 H_2O
		39 55	60°	13 68	
1 6	37		60 8		13 12
1 6		36 9	78 2	5 52	
2 6	33 84		80 5		4 56
2 8		33 2	91	2 02	
3 2	33 15		95 4	1 53	
4 6	32 16		95		1 785
4 9		31 89	100		2 513

(Cingolani, I c)

Chromium potassium selenate, $\text{Cr}_2(\text{SeO}_4)_3 \cdot 5\text{K}_2\text{SeO}_4$
More sol in H_2O than the corresponding sulphate (Jolin)

Chromium sodium selenate, $\text{Cr}_2(\text{SeO}_4)_3 \cdot \text{Na}_2\text{SeO}_4 + 5\text{H}_2\text{O}$
White sol in H_2O (Jolin)

Chromic potassium selenate, $\text{Cr K}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$
Resembles the sulphate in every particular

Chromic rubidium selenate, $\text{Cr}_2\text{Rb}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$
Sol in H_2O

Chromic sodium selenate, $\text{Cr}_2\text{Na}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$
Sol in H_2O (Fabre, C R 105 114)

Chromic thallous selenate, $\text{Cr}_2\text{Tl}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$
Sol in H_2O (Fabre, C R 105 114)

Chromic selenate potassium sulphate,
 $\text{Cr}_2(\text{SeO}_4)_3 \cdot \text{K}_2\text{SO}_4 + 24\text{H}_2\text{O}$
Sol in H_2O (v Gerichten)

Cobaltous selenate, basic, $4\text{CoO} \cdot 3\text{SeO}_3 + \text{H}_2\text{O}$
Insol in H_2O , sol in acids (Bogdan, Bull Soc (3) 9 586)
 $\text{Co}_3(\text{OH})_2(\text{SeO}_4)_2$ Insol in H_2O Sol in acids (Bogdan, C C 1895 630)

Cobaltous selenate, $\text{CoSeO}_4 \cdot 5\text{H}_2\text{O}$
Easily sol in H_2O (Topsoë)
+6 H_2O Easily sol in H_2O (Topsoë)
+7 H_2O Efflorescent Extremely sol in H_2O (Topsoë)
+18 H_2O Very unstable (Copaux, A ch 1905, (8) 6 553)

Cobaltous potassium selenate, $\text{CoSeO}_4 \cdot \text{K}_2\text{SeO}_4 + 6\text{H}_2\text{O}$
More sol in H_2O than corresponding sulphate (v Hauer, W A B 39 837)

Cobaltous rubidium selenate, $\text{CoRb}_2(\text{SeO}_4)_2 + 6\text{H}_2\text{O}$
Sol in H_2O (Topsoë)

Cobaltous thallous selenate, $\text{CoTl}_2(\text{SeO}_4)_2 + 6\text{H}_2\text{O}$
Sol in H_2O (Topsoë)

Cupric selenate, basic, $3\text{CuO} \cdot 2\text{SeO}_3 + 4\text{H}_2\text{O}$
Insol in H_2O , sol in acids (Bogdan, Bull Soc (3) 9 588)
+5 H_2O Sl sol in cold H_2O (Metzner, C R 1898, 127 55)
+ H_2O , and +2 H_2O (Metzner)

Cupric selenate, $\text{CuSeO}_4 \cdot 5\text{H}_2\text{O}$
Solubility in H_2O —
257 g salt in 1 l sat solution at 15°
346 " " 11 " " 35°
435 " " 11 " " 55°
Aq solution decomp at 70° (Metzner, C R 1898, 127 55)
+ H_2O , and +2 H_2O (Metzner)

Cupric hydrazine selenate, $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SeO}_4 \cdot \text{CuSeO}_4 + \frac{1}{2}\text{H}_2\text{O}$
Decomp in aq solution (Rumini, C C 1907, I 86)

Cupric magnesium selenate , $\text{CuMg}_2(\text{SeO}_4)_4 + 28\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Glucinum selenate , $\text{GlSeO}_4 + 4\text{H}_2\text{O}$ Very sol in H_2O (Atterberg)
Cupric nickel selenate , CuSeO_4 , $\text{NiSeO}_4 + 14\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Gold (auric) selenate , $\text{Au}_2(\text{SeO}_4)_3$ Insol in H_2O Sol in hot conc $\text{H}_2\text{SeO}_4 + \text{Aq}$ Somewhat sol in H_2SO_4 and $\text{HNO}_3 + \text{Aq}$ Decomp by $\text{HCl} + \text{Aq}$ (Lenher, J Am Chem Soc 1902, 24 355)
Cupric potassium selenate , CuSeO_4 , $\text{K}_2\text{SeO}_4 + 6\text{H}_2\text{O}$ Sl sol in H_2O (Topsoe)	Indium selenate , $\text{In}_2(\text{SeO}_4)_3 + 10\text{H}_2\text{O}$ Hydroscopic, easily sol in H_2O (Mathers, J Am Chem Soc 1908, 30 214)
Cupric zinc selenate , $\text{CuZn}_3(\text{SeO}_4)_4 + 28\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Iron (ferrous) selenate , $\text{FeSeO}_4 + 5\text{H}_2\text{O}$ Sol in H_2O (Wohlwill, A 114 169) $+ 7\text{H}_2\text{O}$ Efflorescent, and sol in H_2O (Topsoe)
Cupric selenate ferrous sulphate , 2CuSeO_4 , $3\text{FeSO}_4 + 35\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Iron (ferrous) potassium selenate , FeSeO_4 , $\text{K}_2\text{SeO}_4 + 6\text{H}_2\text{O}$ Easily sol in H_2O Solution decomp somewhat on standing (Topsoe)
Cupric selenate magnesium sulphate , CuSeO_4 , $3\text{MgSO}_4 + 28\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Iron (ferric) rubidium selenate , $\text{Rb}_2\text{Fe}_2(\text{SeO}_4)_4 + 24\text{H}_2\text{O}$ Sl sol in H_2O (Roncogliolo, Gazz ch it 1905, 35 (2) 553)
Cupric selenate zinc sulphate , CuSeO_4 , $3\text{ZnSO}_4 + 28\text{H}_2\text{O}$ Sol in H_2O (Wohlwill)	Iron (ferric) selenate potassium sulphate , $\text{Fe}_2(\text{SeO}_4)_3$, $\text{K}_2\text{SO}_4 + 24\text{H}_2\text{O}$ Sol in H_2O (v Gerichten)
Didymium selenate , $\text{D}_{12}(\text{SeO}_4)_3 + 5\text{H}_2\text{O}$, and $6\text{H}_2\text{O}$ Sol in H_2O $+ 8\text{H}_2\text{O}$ Easily sol in H_2O (Cleve) $+ 10\text{H}_2\text{O}$ Sol in H_2O (Cleve)	Lanthanum selenate , $\text{La}_2(\text{SeO}_4)_3 + 6\text{H}_2\text{O}$, and $10\text{H}_2\text{O}$ Easily sol in cold H_2O (Cleve) $+ 12\text{H}_2\text{O}$ (Frenchs and Smith, A 191 355)
Didymium potassium selenate , $\text{D}_{12}(\text{SeO}_4)_3$, $\text{K}_2\text{SeO}_4 + 9\text{H}_2\text{O}$ Not deliquescent Easily sol in H_2O (Cleve)	Lanthanum potassium selenate , $\text{La}_2(\text{SeO}_4)_3$, $\text{K}_2\text{SeO}_4 + 9\text{H}_2\text{O}$ Quite sol in H_2O (Cleve)
Didymium sodium selenate , $\text{D}_{12}(\text{SeO}_4)_3$, $\text{Na}_2\text{SeO}_4 + 4\text{H}_2\text{O}$ Easily sol in H_2O (Cleve)	Lanthanum sodium selenate , $\text{La}_2(\text{SeO}_4)_3$, $\text{Na}_2\text{SeO}_4 + 4\text{H}_2\text{O}$ Easily sol in H_2O (Cleve)
Dysprosium selenate , $\text{Dy}_2(\text{SeO}_4)_3 + 8\text{H}_2\text{O}$ Easily sol in H_2O , insol in alcohol (Jantsch, B 1911, 44 1275)	Lead selenate, basic , 2PbO , SeO_3 Decomp by acids with separation of PbSeO_4 3PbO , $\text{PbSeO}_4 + \text{H}_2\text{O}$ Ppt (Stromholm, Z anorg 1904, 38 443)
Erbium selenate , $\text{Er}_2(\text{SeO}_4)_3 + 8\text{H}_2\text{O}$, and $9\text{H}_2\text{O}$ Easily sol in H_2O (Topsoe)	Lead selenate , PbSeO_4 Insol in H_2O or $\text{HNO}_3 + \text{Aq}$ (Schafarik, W A B 47 256) Min <i>Kerstenite</i>
Erbium potassium selenate , $\text{Er}_2(\text{SeO}_4)_3$, $\text{K}_2\text{SeO}_4 + 8\text{H}_2\text{O}$ Easily sol in H_2O (Cleve)	Lithium selenate , $\text{Li}_2\text{SeO}_4 + \text{H}_2\text{O}$ Not deliquescent Easily sol in H_2O (Topsoe)
Gadolinium selenate , $\text{Gd}_3(\text{SeO}_4)_3 + 10\text{H}_2\text{O}$ Decomp in the air (Benedicks, Z anorg 1900, 22 410)	
Gadolinium potassium selenate , $\text{Gd}_2(\text{SeO}_4)_3$, $3\text{K}_2\text{SeO}_4 + 4\text{H}_2\text{O}$ Sol in H_2O (Benedicks, Z anorg 1900, 22 412)	

- agnesium selenate**, $\text{MgSeO}_4 \cdot 6\text{H}_2\text{O}$
Solubility resembles closely that of MgSO_4 (opsoe)
- agnesium potassium selenate**, $\text{MgK}_2(\text{SeO}_4)_2 \cdot 6\text{H}_2\text{O}$
Easily sol in H_2O (Topsoe)
- agnesium rubidium selenate**, $\text{MgSeO}_4 \cdot \text{Rb}_2\text{SeO}_4 \cdot 6\text{H}_2\text{O}$
(Tutton, Chem Soc 1905, 87 1163)
- anganous selenate**, $\text{MnSeO}_4 \cdot 2\text{H}_2\text{O}$
Easily sol in H_2O (Topsoe)
+ $5\text{H}_2\text{O}$ Easily sol in H_2O Solution comp on warming or standing (Topsoe)
- anganous potassium selenate**, $\text{K}_2\text{SeO}_4 \cdot \text{MnSeO}_4$
Not deliquescent Easily sol in H_2O (opsoe)
- ercurous selenate**, $6\text{Hg}_2\text{O} \cdot 5\text{SeO}_3$
Very sl sol in H_2O Sl attacked by boiling HNO_3 Insol in $\text{HCl} + \text{Aq}$ (Kohler, pgg 89 146)
 Hg_2SeO_4 Very sl sol in H_2O , insol in $\text{Cl} + \text{Aq}$ (Cameron and Davy, C N 44)
- ercuric selenate, basic**, $6\text{HgO} \cdot 2\text{SeO}_3 \cdot \text{H}_2\text{O}$
Insol in H_2O , or cold $\text{HNO}_3 + \text{Aq}$ Sol in dil HNO_3 or $\text{HCl} + \text{Aq}$ (Kohler)
 $\text{HgSeO}_4 \cdot 2\text{HgO}$ Sol in 10,330 pts H_2O (Cameron and Davy)
- ercuric selenate**, $\text{HgSeO}_4 \cdot \text{H}_2\text{O}$
Decomp by H_2O with formation of basic lt (Kohler)
Sol in H_2SeO_4 , H_2SO_4 , HNO_3 , or $\text{HCl} + \text{Aq}$, it decomp by H_2O to 2HgO , HgSeO_4 (Cameron and Davy, C N 44 63)
- nickel selenate**, $\text{NiSeO}_4 \cdot 6\text{H}_2\text{O}$
Very easily sol in H_2O (v Hauer, W A 39 305)
- nickel potassium selenate**, $\text{NiSeO}_4 \cdot \text{K}_2\text{SeO}_4 \cdot 6\text{H}_2\text{O}$
Sol in H_2O (Topsoe)
- nickel thallium selenate**, $\text{NiSeO}_4 \cdot \text{Tl}_2\text{SeO}_4 \cdot 6\text{H}_2\text{O}$
Sol in H_2O (Pettersson)
- aluminum selenate**
Sol in boiling H_2O Sol in $\text{HCl} + \text{Aq}$ sol in alcohol (Cameron and Macallan, and R Soc Proc 46 13)
- Potassium selenate**, K_2SeO_4
Nearly equally sol in cold and hot H_2O (Mitscherlich, Pogg 9 623)
100 g H_2O dissolve 110.5 g K_2SeO_4 at 0° , 112.8 g at 20° , 122.2 g at 100° (Etard, C R 1888, 106 741)
Sat $\text{K}_2\text{SeO}_4 + \text{Aq}$ contains at

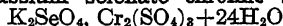
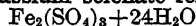
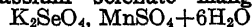
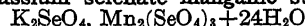
-20°	-5°	$+5^\circ$
51.5	51.7	52.0% K_2SeO_4

18°	97°
52.6	54.9% K_2SeO_4

(Etard, A ch 1894, (7) 2 550)
100 g H_2O at 12° dissolve 115.0 g K_2SeO_4 (Tutton, Chem Soc 1897, 71 850)
Sp gr of $\text{K}_2\text{SeO}_4 + \text{Aq}$ at 20° compared with H_2O at 4° , containing

% K_2SeO_4	35.76	41.79	50.00
Sp gr	1.3591	1.4385	1.5590

(Tutton, Chem Soc 1897, 71 851)
- Potassium hydrogen selenate**, KHSO_4
Sol in H_2O
- Potassium praseodymium selenate**, $3\text{K}_2\text{SeO}_4 \cdot \text{Pr}_2(\text{SeO}_4)_3 \cdot 4\text{H}_2\text{O}$
Sl sol in H_2O (von Scheele, Z anorg 1893, 18 361)
- Potassium samarium selenate**, $\text{K}_2\text{SeO}_4 \cdot \text{Sm}_2(\text{SeO}_4)_3 \cdot 6\text{H}_2\text{O}$
Easily sol in H_2O (Cleve, Bull Soc (2) 43 166)
- Potassium sodium selenate**, $3\text{K}_2\text{SeO}_4 \cdot \text{Na}_2\text{SeO}_4$
Sol in H_2O (Topsoe)
- Potassium thallium selenate**, $\text{K}_2\text{SeO}_4 \cdot \text{Tl}_2(\text{SeO}_4)_3 \cdot 8\text{H}_2\text{O}$
Very sol in dil acids (Fortini, C C 1903, II 706)
- Potassium uranyl selenate**, $\text{K}_2\text{SeO}_4 \cdot (\text{UO}_2)\text{SeO}_4 \cdot 2\text{H}_2\text{O}$
Sl sol in cold, easily in hot H_2O (Sendtner)
- Potassium yttrium selenate**, $\text{K}_2\text{SeO}_4 \cdot \text{Y}_2(\text{SeO}_4)_3 \cdot 6\text{H}_2\text{O}$
Very sol in H_2O (Cleve)
- Potassium zinc selenate**, $\text{K}_2\text{SeO}_4 \cdot \text{ZnSeO}_4 \cdot 2\text{H}_2\text{O}$
Sol in H_2O (Topsoe)
+ $6\text{H}_2\text{O}$ Sol in H_2O (Topsoe)
- Potassium selenate aluminum sulphate**, $\text{K}_2\text{SeO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
Sol in H_2O (v Gerichten)

Potassium selenate chromic sulphate,Sol in H_2O (v Gerichten)**Potassium selenate ferric sulphate, $\text{K}_2\text{SeO}_4,$** Sol in H_2O (v Gerichten)**Potassium selenate manganous sulphate,**Sol in H_2O (v Gerichten, A 168 225)**Potassium selenate manganic sulphate,**Sol in H_2O (v Gerichten)**Praseodymium selenate, $\text{Pr}_2(\text{SeO}_4)_2$** Sol in H_2O (von Schule, Z anorg 1898, 18 360)+ $8\text{H}_2\text{O}$ Sl sol in H_2O , sol in H_2SO_4 (von Schule)**Rubidium selenate, Rb_2SeO_4** Sol in H_2O (Petersson)100 g H_2O at 12° dissolve 158.9 g Rb_2SeO_4 (Tutton, Chem Soc 1897, 71 850)Sp gr of $\text{Rb}_2\text{SeO}_4 + \text{Aq}$ at 20° compared with H_2O at 4° , containing

% Rb_2SeO_4	40.60	47.07
Sp gr	1.4688	1.5806

(Tutton)

Rubidium hydrogen selenate, RbHSeO_4 Sol in equal pts H_2O , very hygroscopic (Norris, Am Ch J 1901, 26 321)**Rubidium zinc selenate, $\text{Rb}_2\text{Zn}(\text{SeO}_4)_2 + 6\text{H}_2\text{O}$**

(Tutton, Zeit Kryst 1900, 33 8)

Samarium selenate, $\text{Sm}_2(\text{SeO}_4)_3 + 8\text{H}_2\text{O}$ More sol in H_2O than $\text{Sm}_2(\text{SO}_4)_3 + 12\text{H}_2\text{O}$ Efflorescent (Cleve)**Scandium selenate, $\text{Sc}_2(\text{SeO}_4)_3 + 2\text{H}_2\text{O}$, and + $8\text{H}_2\text{O}$**

(Crookes, Roy Soc Proc 1908, 80, A 518)

Silver selenate, Ag_2SeO_4 As Ag_2SO_4 (Mitscherlich, Pogg 12 138)**Silver selenate ammonia, $\text{Ag}_2\text{SeO}_4, 4\text{NH}_3$** Easily sol in H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ without decomp (Mitscherlich, Pogg 12 141)**Sodium selenate, Na_2SeO_4** Very sol in H_2O , forming supersat solutions Cryst also with $10\text{H}_2\text{O}$, which effloresces Maximum point of solubility is at 33° (Mitscherlich)Solubility in H_2O at t°

t°	% Na_2SeO_4	Mols H_2O to 1 mol Na_2SeO_4	Mols anhydrous salt to 100 mols H_2O
35 2	45 47	17 59	7 94
39 5	45 26	12 70	7 87
50	44 49	13 10	7 63
75	42 83	14 00	7 14
100	42 14	14 42	6 93

(Funk, B 1900, 33 3697)

+ $10\text{H}_2\text{O}$ Solubility in H_2O at t°

t°	% Na_2SeO_4	Mols H_2O to 1 mol Na_2SeO_4	Mols anhydrous salt to 100 mols H_2O
0	11 74	79 08	1 26
15	25 01	31 48	3 18
25 2	36 91	17 95	5 57
27	39 18	16 30	6 13
30	44 05	13 33	7 50

(Funk)

Sp gr of sat solution at $18^\circ = 1.315$ (Funk)**Sodium selenate vanadate** $\text{Se}_2\text{Selenovanadate}$, sodium**Strontium selenate, SrSeO_4** Insol in H_2O or $\text{HNO}_3 + \text{Aq}$, decomp by long boiling with $\text{HCl} + \text{Aq}$ **Tellurium selenate, $2\text{TeO}_2, \text{SeO}_3$**

As sulphate (Metzner, A ch 1898, (7) 15 203)

Thallous selenate, Tl_2SeO_4 Sl sol in cold, much more in hot H_2O Insol in alcohol and ether (Kuhlmann)100 g H_2O dissolve 2.13 g at 9.3° , 2.4 g at 12° , 10.86 g at 100° (Tutton, Proc Roy Soc 1907, 79 A, 351)2.8 g are sol in 100 g H_2O at 20° , 8.5 g at 80° (Glauser, Z anorg 1910, 66 437)**Thallous hydrogen selenate, $\text{HTlSeO}_4 + 3\text{H}_2\text{O}$**

(Oettinger)

Thallous zinc selenate, $\text{TlSeO}_4, \text{ZnSeO}_4 + 6\text{H}_2\text{O}$ Easily sol in H_2O , but less than the corresponding sulphate (Werther, Bull Soc 1865 60)**Thorium selenate, $\text{Th}(\text{SeO}_4)_4 + 9\text{H}_2\text{O}$** 100 pts $\frac{1}{2}\text{H}_2\text{O}$ dissolve 0.498 pt $\text{Th}(\text{SeO}_4)_4$ at 0° , and 1.972 pts at 100° (Cleve)

Tin (stannic) selenate, basic, $\text{SnO}(\text{SeO}_4) + \text{H}_2\text{O}$
 1 l. l. l. Sol in H_2O (Ditte, C R 231)

Uranyl selenate, $(\text{UO}_2)\text{SeO}_4, \text{H}_2\text{SeO}_4 + 18\text{H}_2\text{O}$
 1 ry deliquescent
 2 $\text{UO}_2\text{SeO}_4, \text{H}_2\text{SeO}_4 + 12\text{H}_2\text{O}$ Efflorescent
 Sol in H_2O (Sendtner, A 195 325)

Ytterbium selenate, $\text{Yb}_2(\text{SeO}_4)_3$
 1 anhydrous
 15 H_2O (?), +8 H_2O Ppt (Cleve, Z 1902, 32 145)

Ytterbium selenate, $\text{Y}_2(\text{SeO}_4)_3$
 1 anhydrous Sol in H_2O with hissing and evolution of heat (Popp)
 8 H_2O Easily sol in H_2O (Cleve)
 9 H_2O Efflorescent

Zinc selenate, $\text{ZnSeO}_4 + 5\text{H}_2\text{O}$
 1 l in H_2O (Topsoe)
 6 H_2O Sol in H_2O (Topsoe)
 7 H_2O Sol in H_2O

Selenious acid, H_2SeO_3
 1 l. l. l. in moist, efflorescent in dry air
 Very sol in cold, and in nearly every proportion in hot H_2O Easily sol in alcohol (Berzelius)

Sp gr of H_2SeO_3 and of $\text{H}_2\text{SeO}_3 + \text{Aq}$ at t°
 Two series of experiments

		t	Sp gr at t°
H_2	$\text{O}_3 + \text{Aq}$ (A)	18 0	1 4386
	vol A + 0 5 vol H_2O	18 0	1 3179
	" + 1 0 "	17 7	1 2337
	" + 1 5 "	16 6	1 2045
	" + 2 0 "	14 0	1 1984
	" + 2 5 "	17 0	1 1712
	" + 3 0 "	19 2	1 1600
	"	"	"
H_2	$\text{O}_3 + \text{Aq}$ (B)	15 8	1 4698
	vol B + 0 5 vol H_2O	16 5	1 3191
	" + 1 0 "	13 0	1 2515
	" + 1 5 "	14 2	1 2074
	" + 2 0 "	17 0	1 1992
	" + 2 5 "	16 5	1 1793
	" + 3 0 "	14 2	1 1678
	"	"	"

(de Connick, C C 1905, I 1693)

See also Selenium dioxide

sol in liquid NH_3 (Gore, Am Ch J 186, 20 830)

Selenites

alkali selenites are sol in H_2O The other neutral selenites are insol in H_2O , but sol in $\text{H}_2\text{O}_3 + \text{Aq}$, Pb, and Ag salts slowly The

neutral salts are insol in $\text{HCl} + \text{Aq}$ The acid salts of the heavy metals are sol in H_2O

Aluminum selenite, basic, $4\text{Al}_2\text{O}_3, 9\text{SeO}_2 + 36\text{H}_2\text{O}$

Precipitate (Nilson, Upsala 1875)

Aluminum selenite, $\text{Al}_2(\text{SeO}_3)_3$

Precipitate (Berzelius)
 +7 H_2O Sl sol in H_2O (Nilson) Sol in $\text{H}_2\text{SeO}_3 + \text{Aq}$
 +3 H_2O Insol in H_2O , sol in acids (Boutzoureano, A ch (6) 17 289)

Aluminum selenite, acid, $\text{Al}_2\text{O}_3, 4\text{SeO}_2 + 3\text{H}_2\text{O}$

(Boutzoureano)
 2 $\text{Al}_2\text{O}_3, 9\text{SeO}_2 + 12\text{H}_2\text{O}$ Sol in H_2O (Nilson)
 $\text{Al}_2\text{O}_3, 6\text{SeO}_2$ Very sol in H_2O (Berzelius)
 +5 H_2O (Nilson)
 +2 H_2O (Boutzoureano)

Ammonium selenite, $(\text{NH}_4)_2\text{SeO}_3$

Deliquescent Very sol in H_2O
 Precipitated from aqueous solution by alcohol Insol in ether (Muspratt, A 70 275)

Ammonium hydrogen selenite, NH_4HSeO_3

Not deliquescent Sol in H_2O (Berzelius)

Ammonium trihydrogen selenite,

$\text{NH}_4\text{H}_3(\text{SeO}_3)_2$

Deliquescent (Berzelius)

Ammonium vanadium selenite

See Vanadioselenite, ammonium

Ammonium uranyl selenite, $(\text{NH}_4)_2\text{SeO}_3, (\text{UO}_2)\text{SeO}_3$

Completely insol in H_2O (Sendtner)

Antimony selenite, $\text{Sb}_2(\text{SeO}_3)_3, \text{SeO}_2$

(Nilson, Bull Soc (2) 23 494)

Barium selenite, BaSeO_3

Sl sol in H_2O Sol in $\text{H}_2\text{SeO}_3 + \text{Aq}$ So in acids (Nilson)
 + H_2O (Nilson)

Barium pyroselenite, BaSe_2O_5

Very sl sol in cold, more in warm H_2O (Berzelius)

Bismuth selenite, $\text{Bi}_2(\text{SeO}_3)_3, \text{H}_2\text{SeO}_3$

(Nilson)

$\text{Bi}_2(\text{SeO}_3)_3$ (Nilson)

Cadmium selenite, CdSeO_3

Insol in H_2O Sol in $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Muspratt, Chem Soc 2 65)

2CdO , $3\text{SeO}_2 + \text{H}_2\text{O}$ Insol in H_2O , sol in acids (Boutzoureano)
 $+ \frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , sol in dil acids (Boutzoureano)

Cadmium selenite ammonia, CdSeO_3 , NH_3
 Insol in cold or hot H_2O (Boutzoureano, ch (6) 17 289)

selenite, $\text{CaSeO}_3 + \frac{1}{3}\text{H}_2\text{O}$
 sol in H_2O (Berzelius) More
 $\text{O}_3 + \text{Aq}$ (Nilson)

hydrogen selenite, $\text{CaH}_2(\text{SeO}_3)_2 +$
 in H_2O (Nilson)
 11 Easily sol in H_2O (Nil-

nite, basic, $2\text{Ce}_2\text{O}_3$, $5\text{SeO}_2 +$
 -te (Nilson)

selenite, $\text{Ce}_2(\text{SeO}_3)_3 + 3\text{H}_2\text{O}$
 Insol in H_2O Sol in much selenious acid
 John)
 $+ 12\text{H}_2\text{O}$ (Nilson)

Cerous selenite, acid, Ce_2O_3 , $4\text{SeO}_2 + 5$, or 6
 H_2O

| Insol in H_2O , but sol in selenious, and
 other acids (John)
 Ce_2O_3 , $6\text{SeO}_2 + 5\text{H}_2\text{O}$ Not decomp by
 H_2O (Nilson)

Ceric selenite, $\text{Ce}(\text{SeO}_3)_2$

Insol in H_2O
 Sl sol in conc HNO_3 Sol in dil acids
 Sol in $\text{H}_2\text{O}_2 + \text{Aq}$ (Barbieri, B 1910, 43
 2215)

Chromium selenite, basic, $4\text{Cr}_2\text{O}_3$, $9\text{SeO}_2 +$
 $64\text{H}_2\text{O}$

Precipitate (Nilson)

Chromic selenite, $\text{Cr}_2(\text{SeO}_3)_3 + 3\text{H}_2\text{O}$

(Boutzoureano)
 $+ 15\text{H}_2\text{O}$ (Nilson)
 Very sl sol or insol in H_2O , sl sol in
 $\text{H}_2\text{SeO}_3 + \text{Aq}$, sol in hot conc $\text{HCl} + \text{Aq}$
 (Taquet, C R 96 107)

Chromic selenite, acid, Cr_2O_3 , $4\text{SeO}_2 + 13\text{H}_2\text{O}$

Slowly sol in $\text{HCl} + \text{Aq}$ Insol in H_2O
 (Nilson)
 Cr_2O_3 , $5\text{SeO}_2 + 9\text{H}_2\text{O}$ Insol in H_2O
 (Nilson)

Chromic diselenite

Insol in H_2O , sol in acids (Taquet, C
 R 97 1435)

Cobaltous selenite, CoSeO_3

Insol in H_2O (Berzelius)
 $+ \frac{1}{3}\text{H}_2\text{O}$ Insol in H_2O , sol in acids
 (Boutzoureano, A ch (6) 17 289)

Cobaltous hydrogen selenite, $\text{CoH}_2(\text{SeO}_3)_2$

Sol in H_2O (Berzelius)
 $+ 2\text{H}_2\text{O}$ Sol in H_2O with decomp
 (Boutzoureano)

Cuprous selenite

Insol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$
 (Berzelius)

Cupric selenite, basic, 2CuO , SeO_2

Insol in H_2O , sol in $\text{NH}_4\text{OH} + \text{Aq}$
 (Boutzoureano)
 Sol in acids

Cupric selenite, $\text{CuSeO}_3 + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O or $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Berzelius)
 $+ \text{H}_2\text{O}$, and $2\text{H}_2\text{O}$ (Boutzoureano)
 $+ 2\text{H}_2\text{O}$ Min *Chalcomenite* Insol in H_2O
 or $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Friedel and Sarasin, Zeit
 Kryst 1881, 6 300)

Cupric selenite, acid, CuO , $2\text{SeO}_2 + \text{H}_2\text{O} =$
 $\text{CuH}_2(\text{SeO}_3)_3$

Insol in H_2O Sol in acids (Nilson)
 $+ 2\text{H}_2\text{O}$ As above (Boutzoureano)
 $+ 4\text{H}_2\text{O}$ As above (B)

Cupric selenite ammonia, CuSeO_3 , $\text{NH}_3 +$
 H_2O

Decomp by H_2O (Boutzoureano, A ch
 (6) 17 289)

Didymium selenite, basic, $3\text{D}_2\text{O}_3$, $8\text{SeO}_2 +$
 $28\text{H}_2\text{O}$

Precipitate (Nilson)
 $+ 21\text{H}_2\text{O}$ Insol in H_2O (Cleve, Bull
 Soc (2) 43 363)

Didymium selenite, $\text{D}_2(\text{SeO}_3)_3 + 6\text{H}_2\text{O}$

Precipitate (Smith)

Didymium selenite, acid, D_2O_3 , $4\text{SeO}_2 +$
 $5\text{H}_2\text{O}$

Precipitate (Cleve)
 Composition is $\text{D}_2(\text{SeO}_3)_3 + 6\text{H}_2\text{O}$ (Smith)
 $+ 9\text{H}_2\text{O}$ (Nilson)
 $2\text{D}_2\text{O}_3$, $9\text{SeO}_2 + 18\text{H}_2\text{O}$ (Nilson)

Erbium selenite, $\text{Er}_2(\text{SeO}_3)_3 + 5\text{H}_2\text{O}$, and
 $9\text{H}_2\text{O}$

Precipitate (Nilson)

Erbium hydrogen selenite, $\text{Fr}_2\text{H}_2(\text{SeO}_3)_4 +$
 $4\text{H}_2\text{O}$

Decomp by hot H_2O

- Gadolinium hydrogen selenite**, $\text{Gd}_2(\text{SeO}_3)_3 \cdot \text{H}_2\text{SeO}_3 + 6\text{H}_2\text{O}$
 pt (Benedicks, Z anorg 1900, **22** 41)
- Gallium selenite, basic**, $5\text{GaO} \cdot 2\text{SeO}_2 + 10\text{H}_2\text{O}$
 precipitate (Nilson) According to Atterberg, $7\text{GaO} \cdot 3\text{SeO}_2 + 14\text{H}_2\text{O}$
 (2) $3\text{H}_2\text{O} \cdot \text{SeO}_2 + 4\text{H}_2\text{O}$ (Atterberg, Bull Soc 19 497)
 (A) $3\text{H}_2\text{O} \cdot 2\text{SeO}_2 + 6\text{H}_2\text{O}$ Insol in H_2O (Atterberg)
- Gallium selenite**, $\text{GaSeO}_4 + 2\text{H}_2\text{O}$
 sol in little H_2O , decomp by excess (Nilson)
- Gallium selenite, acid**
 (a) $3\text{GaO} \cdot 5\text{SeO}_2 + 3\text{H}_2\text{O}$, (b) $\text{GaO} \cdot 2\text{SeO}_2 + \frac{1}{2}\text{H}_2\text{O}$, (c) $3\text{GaO} \cdot 7\text{SeO}_2 + 5\text{H}_2\text{O}$, (d) $\text{GaO} \cdot 3\text{SeO}_2 + 2\text{H}_2\text{O}$ All are very sl sol in cold or warm H_2O a, b, and c are sol in warm H_2O containing HCl , d is sol only in boiling $\text{HCl} + \text{Aq}$ (Nilson)
- Indium selenite, basic**, $\text{In}_3\text{Se}_3\text{O}_{30} + 64\text{H}_2\text{O}$
 (Nilson)
- Indium selenite**, $\text{In}_2(\text{SO}_3)_3 + 6\text{H}_2\text{O}$
 l sol in H_2O (Nilson)
- Indium hydrogen selenite**, $\text{In}_2(\text{SeO}_3)_3 \cdot 3\text{H}_2\text{SeO}_3 + 4\text{H}_2\text{O}$
 sol in H_2O (Nilson)
 (H) $\text{In}_2(\text{SeO}_3)_3 \cdot 3\text{H}_2\text{SeO}_3 + 12\text{H}_2\text{O}$ Sol in H_2O (Nilson)
- Iron (ferrous) selenite**
 ppt Sol in $\text{HCl} + \text{Aq}$ with partial separation of Se (Berzelius)
- Iron (ferrous) hydrogen selenite**
 sl sol in H_2O (Berzelius)
- Iron (ferric) selenite, basic**, $2\text{Fe}_2\text{O}_3 \cdot 3\text{SeO}_2 + x\text{H}_2\text{O}$
 nsol in H_2O (Berzelius)
 $\text{Fe}_2\text{O}_3 \cdot 2\text{SeO}_2$ Insol in H_2O , easily sol in acids (Boutzoureano, A ch (6) **17** 289)
 (a) $3\text{Fe}_2\text{O}_3 \cdot 8\text{SeO}_2 + 28\text{H}_2\text{O}$ Insol in H_2O (Nilson)
- Iron (ferric) selenite**, $\text{Fe}_2(\text{SeO}_3)_3 + 4\text{H}_2\text{O}$
 [nsol in H_2O (Muspratt, Chem Soc **2** 5)
 + H_2O Insol in H_2O (Boutzoureano, A ch (6) **17** 289)
 (A) + $3\text{H}_2\text{O}$ Insol in H_2O (B)
 + $10\text{H}_2\text{O}$ Insol in H_2O (B)
- Iron (ferric) selenite, acid**, $\text{Fe}_2\text{O}_3 \cdot 6\text{SeO}_2 + x\text{H}_2\text{O}$
 Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ (Berzelius)
 + $2\text{H}_2\text{O}$ (Boutzoureano, A ch (6) **17** 289)
 $\text{Fe}_2\text{O}_3 \cdot 4\text{SeO}_2 + \text{H}_2\text{O}$ Insol in H_2O , sol in acids (Boutzoureano)
- Lanthanum selenite, basic**, $3\text{La}_2\text{O}_3 \cdot 8\text{SeO}_2 + 28\text{H}_2\text{O}$
 Precipitate (Nilson)
- Lanthanum selenite**, $\text{La}_2(\text{SeO}_3)_3 + 9\text{H}_2\text{O}$, or $12\text{H}_2\text{O}$
 Insol in H_2O (Nilson)
- Lanthanum selenite, acid**, $\text{La}_2\text{H}_4(\text{SeO}_3)_5 + 4\text{H}_2\text{O}$
 (Nilson)
 $\text{La}_2\text{H}_5(\text{SeO}_3)_5 + 2\text{H}_2\text{O}$ (Cleve)
- Lead selenite**, PbSeO_3
 Scarcely sol in H_2O , even when it contains H_2SeO_3 Sl sol in $\text{HNO}_3 + \text{Aq}$ (Berzelius)
- Lithium selenite**, $\text{Li}_2\text{SeO}_3 + \text{H}_2\text{O}$
 Difficultly sol in H_2O (Nilson, Bull Soc (2) **21** 253)
- Lithium hydrogen selenite**, LiHSO_3
 Very sol in H_2O (Nilson)
- Lithium trihydrogen selenite**, $\text{LiH}_3(\text{SeO}_3)_2$
 Not deliquescent Sol in H_2O (Nilson)
- Lithium vanadium selenite**
 See Vanadioselenite, lithium
- Magnesium selenite**, $\text{MgSeO}_3 + 2\text{H}_2\text{O}$
 Insol in H_2O , sol in dil acids, especially if warm, also in $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Boutzoureano, A ch (6) **18** 302)
 + $3\text{H}_2\text{O}$ Very sl sol in hot H_2O (Berzelius)
 + $6\text{H}_2\text{O}$ As the $2\text{H}_2\text{O}$ salt (Boutzoureano)
 + $7\text{H}_2\text{O}$ Sl sol in H_2O Easily sol in acetic, and mineral acids (Hilger, Z anal **13** 132)
- Magnesium hydrogen selenite**, $\text{MgH}_2(\text{SeO}_3)_2 + 3\text{H}_2\text{O}$
 Very deliquescent Easily sol in H_2O (Nilson)
 Insol in alcohol (Muspratt)
 $\text{MgO} \cdot 2\text{SeO}_2$ Insol in H_2O , sol in acids (Boutzoureano)
- Magnesium tetrahydrogen selenite**, $\text{MgH}_4(\text{SeO}_3)_3$, and $+3\text{H}_2\text{O}$
 Sol in H_2O (Nilson)

Manganous selenite, $\text{MnSeO}_3 + \text{H}_2\text{O}$

Precipitate (Nilson)
 $+ 2\text{H}_2\text{O}$ Insol in H_2O (Berzelius)
 Sol in cold $\text{HCl} + \text{Aq}$ (Muspratt)
 $+ \frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , sol in dil acids
 (Boutzoureano)

Manganous selenite, acid, MnSe_2O_5

Sol in H_2O (Berzelius, Nilson)
 $\text{MnO}, 2\text{SeO}_2 + \text{H}_2\text{O} = \text{MnH}_2(\text{SeO}_3)_2$
 (Boutzoureano, A ch (6) 17 289)
 $+ 5\text{H}_2\text{O}$ Decomp by H_2O to MnSeO_3
 (Boutzoureano)

Manganic selenite, basic, $\text{Mn}_2\text{O}_3, 2\text{SeO}_2$

Insol in H_2O , cold H_2SO_4 , or $\text{HNO}_3 + \text{Aq}$,
 insol in hot dil H_2SO_4 or $\text{HNO}_3 + \text{Aq}$
 (Laugier, C R 104 1508)
 Sol in warm $\text{HCl} + \text{Aq}$ with decomp

Manganic selenite, $\text{Mn}_2(\text{SeO}_3)_3 + 5\text{H}_2\text{O}$
(Laugier)**Manganic selenite, acid, $\text{Mn}_2\text{O}_3, 4\text{SeO}_2$**

Insol in H_2O , cold H_2SO_4 , and $\text{HNO}_3 + \text{Aq}$
 Insol in dil hot H_2SO_4 , and $\text{HNO}_3 + \text{Aq}$ Sol
 in cold $\text{HCl} + \text{Aq}$, and in $\text{H}_2\text{SO}_3 + \text{Aq}$ with
 separation of Se (Laugier, C R 104 1508)

Mercurous selenite, basic, $3\text{Hg}_2\text{O}, 2\text{SeO}_2 + 5\text{H}_2\text{O}$

(Boutzoureano)

Mercurous selenite, Hg_2SeO_3

Insol in H_2O or $\text{H}_2\text{SeO}_3 + \text{Aq}$ Sol in hot
 $\text{HNO}_3 + \text{Aq}$ (Kohler, Pogg 89 146)
 Sl sol in $\text{HCl} + \text{Aq}$, and $\text{KOH} + \text{Aq}$ (Berzelius)

Mercurous selenite, acid, $3\text{Hg}_2\text{O}, 4\text{SeO}_2$

Insol in H_2O or $\text{H}_2\text{SeO}_3 + \text{Aq}$ Sl sol in
 boiling $\text{HNO}_3 + \text{Aq}$ (Kohler)

Mercuric selenite, basic, $7\text{HgO}, 4\text{SeO}_2$

Insol in H_2O Sl sol in $\text{HNO}_3 + \text{Aq}$
 Easily sol in $\text{HCl} + \text{Aq}$ (Kohler, Pogg 89 146)

Mercuric selenite, HgSeO_3

Insol in H_2O (Berzelius) Nearly insol
 in $\text{HNO}_3 + \text{Aq}$ Sol in $\text{K}_2\text{SeO}_3 + \text{Aq}$ (Divers,
 Chem Soc 48 585)

Insol in dil $\text{HNO}_3 + \text{Aq}$, sol in $\text{HCl} + \text{Aq}$
 (Rosenheim and Pritze, Z anorg 1909, 63 278)

Solubility in $\text{Na}_2\text{SeO}_3 + \text{Aq}$ at 25°

$\text{Na}_2\text{SeO}_3 + \text{Aq}$ Normality	% HgSeO_3
2 0	2 73
1 0	1 39
0 5	0 70
0 25	0 53
0 125	0 32
0 0625	0 18

(Rosenheim and Pritze, Z anorg 1909, 63 281)

$\text{HgSeO}_3, \text{H}_2\text{SeO}_3$ Easily sol in H_2O , very
 sl sol in alcohol (Berzelius)
See also selenium dioxide

Mercuric sodium selenite, $\text{HgSeO}_3, \text{Na}_2\text{SeO}_3$

Decomp by H_2O and alkalis with pptn
 of HgSeO_3 (Rosenheim and Pritze, Z
 anorg 1909, 63 279)

Mercuric selenite sodium chloride, $\text{HgSeO}_3, \text{NaCl} + 2\text{H}_2\text{O}$

Decomp by H_2O (Rosenheim and Pritze,
 Z anorg 1909, 63 280)

Nickel selenite, $\text{NiSeO}_3 + \text{H}_2\text{O}$

Insol in H_2O , sol in $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Muspratt,
 Chem Soc 2 52)
 $+ \frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Boutzoureano,
 A ch (6) 17 28)

Nickel selenite, acidSol in H_2O (Berzelius)**Potassium selenite, $\text{K}_2\text{SeO}_3 + \text{H}_2\text{O}$**

Very deliquescent Sol in nearly all pro-
 portions in H_2O Insol in alcohol, which
 separates it as oil from aqueous solution
 (Muspratt, Chem Soc 2 52)

Potassium hydrogen selenite, KHSeO_3

Very deliquescent Very sl sol in alcohol
 (Muspratt, Chem Soc 2 52)

Potassium trihydrogen selenite, $\text{KH}_3(\text{SeO}_3)_2$

Very deliquescent Pptd from H_2O by
 alcohol (Muspratt)
 Not deliquescent (Nilson)

Potassium hydrogen pyroselenite, $\text{KHSe}_2\text{O}_5 + \text{H}_2\text{O}$

(Muthmann, B 1893, 26 1015)

Potassium uranyl selenite, $\text{K}_2\text{SeO}_3,$ $(\text{UO}_2)\text{SeO}_3$ Absolutely insol in H_2O (Sendtner)**Praseodymium hydrogen selenite,** $\text{Pr}_2(\text{SeO}_3)_3, \text{H}_2\text{SeO}_3 + 3\text{H}_2\text{O}$

Sol in H_2O (von Scheele, Z anorg
 1898, 18 362)

Samarium selenite, basic, $3\text{Sm}_2\text{O}_3, 8\text{SeO}_2 + 7\text{H}_2\text{O}$

Precipitate (Cleve)

Samarium selenite, acid, $\text{Sm}_2\text{O}_3, 4\text{SeO}_2 + 5\text{H}_2\text{O}$

Precipitate (Cleve)

Scandium selenite, $\text{Sc}_2(\text{SeO}_3)_3 + \text{H}_2\text{O}$

Insol precipitate

- Selenium hydrogen selenite**, $\text{Se}_2(\text{SeO}_3)_3$, $3\text{H}_2\text{SeO}_3$
sol in H_2O Not attacked by cold dil aq, but easily if warmed
- Selenium selenite**, Ag_2SeO_3
sl sol in cold, somewhat more sol in hot H_2O Easily sol in hot $\text{HNO}_3 + \text{Aq}$, from which it is precipitated by H_2O (Berzelius)
sol in $\text{K}_2\text{SeO}_3 + \text{Aq}$, sl sol in dil $\text{HNO}_3 + \text{Aq}$ (Divers, Chem Soc 49 585)
- Selenium selenite ammonia**, Ag_2SeO_3 , NH_3
sol in boiling H_2O (Boutzoureano, A ch (6) 17 289)
- Sodium selenite**, Na_2SeO_3
sl sol in H_2O Insol in alcohol (Berzelius)
 $5\text{H}_2\text{O}$
- Sodium selenite acid**, NaHSO_3
permanent Sol in H_2O
 $2.4\text{Se}_2\text{O}_3$ Sol in H_2O (Sacc, A ch (3) 21 19)
 $2\text{H}_2\text{O}$ Not deliquescent Sol in H_2O
- Sodium vanadium selenite**
e Vanadioselenite, sodium
- Strontium selenite**, $\text{SrSeO}_3 + 7\text{H}_2\text{O}$
precipitate Insol in H_2O Sol in $\text{HNO}_3 + \text{aq}$ (Muspratt)
- Strontium hydrogen selenite**, $\text{SrH}_2(\text{SeO}_3)_2$
sl sol in hot or cold H_2O (Nilson)
early insol in hot or cold H_2O (Berzelius)
- Thallous selenite**, H_2SeO_3
sl sol in H_2O Insol in alcohol and chl (Kuhlmann, Bull Soc (2) 1 330)
- Thallous hydrogen selenite**, HHSO_3
more sol in H_2O than the above compound (Nilson)
- Thallous selenite**, $\text{H}_2(\text{SeO}_3)_3$
sol in H_2O Sol in dil HNO_3
sl sol in H_2O easily decomp by HCl and H_2SO_4 (Marshall, Z anorg 1909, 62 177)
- Thorium selenite**, $\text{Th}(\text{SeO}_3)_2 + \text{H}_2\text{O}$, or $8\text{H}_2\text{O}$
sol in H_2O , easily sol in $\text{HCl} + \text{Aq}$ (Nilson)
- Thorium selenite acid**, 2ThO_2 , $7\text{SeO}_2 + 16\text{H}_2\text{O}$, $5\text{SeO}_2 + 5\text{H}_2\text{O}$ (Nilson)
- Tin (stannic) selenite**
Insol in H_2O , sol in $\text{HCl} + \text{Aq}$, from which it is pptd by H_2O (Berzelius)
- Uranic selenite**, U_2O_3 , SeO_2
Insol in H_2O (Boutzoureano)
 $+ 2\text{H}_2\text{O}$ (B)
- Uranic selenite acid**, $2\text{U}_2\text{O}_3$, $3\text{SeO}_2 + 7\text{H}_2\text{O}$
Insol in H_2O (Boutzoureano, A ch (6) 17 289)
- Uranyl selenite**, $(\text{UO}_2)\text{SeO}_3 + 2\text{H}_2\text{O}$
Precipitate (Nilson)
- Uranyl selenite acid**, 3UO_3 , $5\text{SeO}_2 + 7\text{H}_2\text{O}$, or $9\text{H}_2\text{O}$
Insol in H_2O
 UO_3 , $2\text{SeO}_2 + \text{H}_2\text{O} = (\text{UO}_2)_2\text{H}_2(\text{SeO}_3)_2$
Absolutely insol in H_2O and $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Sendtner, A 195 325)
- Vanadium selenite**
See Vanadioselenious acid
- Ytterbium selenite**, $\text{Yb}_2(\text{SeO}_3)_3$
Insol precipitate
- Ytterbium hydrogen selenite**, $\text{Yb}_2\text{H}_2(\text{SeO}_3)_4 + 4\text{H}_2\text{O}$
Insol in H_2O
- Yttrium selenite**, $\text{Y}_2(\text{SeO}_3)_3 + 12\text{H}_2\text{O}$
Insol in H_2O or $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Berzelius)
Sol in hot $\text{H}_2\text{SeO}_3 + \text{Aq}$ (Nilson)
- Yttrium hydrogen selenite**, $\text{Y}_2\text{H}_2(\text{SeO}_3)_4 + 3\text{H}_2\text{O}$
Sl sol in H_2O Easily sol in HCl or $\text{HNO}_3 + \text{Aq}$ (Cleve)
- Zinc selenite**, ZnSeO_3
Insol in H_2O , sol in acids (Boutzoureano, A ch (6) 18 289)
 $+ 2\text{H}_2\text{O}$ Insol in H_2O Sol in H_2SeO_3 , or $\text{HNO}_3 + \text{Aq}$ (Muspratt, Chem Soc 2 52)
- Zinc hydrogen selenite**, $\text{ZnH}_2(\text{SeO}_3)_2$
Easily sol in H_2O (Berzelius)
 $+ 2\text{H}_2\text{O}$ Sol in cold H_2O (Boutzoureano)
 ZnO , $4\text{SeO}_2 + 3\text{H}_2\text{O}$ Easily sol in H_2O (Wohler, A 63 279)
- Zinc selenite ammonia**, ZnSeO_3 , NH_3
Insol in cold or hot H_2O (Boutzoureano, A ch (6) 17 289)
- Zirconium selenite basic**, 4ZrO_2 , $3\text{SeO}_2 + 18\text{H}_2\text{O}$
Precipitate Sl sol in $\text{HCl} + \text{Aq}$ (Nilson)

Zirconium selenite, $Zr(SeO_3)_2$

Absolutely insol in H_2O , difficultly sol in boiling $HCl + Aq$ (Nilson)
 $+ H_2O$ (Nilson)

Selenium, Se

Insol in H_2O Schultz (J pr (2) 32 390) has obtained a soluble colloidal modification which can be isolated by dialysis

Insol in $HCl + Aq$ Decomp by $HNO_3 + Aq$ Sol in fuming H_2SO_4 (Schultz-Sellac, B 4 113)

1000 pts CS_2 dissolve 1 pt cryst Se at boiling-point (46.6°), and 0.16 pt at 0° (Mitscherlich, J B 1855 314) Solubility of Se in CS_2 is variable—1 pt Se is sol in 1376–2464–3746 pts CS_2 at 20° (Rammelsberg, B 7 669) Cryst Se, which is sol in CS_2 , becomes insol in CS_2 after heating to 110°, but after fusion is again sol (Otto)

Four modifications—(1) Amorphous red, (2) crystalline red, (3) granular gray, (4) laminated 1 and 2 are sol in CS_2 , 3 and 4 are insol in CS_2 . All forms are sol in $SeCl_2$, from which crystallizes a black modification, insol in CS_2 . CCl_4 with trace of CS_2 dissolves red Se slightly, black Se not at all $Se(C_2H_5)_2$ dissolves all modifications in small but apparently equal quantities (Rathke, A 152 181)

According to Saunders (J phys Chem 1900, 4 428) selenium exists in three modifications

1 Liquid, including vitreous, amorphous, and colloidal selenium

a Vitreous

Sol in liquid NH_3 at 25° (Franklin, Am Ch J 1898, 20 820)

Insol in liquid NH_3 between -30° and +10° Franklin's results are due to impure selenium and not completely dry NH_3 (Hugot, A Ch 1900, (7) 21 5)

Almost insol in CS_2 (Schutzenberger *Chimie générale* 1 438)

Action of light increases solubility in CS_2 (Saunders, J phys Chem 1900, 4 456)

Solubility in methylene iodide at 12° is 1.3 pts in 100 (Retgers, Z anorg 1893, 3 343)

Sol in CSe_2 , ethyl selenide, and in ethyl sulphide

Very sol in Se_2Cl_2 (Rathke, A 1869, 152 181)

b Amorphous

Completely sol in CS_2 at ord temp if Se has not been heated If heated or extracted with warm CS_2 it becomes partly insol (Peterson, Z phys Chem 1891, 81 612)

Passes into red crystalline form in solution in CS_2 , C_6H_6 , isobutyric acid, acetophenone, acetone $CHCl_3$, thiophene, toluene, benzonitrile, ethyl acetate, and alcohol (Saunders, J phys Chem 1900, 4 463)

Solution in quinoline, aniline, pyridine,

etc, cause conversion into gray metallic form

c Colloidal

Forms colloidal solution with H_2O

A colloidal solution of Se in H_2O can be obtained It is not decomp by boiling, but is decomp by electrolytes with separation of red selenium (Gutbier, Z anorg 1902, 32 106)

2 Red crystalline

Sol in CS_2

3 Gray, crystalline or metallic

Sol in selenium chloride and other solvents as vitreous Se (Rathke, A 1869, 152 181)

Sl sol in CS_2 , toluene, nitrobenzene, quinoline, aniline, and KOH Pptd from conc $KOH + Aq$ in long needles with mpt 219° (Coste, C R 1909, 149 674)

Sol in many organic substances at high temp as quinoline, ethyl benzoate, aniline and naphthalene (Saunders, J phys Chem 1900, 4 469)

Completely insol in CS_2 (Saunders, J phys Chem 1900, 4 474)

Solubility of the two modifications of gray crystalline Se in CS_2

100 cc boiling CS_2 dissolve mg Se

I	II	III
Mg Se	Mg Se	Mg Se
3.2	4.1	2.7
2.8	4.0	2.2
3.6	2.9	1.9
3.3	2.8	1.0
2.2	2.9	2.0
	4.0	

I Se heated 1 hr at 140° Modification A

II Modification A

III Se heated 48 hrs at 190°–200° Modification B

(Marc, Z anorg 1907, 53 302)

Se_2Br_2 dissolves 22% Se (Schneider, Pogg 128 327)

Red Se is sol in $(NH_4)_2SO_3 + Aq$ (Uelsmann, A 116 122)

Sol in alkalis and Mg sulphites + Aq

365 pts $K_2SO_3 + Aq$ dissolve 102 pts Se
 360 pts $MgSO_3, 3H_2O + Aq$ dissolve 116 pts Se

Insol in $BaSO_3 + Aq$ (Rathke and Zschiesche, J pr 92 145)

Sol in $KCN + Aq$ with formation of $KSeCN$ (Franklin, Am Ch J 1898, 20 830)

100 pts methylene iodide dissolve 1.3 pts Se at 12° (Retgers, Z anorg 3 343)

Sol in quinoline, but reacts with the solvent with evolution of H_2 (Beckmann and Gabel, Z anorg 1906, 51 236)

Selenium monobromide, Se_2Br_2

Insol in H_2O , but gradually decomp by. Decomp by absolute alcohol and benzene. Sol in $\text{C}_2\text{H}_5\text{I}$, but soon decomposed. Miscible with CS_2 , less sol in CHCl_3 and $\text{C}_2\text{H}_5\text{Br}$ (Schneider, Pogg 128 327)

Selenium tetrabromide, SeBr_4

Sol in H_2O with decomp. Decomp by alcohol. Sol in $\text{HCl} + \text{Aq}$, sl sol in CS_2 , CHCl_3 , and $\text{C}_2\text{H}_5\text{Br}$ (Schneider, Pogg 1450)
Decomp by $\text{C}_2\text{H}_5\text{I}$

Selenium bromotrichloride, SeCl_3Br

Insol in CS_2 (Fvans and Ramsay, Chem Soc 45 62)

Selenium tetrabromide sulphur trioxide, $\text{SeBr}_4, 2\text{SO}_3$

Decomp by H_2O (Prandtl, Z anorg 19, 62 242)

Selenium tribromochloride, SeClBr_3

See Selenium chlorotribromide

Selenium monochloride, Se_2Cl_2

Gradually decomp by H_2O . Dissolves a modifications of selenium on heating (Attkin, A 152 181). Insol in conc H_2SO_4 , easily sol in fuming H_2SO_4 . Sol in CHCl_3 , CH_2Cl_2 , CCl_4 . Gradually decomp by H_2O , alcohol, and ether (Divers and Shimosé, I 17 862). Sol in CS_2 (Evans and Ramsay, Chem Soc 45 62)

Selenium tetrachloride, SeCl_4

Deliquescent on moist air. Decomp with H_2O (Berzelius, A ch 9 225). Insol in H_2O . Easily sol in hot POCl_3 , from which it crystallizes on cooling (Michaelis, Zeit chem (2) 6 460). Very sl sol in CS_2 (Evans and Ramsay, Chem Soc 45 62)

Selenium dichlorobromide, SeCl_2Br_2

(Evans and Ramsay, Chem Soc 45 62)

Selenium chlorotribromide, SeClBr_3

Very sl sol in CS_2 (Fvans and Ramsay)

Selenium trichlorobromide, SeCl_3Br

See Selenium bromotrichloride

Selenium fluoride

Sol in conc $\text{HF} + \text{Aq}$. Decomp immediately by H_2O (Knox)

Selenium moniodide, Se_2I_2

Decomp by H_2O . All solvents of iodine dissolve out that element (Schneider, Pogg 129 627)

Selenium tetraiodide, SeI_4

Slowly decomp by much H_2O . Iodine is dissolved out by all solvents of that element (Schneider, Pogg 129 627)

Selenium nitride

See Nitrogen selenide

Selenium monoxide, SeO (?)

Sl sol in H_2O (Berzelius)
Does not exist (Sacc)

Selenium dioxide, SeO_2

Deliquescent. Easily sol in H_2O and alcohol. Sol in glacial $\text{HC}_2\text{H}_3\text{O}_2$ (Hinsberg, A 260 40)

Solubility in H_2O between -3° and $+36^\circ$ = 45.0 + 0.7692t (Etard, C R 1888, 106 742)

1 pt is sol in 2.67 pts H_2O at 11.3°
1 pt " " " 2.60 " " " 14°
1 pt " " " 2.54 " " " 15.6°

(de Coninck, C R 1906, 142 571)

Sp gr of $\text{SeO}_2 + \text{Aq}$ at t°

t°	% SeO_2	Sp gr
15.1	1	0.9923
15.3	2	1.0068
13.0	3	1.0200
13.0	4	1.0302
14.5	5	1.0346
14.8	6	1.0402
14.1	7	1.0535
15.0	8	1.0571
15.6	9	1.0719
15.2	10	1.0743

(de Coninck, C R 1906, 142 571)

See also Selenious acid

1 pt SeO_2 is sol in 9.84 pts alcohol (93°) at 14°

1 pt SeO_2 is sol in 15.0 pts methyl alcohol at 11.8°

1 pt SeO_2 is sol in 23.0 pts acetone at 15.3°

1 pt SeO_2 is sol in 90.0 pts acetic acid at 12.9° (de Coninck, C R 1906, 142 572)

Traces dissolve in acetic anhydride. Sol in phenyl mercaptan (Hinsberg, A 1890, 260 40)

Insol in pure C_6H_6 (Clausnizer, A 1879, 196 271)

See Selenious acid

Selenium trioxide, SeO_3

Not obtained in a pure state (Cameron and Macallan)

See Selenic acid

Selenium dioxide hydrobromic acid, SeO_2 , 4HBr Decomp at 55° (Ditte, A ch (5) 10 82) SeO_2 , 5HBr Decomp at 65° (Ditte, A ch (5) 10 82)**Selenium dioxide hydrochloric acid, SeO_2 , 2HCl** Decomp at 26° SeO_2 , 4HCl Decomp at 0° Sol in H_2O without evolution of gas (Ditte, A ch (5) 10 82)**Selenium dioxide sulphur trioxide, SeO_2 , SO_3** Decomp violently by H_2O (Weber, B. 19 3185)Composition may be $(\text{SeO})\text{SO}_4$ (?)**Selenium oxy-compounds**

See Selenyl compounds

Selenium diphosphide, P_2Se

See Phosphorus monoselenide

Selenium tetraphosphide, P_4Se

See Phosphorus semiselenide

Selenium monosulphide, SeS Insol in H_2O and ether Sol in CS_2 Decomp by alcohol (Ditte, C R 73 625, 660)

Other compounds of Se and S are probably mixtures of the two elements

Selenium disulphide, SeS_2 Compound of this formula is a mixture of SeS and S (Ditte, C R 73 625, 660).**Selenium sulphoxide, SeSO_3** Decomp by H_2O Sol in fuming H_2SO_4 , conc H_2SO_4 Sol in H_2SO_4 of 1 806 sp gr without decomp (Weber, Pogg 156 531)Decomp by H_2O , sol in H_2SO_4 (Divers and Shmosé, B 17 858)**Selenuretted hydrogen, H_2Se**

See Hydrogen selenide

Selenoarsenic acid**Potassium selenoarsenate, $\text{KAsSe}_3 + 2\text{H}_2\text{O}$** Only sl sol in cold H_2O , sol in warm H_2O with decomp, more stable in $\text{KOH} + \text{Aq}$ (Clever, Z anorg 1895, 10 132)**Sodium selenoarsenate, $\text{Na}_3\text{AsSe}_4 + 9\text{H}_2\text{O}$** Very sol in H_2O , very unstable (Szarvasy, B 1895, 28 2658)**Selenoarsenous acid****Sodium selenoarsenite, $\text{Na}_3\text{AsSe}_3 + 9\text{H}_2\text{O}$** Moderately sol in H_2O (Clever and Muthmann, Z anorg 1895, 10 139)**Selenobismuthous acid****Potassium metaselenobismuthite, Bi_2Se_3 , K_2Se or KBiSe_2** Insol in cold dil $\text{HCl} + \text{Aq}$ Sol on warming, with evolution of H_2Se (Hilger and van Scherpenberg, Mitt Pharm II 4)**Selenocyanhydric acid, HSeCN**

Known only in aqueous solution

Ammonium selenocyanide, NH_4SeCN Very deliquescent, and sol in H_2O **Barium —, $\text{Ba}(\text{SeSCN})_2$** Very sol in H_2O **Lead —, $\text{Pb}(\text{SeCN})_2$** Sl sol in cold, sol with sl decomp in boiling H_2O Insol in alcohol**Mercurous —, $\text{Hg}_2(\text{SeCN})_2$**

Ppt

Mercuric —, $\text{Hg}(\text{SeCN})_2$ Sl sol in cold H_2O Easily sol in MCN , MSCN , or $\text{MSeCN} + \text{Aq}$, also sol in hot $\text{HgCl}_2 + \text{Aq}$ (Cameron and Davy, C N 44 63)Decomp by hot H_2O (Rosenheim, Z anorg 1909, 63 276)**Mercuric potassium —, $\text{Hg}(\text{SeCN})_2$, KSeCN** Easily sol in H_2O Sl sol in cold alcohol (Cameron and Davy, C N 44 63)**Mercuric selenocyanide chloride,** $\text{Hg}(\text{SeCN})_2$, HgCl_2 Sol in boiling H_2O and in abs alcoholDecomp by long boiling with H_2O (Rosenheim and Pritze, Z anorg 1909, 63 276)**Platinum potassium — (Potassium platinum-selenocyanide) $\text{K}_2\text{Pt}(\text{SeCN})_6$** Sol in H_2O and alcohol (Clarke, B 11 1325)**Potassium —, KSeCN** Very deliquescent, and sol in H_2O with absorption of heat More sol in H_2O than KSCN Sol in alcohol**Potassium — mercuric bromide, KSeCN , HgBr_2** Sl sol in cold, more easily in hot H_2O or alcohol (Cameron and Davy, C N 44 63)

- Potassium selenocyanide mercuric chloride**, KSeCN , HgCl_2
as the bromide
- Potassium — mercuric iodide**, KSeCN , HgI_2
sol in cold, easily in hot H_2O or alcohol
(Cameron and Davy)
- Potassium — mercuric sulphocyanide**, KSeCN , $\text{Hg}(\text{SCN})_2$
sol in cold, much more in hot H_2O or alcohol
Somewhat sol in ether (Cameron and Davy)
- Silver —**, AgSeCN
insol in H_2O Almost insol in NH_4OH +
A or cold dil acids Quickly decomp by
hot conc acids
- Sodium —**, NaSeCN
very sol in H_2O
- Selenomolybdic acid**
- Potassium selenomolybdate**, $5\text{K}_2\text{O}$, 6SeO_2 , 17MoO_3
readily sol in H_2O without decomp
(Cobbs, Am Ch J 1895, 17 177)
- Selenopentathionic acid**
- Sodium selenopentathionate**, $\text{Na}_2\text{S}_4\text{SeO}_3$
A dil solution may be boiled for some time
without change (Norris and Fay, Am Ch
J 1900, 23 121)
- Selenophosphoric acid**
- Ammonium selenophosphate**,
 $2(\text{NH}_4)_2\text{O}$, P_2O_5 , $2\text{SeO}_3 + 3\text{H}_2\text{O}$
sol in H_2O with decomp (Weinland, B
1903, 36 1402)
- Barium selenophosphate**,
 $2\text{K}_2\text{O}$, P_2O_5 , $2\text{SeO}_3 + 3\text{H}_2\text{O}$
sol in H_2O with decomp
 $3.5\text{K}_2\text{O}$, P_2O_5 , $5\text{SeO}_3 + 5.5\text{H}_2\text{O}$ Easily
sol in H_2O (Weinland)
- Iridium selenophosphate**,
 $2\text{Rb}_2\text{O}$, P_2O_5 , $2\text{SeO}_3 + 3\text{H}_2\text{O}$
Sol in H_2O with decomp (Weinland)
- Thioselenophosphorous acid**
- Potassium triselenophosphite**,
 $\text{K}_2\text{HPS}_3 + 2\frac{1}{2}\text{H}_2\text{O}$
Decomp by moist air and dil acids, sol
in conc KOH + Aq, sol in cold, easily sol
in hot H_2O (Muthmann, Z anorg 1897,
198)
- Selenosamic acid**, HSeO_2NH_2
Known only in its salts
- Ammonium selenosamate**, $(\text{NH}_4)_2\text{SeO}_2\text{NH}_2$
Deliquescent Decomp slowly by H_2O
into $(\text{NH}_4)_2\text{SeO}_3$
1 pt is sol in 116 pts cold alcoholic am-
monia at 12° More sol in hot alcoholic
ammonia SI attacked by cold HCl or HNO_3
(Cameron and Macallan, C N 1888, 57 163)
- Ammonium hydrogen selenosamate**,
 $\text{NH}_4\text{H}(\text{SeO}_2\text{NH}_2)_2$
Deliquescent Sol in 14 pts alcohol at
 14° (Cameron and Macallan, Proc Roy
Soc 44 112)
- Selenostannic acid**
- Ammonium selenostannate**, 3SnSe_2 $(\text{NH}_4)_2\text{Se}$
 $+ 3\text{H}_2\text{O}$
Sol in H_2O (Ditte, C R 95 641)
- Platinum potassium —**, K_2Se , 3PtSe , SnSe_2
Insol in hot or cold H_2O , NH_4OH , or
 KOH + Aq Not attacked by hot HCl + Aq
(Schneider, J pr (2) 44 507)
- Platinum sodium —**, NaSe , 3PtSe , SnSe_2
Properties as the corresponding K salt
(Schneider)
- Potassium —**, $\text{K}_2\text{SnSe}_3 + 3\text{H}_2\text{O}$
Easily sol in H_2O (Ditte, C R 95 441)
- Selenosulphantimonic acid**
- Sodium selenosulphantimonate**, $\text{Na}_3\text{SbSeS}_3 +$
 $9\text{H}_2\text{O}$
Sol in H_2O (Hofacker, A 107 6)
 $\text{Na}_3\text{SbS}_{1.5}\text{Se}_2 + 9\text{H}_2\text{O}$ Somewhat sol in
 H_2O (Pouget, A ch 1899, (7) 18 564)
- Selenosulphantimonous acid**
- Potassium selenosulphantimonite**,
 $\text{Sb}_4\text{S}_5\text{Se}_6\text{K}_{10} + 4\text{H}_2\text{O}$
Sol in H_2O (Pouget, A ch 1899, (7)
18 563)
- Sodium selenosulphantimonite**, $\text{Na}_3\text{SbS}_{1.5}\text{Se}_2 +$
 $9\text{H}_2\text{O}$
Sol in H_2O (Pouget, A ch 1899, (7) 18
564)
- Selenosulpharsenic acid**
- Potassium selenosulpharsenate**, $3\text{K}_2\text{S}$, As_2Se_3
 $+ 12\text{H}_2\text{O}$
Very unstable in the air Very sol in H_2O
Fairly stable in aqueous solution Decomp
by acids (Clever, Z anorg 1895, 10 134)

Sodium selenosulpharsenate, $\text{Na}_3\text{AsS}_3\text{Se} + 8\text{H}_2\text{O}$

Decomp by acids, stable in dry air (Messinger, B 1897, 30 801)

$3\text{Na}_2\text{S}, \text{As}_2\text{Se}_3 + 18\text{H}_2\text{O}$ Quite sol in H_2O , quite stable in air (Clever, Z anorg 1895, 10 140)

$\text{Na}_4\text{As}_2\text{S}_5\text{Se}_3 + 16\text{H}_2\text{O}$ Sl sol in H_2O , decomp by acids (Messinger, B 1897, 30 803)

$\text{Na}_4\text{As}_2\text{S}_7\text{Se} + 16\text{H}_2\text{O}$ Stable in dry air, easily sol in H_2O , decomp by acids (Messinger, B 1897, 30 800)

$\text{Na}_3\text{AsS}_2\text{Se}_2 + 9\text{H}_2\text{O}$ Decomp in aq solution by dil acids (Messinger, B 1897, 30 802)

$\text{Na}_3\text{AsSSe}_3 + 9\text{H}_2\text{O}$ Sol in H_2O , decomp by aq acids hygroscopic (Messinger)

Selenosulphophosphorous acid

Potassium selenosulphophosphite, $2\text{K}_2\text{S}, \text{P}_2\text{Se}_3 + 5\text{H}_2\text{O}$

Sol in H_2O , decomp by acids (Muthmann, Z anorg 1897, 13 198)

Selenosulphostannic acid

Ammonium selenosulphostannate, $(\text{NH}_4)_2\text{S}, 3\text{SnSe}_2 + 3\text{H}_2\text{O}$

Easily decomp (Ditte, C R 1882, 95 643)

Potassium — $\text{K}_2\text{SnSe}_2\text{S} + 3\text{H}_2\text{O}$

Verv easily sol in H_2O (Ditte, C R 95 641)

Sodium — $\text{Na}_2\text{SnSe}_2\text{S} + 3\text{H}_2\text{O}$

Sol in H_2O (Ditte, C R 95 641)

Selenosulphoxyarsenic acid

Sodium selenosulphoxyarsenate, $\text{Na}_3\text{AsO}_2\text{SSe} + 10\text{H}_2\text{O}$

Easily sol in H_2O but solution rapidly decomp (Messinger, B 1897, 30 798)

$\text{Na}_4\text{As}_2\text{S}_2\text{SeO}_5 + 24\text{H}_2\text{O}$ Sol in H_2O (Messinger)

$\text{Na}_4\text{As}_2\text{SeS}_3\text{O}_4 + 20\text{H}_2\text{O}$ Stable in dry air Sl sol in H_2O , decomp by dil acids (Messinger)

$\text{Na}_6\text{As}_2\text{S}_3\text{Se}_2\text{O}_3 + 20\text{H}_2\text{O}$ Ppt (Messinger)

$\text{Na}_4\text{As}_3\text{S}_2\text{Se}_2\text{O}_8 + 36\text{H}_2\text{O}$ Decomp by aq acids, sol in H_2O , quite stable (Messinger)

Selenosulphur trioxide, SeSO_3

See Selenium sulphoxide

Selenosulphuric acid, H_2SeSO_4

Known only in its salts

Potassium selenosulphate, $\text{K}_2\text{SeSO}_4 + x\text{H}_2\text{O}$

Deliquescent in moist air, decomp by H_2O (Rathke, J pr 95 1)

Selenotrithionic acid, $\text{H}_2\text{S}_2\text{SeO}_6$

Known only in solution, which is stable in dark (Schulze, J pr (2) 32 390)

Barium selenotrithionate

Sol in H_2O (Rathke)

Potassium — $\text{K}_2\text{SeS}_2\text{O}_6$

Sol in H_2O with gradual decomp (Rathke J pr 95 8, 97 56)

Diselenotrithionic acid, $\text{H}_2\text{SSe}_2\text{O}_6$

Exceedingly unstable (Schulze)

Selenovanadic acid

Lithium selenovanadate, $4\text{Li}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 30\text{H}_2\text{O}$

Very sol in H_2O (Prandtl and Lustig, Z anorg 1907, 53 401)

Potassium selenovanadate, $2\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 12\text{SeO}_2 + 12\text{H}_2\text{O}$

(Prandtl and Lustig)

$3\text{K}_2\text{O}, 5\text{V}_2\text{O}_5, 16\text{SeO}_2 + 40\text{H}_2\text{O}$ (Prandtl and Lustig)

$4\text{K}_2\text{O}, 6\text{V}_2\text{O}_5, 21\text{SeO}_2 + 37\text{H}_2\text{O}$ (Prandtl and Lustig)

$5\text{K}_2\text{O}, 10\text{V}_2\text{O}_5, 26\text{SeO}_2 + 43\text{H}_2\text{O}$ (Prandtl and Lustig)

Sodium selenovanadate, $4\text{Na}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO} + 20\text{H}_2\text{O}$

Very sol in H_2O Solution decomp gradually (Prandtl and Lustig)

$2\text{Na}_2\text{O}, 7\text{V}_2\text{O}_5, 10\text{SeO}_2 + 13\text{H}_2\text{O}$ (Prandtl and Lustig)

$2\text{Na}_2\text{O}, 7\text{V}_2\text{O}_5, 12\text{SeO}_2 + 45\text{H}_2\text{O}$, and $+90\text{H}_2\text{O}$ (Prandtl and Lustig)

Selenoxyarsenic acid

Ammonium selenoxyarsenate, $2(\text{NH}_4)_2\text{O}, 2\text{SeO}_3, \text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$

Sol in H_2O with decomp (Weinland, B 1903, 36 1403)

Barium sodium selenoxyarsenate,

$\text{BaNaAsO}_3\text{Se} + 9\text{H}_2\text{O}$

Ppt (Weinland, Z anorg 1897, 14 56)

Potassium selenoxyarsenate, $2\text{K}_2\text{O}, 2\text{SeO}_3, \text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$

Sol in H_2O with decomp (Weinland and Bartlingck, B 1903, 36 1403)

$7\text{K}_2\text{O}, 10\text{SeO}_3, 2\text{As}_2\text{O}_5 + 11\text{H}_2\text{O}$ Very sol in H_2O (Weinland and Bartlingck)

$3\text{K}_2\text{O}, \text{As}_2\text{Se}_3 + 10\text{H}_2\text{O}$ Easily decomp by

mixture Very sol in H_2O (Clever, Z anrg 1895, 10 126)

Rubidium selenoxyarsenate, $2Rb_2O, 2SeO_3, As_2O_5+3H_2O$

sol in H_2O with decomp (Weinland and Ettinger)

Sodium selenoxyarsenate, Na_3AsSeO_3

fairly stable in air and in aq solution (Weinland, B 1896, 29 1010)

$As_2AsSeO_3+12H_2O$ Stable in the air when pure, sol in H_2O with decomp (Weinland, Z anorg 1897, 14 50)

$As_2AsSeO_3+12H_2O$ Very sol in H_2O , unstable (Szarvasy, B 1895, 28 2657) $Na_2O, 3Na_2Se, As_2O_5+50H_2O$ Easily in H_2O Solution may be boiled for a long time without decomp (Clever, Z anrg 1895, 10 136)

Selenoxyphosphoric acid

Ammonium triselenmonoxyphosphate, $(NH_4)_3PSe_3O+10H_2O$
pt (Ephraim, B 1910, 43 280)

Ammonium hydrogen triselenmonoxyphosphate, $(NH_4)_5H(PSe_3O)_2+18H_2O$
pt (Ephraim)

Barium hydrogen diselenmonoxyphosphate, $BaHPS_2O_2+14H_2O$
decomp in moist air (Ephraim)

Potassium selenoxyphosphate, $K_3PSe_3O+5H_2O$
decomp by HNO_3 Insol in alcohol and ether (Ephraim)

Sodium monoselenmonoxyphosphate, $Na_4PSe_3O+20H_2O$
decomp by H_2O (Ephraim)

Sodium triselenmonoxyphosphate, $Na_3PSe_3O+10H_2O$
sol in H_2O Decomp in aq solution Easily sol in conc $NaOH+aq$ (Muthmann, Z anorg 1897, 13 199)

Selenyl bromide, $SeOBr_2$ (?)
chloride, Pogg 129 450)

Selenyl bromide sulphur dioxide, $SeOBr_2, SO_2$
handl, Z anorg 1909, 62 242)

Selenyl chloride, SeO_2Cl_2
easily decomp by H_2O (Weber, Pogg 111 615)

Selenyl sulphur chloride
e Sulphoselenyl chloride

Selenyl stannic chloride, $2SeOCl_2, SnCl_4$

Extremely deliquescent Completely sol in H_2O (Weber, B A B 1865 154)

Selenyl titanium chloride, $2SeOCl_2, TiCl_4$

Decomp by H_2O with separation of an insol residue Decomp by NH_4OH+aq (Weber, B A B 1865 154)

Sesquauramine

See Sesquauramine

Sesquihydraurylamine, $(HOAu)_3N, NH_3$

See Sesquihydraurylamine

Silicic acid, SiO_2, xH_2O

See also Silicon dioxide

Silicic acid is sol in 1000 pts pure H_2O (Kirwan)

When pptd from alkali silicates+aq by CO_2 , 0.021 pt SiO_2 remains dissolved in 100 pts H_2O (Struckmann, A 94 341)

When pptd as above, 100 pts H_2O dissolve 0.09 pt SiO_2 in 3 days, 100 pts H_2CO_3+aq dissolve 0.078 pt SiO_2 in 3 days But if heated much more dissolves, the jelly itself becoming liquid, such jelly containing 2.49 pts SiO_2 to 100 pts H_2O This solution is not pptd by considerable quantities of alcohol, but conc $(NH_4)_2CO_3$, $NaCl$, or $CaCl_2+aq$, etc, cause gelatinization (Maschke, J pr 68 234)

Solubility in H_2O depends on the amt of H_2O , in presence of which the silicic acid is set free by dil acids, CO_2 , or alkali salts+aq If H_2O is present in sufficient quantity to retain the silicic acid, much more will remain in solution than can be dissolved by digesting the gelatinous acid with H_2O afterwards 1 pt SiO_2 can thus be held in solution by 500 pts H_2O Presence of NH_4OH , $(NH_4)_2CO_3$, or NH_4Cl (in solutions of which SiO_2 is remarkably insol) diminishes the power of H_2O to retain SiO_2 in solution SiO_2 is always more sol in dil than conc NH_4OH+aq (Liebig, A 94 373)

Silicic acid from the coagulation of the colloid form (see p 802) is sol in about 5000 pts H_2O when formed from a 1% solution, and 10,000 pts when formed from a 5% solution, but is insol after being dried (Graham, A 121 36)

Silicic acid is more sol in dil acids than in H_2O , because, when acid is added in excess to moderately dil K_2SiO_3+aq , the solution remains clear, but if only enough acid is added to neutralize the base present, silicic acid will gradually separate out If acid is added to conc K_2SiO_3+aq , silicic acid separates out insol in excess of acid, but if 20-30 pts H_2O are present to 1 pt K_2SiO_3 , and an excess of acid added at once, the silicic acid will remain in solution This result is obtained with HCl , HNO_3 , H_2SO_4 , or

$\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ These solutions may dissolve a neutral salt until saturated and no silicic acid will separate out. Therefore it is the acid that holds the SiO_2 in solution, and not the H_2O (C J B Karsten, (1826) Pogg 3 353)

Even CO_2 has the power of holding SiO_2 in solution (Karsten, *l c*)

Solubility in acids of silicic acid of Struckmann (see above) 100 pts dil $\text{HCl} + \text{Aq}$ of 1.088 sp gr dissolve 0.0172 g SiO_2 in 11 days, 100 pts H_2O sat with CO_2 dissolve 0.0136 g SiO_2 in 7 days

Silicic acid obtained by passing SiF_4 into H_2O is sol while still moist in 11,000 pts cold, and 5500 pts boiling $\text{HCl} + \text{Aq}$ of 1.115 sp gr (Fuchs, A 82 119)

Silicic acid at the moment of separation (as in dissolving cast-iron, steel, etc) is abundantly sol in aqua regia (3 pts $\text{HCl} + \text{Aq}$ of sp gr 1.13 and 1 pt $\text{HNO}_3 + \text{Aq}$ of sp gr 1.33) (Wittstein, Z anal 7 433)

The aq solution obtained by the hydrolysis of ethyl silicate is more stable in acids + Aq or alkali than in pure H_2O (Jordis, Z anorg 1903, 35 16)

$\text{NH}_4\text{OH} + \text{Aq}$ dissolves considerable freshly precipitated silicic acid, $(\text{NH}_4)_2\text{CO}_3$ only a very little (Karsten, Pogg 6 357)

Dry or ignited SiO_2 is sol in $\text{NH}_4\text{OH} + \text{Aq}$ 100 pts $\text{NH}_4\text{OH} + \text{Aq}$ containing 10% NH_3 dissolve 0.714 pt SiO_2 from gelatinous silicic acid, 0.303 pt from artificially dried silicic acid, 0.377 pt from amorphous SiO_2 , 0.017 pt from quartz (Pribram, Z anal 6 119)

$\text{NH}_4\text{OH} + \text{Aq}$ dissolves 0.382 pt SiO_2 from dry silicic acid 0.357 pt from ignited SiO_2 , 0.00827 pt from quartz (Souchay, Z anal 11 182)

Silicic acid precipitated from alkali silicates + Aq with CO_2 is sol as follows 100 pts pure H_2O dissolve 0.021 pt SiO_2 , 100 pts $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ containing 5% $(\text{NH}_4)_2\text{CO}_3$, 0.020 pt, 100 pts containing 1% $(\text{NH}_4)_2\text{CO}_3$, 0.062 pt, 100 pts $\text{NH}_4\text{OH} + \text{Aq}$ containing 19.2% NH_3 , 0.071 pt, 100 pts containing 1.6%, 0.0986 pt (Struckmann, A 94 341)

100 pts $\text{NH}_4\text{OH} + \text{Aq}$ (10% NH_3) dissolve of crystallised SiO_2 , 0.017 pt, amorphous SiO_2 , ignited, 0.38 pt, amorphous $3\text{SiO}_2 \cdot 4\text{H}_2\text{O}$, 0.21 pt, amorphous silicic acid in form of jelly, 0.71 pt. Upon evaporation no ppt is formed, even when 80 mols SiO_2 are present to 1 mol NH_3 (Wittstein, J B 1866 192)

Sol in KOH or $\text{NaOH} + \text{Aq}$, especially if warm (Dumas)

Sol in K_2SiO_3 or $\text{Na}_2\text{SiO}_3 + \text{Aq}$ (Fuchs)

Easily sol in boiling $\text{Na}_2\text{CO}_3 + \text{Aq}$, separating as a jelly on cooling (Pfaff)

NH_4Cl or other NH_4 salts ppt SiO_2 from solution in $\text{Na}_2\text{CO}_3 + \text{Aq}$

100 pts Ti_2O in H_2O dissolve 4.17 pts amorphous SiO_2 in 24 hours' boiling (Flemming, Jena Zeit 4 36)

Sol in butyl amine (Wurtz, A ch (3) 42 166)

Not more sol in H_2O containing sugar than in pure H_2O (Petzholdt, J pr 60 368)

Soluble silicic acid

Colloidal form by dialysis Solutions containing 4.9% SiO_2 may be evaporated until they contain 14% SiO_2 . The SiO_2 is separated from its solution thus made in many ways—

(1) By standing. This happens the more easily the more conc the solution is, and is hastened by heat. A 10–12% solution gelatinizes at ordinary temp in a few hours, and immediately upon heating. A 5–6% solution may be kept 5–6 days, a 2% solution, 2–3 months, and a 1% solution may be kept 2 or more years without gelatinizing.

(2) When the solution is evaporated to dryness in vacuo at 15° a transparent glass is left which is insol in H_2O .

(3) The coagulation of colloidal silicic acid is accelerated by powdered graphite and other indifferent bodies, and it is brought about in a few minutes by a solution of the alkali carbonates, even when only $\frac{1}{10,000}$ pt of the carbonate is present (Graham, A 121 36)

(4) Coagulation is also brought about by passing CO_2 through the solution (Liebig)

CO_2 does not cause coagulation (Maschke). Coagulation is not caused by H_2SO_4 , HCl , HNO_3 , $\text{HC}_2\text{H}_3\text{O}_2$, $\text{H}_3\text{C}_4\text{H}_6\text{O}_6$, or $\text{NH}_4\text{OH} + \text{Aq}$, or by neutral or acid salts + Aq (Graham)

NaCl and $\text{Na}_2\text{SO}_4 + \text{Aq}$ coagulate the solution (Maschke)

Alcohol, sugar, glycerine, or caramel do not coagulate

Soluble $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$, $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$, albumen, and casein precipitate soluble SiO_2 (Graham, A 121 36)

The jelly from colloidal SiO_2 is very sol in slightly alkaline H_2O 1 pt NaOH in 10,000 pts H_2O dissolves in an hour at 100° an amt of the jelly corresponding to 200 pts SiO_2 (Graham)

Other colloidal forms

Various solutions of silicic acid may be obtained as follows

The jelly formed when SiF_4 is passed through H_2O dissolves in a large amt of H_2O and SiO_2 separates out on evaporation. This is still sol in H_2O , but is made insol by evaporation with HCl or H_2SO_4 (Berzelius)

When SiF_4 is absorbed by crystallized H_3BO_3 , and the HF and H_3BO_3 removed by a large excess of $\text{NH}_4\text{OH} + \text{Aq}$, a silicic acid is obtained which is very sol in H_2O . This solution is not decomp by boiling, but on evaporation an insol powder remains (Berzelius, A ch 14 366)

When $\text{K}_2\text{SiO}_3 + \text{Aq}$ is precipitated by CuCl the precipitate washed and dissolved in $\text{HCl} + \text{Aq}$, the solution treated with H_2S filtered and boiled, a solution of silicic acid is obtained

which gelatinizes with KOH or $\text{NH}_4\text{OH} + \text{Aq}$ (Dove, A ch (3) 21 40)
 W n $\text{Na}_2\text{SiO}_3 + \text{Aq}$ containing at most 3%
 SiO_2 saturated with $\text{HCl} + \text{Aq}$ of 1 10 sp
 gr, & d Na_2SiO_3 added until the solution is
 slight opalescent and carefully warmed to
 30° gelatinous mass is obtained which will
 dissolve in H_2O by 12-16 hours' boiling if
 before being exposed to the air. The
 solution is slightly opalescent. The solution
 evaporated by heat until it contains
 6% SiO_2 . In a vacuum or over H_2SO_4 , solu-
 tion containing 10% may be obtained. The
 current, freezing, alcohol, or H_2SO_4
 precipitate or coagulate the solution (Kuhn,
 J pr 19 1)
 Sol with H_2O gives off H_2S , and forms a
 solution of SiO_2 which, after dilution, can be
 kept for months. But when boiled or evapo-
 rated or when a sol silicate is added, it
 becomes gelatinous. It leaves an insol
 residue when evaporated to dryness (Fremy,
 A ch (3) 38 314)
 Various forms of silicic acid have been de-
 scribed as definite compounds of SiO_2 with
 varying amounts of H_2O , but it is doubtful if
 any definite compounds exist, as the per-
 cent of H_2O varies with the moisture of the
 air to which it is exposed (See Ebelmen, A
 ch (16 129, Dover, A ch (3) 21 40,
 Fuchs, A 82 19, Merz, J pr 99 177, van
 Bemmelen, B 11 2232, etc.)

Silicates

The silicates are insol in H_2O with the ex-
 cept of the alkali salts, and these are sol
 only when the ratio of the base to the acid is
 above a certain limit.

Aluminum silicate, $2\text{Al}_2\text{O}_3, \text{SiO}_2 + 10\text{H}_2\text{O}$

Min *Collyrite*. Sol in acids, with forma-
 tion of SiO_2 and H_2O . Becomes transparent in
 H_2O and is decomposed.
 4A $\text{Al}_2\text{O}_3, 3\text{SiO}_2$ Min *Dillinite*
 Al $\text{Al}_2\text{O}_3, \text{SiO}_2$ Min *Andalusite*, *Chastolite*,
Sillimanite, *Disthen* or *Cyanite*. Insol in
 acids.
 + 7 H_2O Min *Allophane*. Completely
 sol in dil acids, decomposed by conc acids with
 separation of SiO_2 and H_2O .
 2A $\text{Al}_2\text{O}_3, 3\text{SiO}_2 + 4\text{H}_2\text{O}$ Min *Pholerite*. In-
 sol in $\text{HNO}_3 + \text{Aq}$.
 + H_2O Min *Glauberite*
 Al $\text{Al}_2\text{O}_3, 2\text{SiO}_2 + 2\text{H}_2\text{O}$ Min *Kaolin*, *Clay*.
 Insol in dil HCl or $\text{HNO}_3 + \text{Aq}$, moderately
 in $\text{SO}_4 + \text{Aq}$ when heated to evaporation,
 extra Al_2O_3 and some SiO_2 , and leaves the
 rest of the SiO_2 sol in boiling $\text{Na}_2\text{CO}_3 + \text{Aq}$.
 All the Al_2O_3 is dissolved by heating with 5-6
 pts of $\text{SO}_3 + 1$ pt H_2O until H_2SO_4 evaporates,
 and then treating with H_2O .
 Quickly attacked by $\text{H}_2\text{SiF}_6 + \text{Aq}$.
 Decomposed by boiling $\text{KOH} + \text{Aq}$, with resi-
 due of SiO_2 (Rummelsberg).
 KC $\text{HCl} + \text{Aq}$ extracts $\frac{1}{4}$ of the SiO_2 (Mala-

guti), is converted thereby into double sili-
 cates of K and Al, which are sol in $\text{HCl} + \text{Aq}$
 (Lemberg).

Solubility in KOH and HCl increased if
 first heated to a low glow (Glinka, C C
 1899, II 1063).

Colloidal clay (Schlosing, C R 79 473)
 + $4\text{H}_2\text{O}$ *Halloysite*. Decomposed by acids
 $4\text{Al}_2\text{O}_3, 9\text{SiO}_2 + 12\text{H}_2\text{O}$ Min *Porcelain*
clay from Passau
 $\text{Al}_2\text{O}_3, 3\text{SiO}_2 + 3\text{H}_2\text{O}$ Min *Razoumoff-*
skine
 $\text{Al}_2\text{O}_3, 4\text{SiO}_2 + 7\text{H}_2\text{O}$ Min *Montmor-*
illonite. Not decomposed by $\text{HCl} + \text{Aq}$, but by
 hot H_2SO_4 .

+ H_2O Min *Pyrophyllite*. Not decomposed
 by H_2SO_4 .
 + $3\text{H}_2\text{O}$ Min *Anauzite*
 $2\text{Al}_2\text{O}_3, 9\text{SiO}_2 + 6\text{H}_2\text{O}$ Min *Cimolite*
 "Aluminum silicate" is insol in acetone
 (Naumann, B 1904, 37 4328), ethyl acetate
 (Naumann, B 1910, 43 314).

Aluminum barium silicate, $\text{Al}_2\text{O}_3, \text{BaO}, 2\text{SiO}_2 + \text{H}_2\text{O}$ (?)

Min *Edingtonite*. Decomposed by $\text{HCl} + \text{Aq}$
 with separation of $\text{SiO}_2, x\text{H}_2\text{O}$.
 $5\text{Al}_2\text{O}_3, 4\text{BaO}, 10\text{SiO}_2$ (Fremy and Feil,
 C R 85 1033)
 $2\text{Al}_2\text{O}_3, 4\text{BaO}, 7\text{SiO}_2$ Min *Barylite*. Very
 sl decomposed by alkali carbonates + Aq (Blom-
 strand).

Aluminum barium potassium silicate,

$\text{Al}_2\text{O}_3, (\text{Ba}, \text{K}_2)\text{O}, 5\text{SiO}_2 + 2\text{H}_2\text{O}$
 Min *Harmotome*. When finely powdered,
 difficultly decomposed by $\text{HCl} + \text{Aq}$ with separa-
 tion of pulverulent $\text{SiO}_2, x\text{H}_2\text{O}$.
 $\text{Al}_2\text{O}_3, (\text{Ba}, \text{K}_2)\text{O}, 4\text{SiO}_2$ Min *Hagalophane*.
 Scarcely attacked by acids.

Aluminum caesium silicate, $\text{H}_2\text{Cs}_2\text{Al}_2\text{Si}_5\text{O}_{15}$ (?)

Min *Pollucite*. Very sl decomposed by $\text{HCl} +$
 Aq .

Aluminum calcium silicate, $\text{Al}_2\text{O}_3, \text{CaO}, 2\text{SiO}_2$

Min *Anorthite*. Completely decomposed by
 $\text{HCl} + \text{Aq}$ with separation of pulverulent $\text{SiO}_2,$
 $x\text{H}_2\text{O}$.
 Min *Barsowite*. Instantaneously decomposed
 by $\text{HCl} + \text{Aq}$, with separation of gelatinous
 $\text{SiO}_2, x\text{H}_2\text{O}$.
 + $4\text{H}_2\text{O}$ Min *Giesmonite*. Gelatinizes
 with $\text{HCl} + \text{Aq}$.
 $\text{Al}_2\text{O}_3, \text{CaO}, 3\text{SiO}_2 + 3\text{H}_2\text{O}$ Min *Scolezite*.
 Easily sol in $\text{HCl} + \text{Aq}$, without formation of
 gelatinous SiO_2 . Sol in $\text{H}_2\text{CO}_3 + \text{Aq}$ with
 pptn of CaC_2O_4 .
 Decomposed by, and sol to a certain extent in
 $\text{H}_2\text{CO}_3 + \text{Aq}$, and decomposed also even by pure
 H_2O (Rogers, Am J Sci (2) 5 408).
 + $5\text{H}_2\text{O}$ Min *Levyite*. Decomposed by acids
 without gelatinizing.
 $\text{Al}_2\text{O}_3, \text{CaO}, 4\text{SiO}_2 + 3\text{H}_2\text{O}$ Min *Capor-*
cranite, *Leonhardtite*. Efflorescent. Easily

sol in acids, with pptn of gelatinous SiO_2 , $x\text{H}_2\text{O}$

Al_2O_3 , CaO , $4\text{SiO}_2 + 4\text{H}_2\text{O}$ Min *Laumontite* Easily gelatinizes with HCl or HNO_3 + Aq , but is not affected by H_2SO_4 unless hot
 Al_2O_3 , CaO , $6\text{SiO}_2 + 5\text{H}_2\text{O}$ Min *Epistilbite* Gelatinizes with conc HCl + Aq (Goldschmidt, Z anal 17 267)

Scarcely decomp by boiling conc HCl + Aq (Jannasch and Tenne, Miner Jahrb 1880, 1 43)

+ $6\text{H}_2\text{O}$ *Silbite* *Heulandite* Slowly but completely gelatinized by HCl + Aq

Al_2O_3 , 2CaO , $3\text{SiO}_2 + \text{H}_2\text{O}$ Min *Prehnite* Imperfectly decomp by acids before ignition, but easily afterwards

Al_2O_3 , 3CaO , 3SiO_2 *Lime alumina garnet* *Grossularite* Partially decomp by acids before ignition, but easily afterwards

$2\text{Al}_2\text{O}_3$, CaO , $2\text{SiO}_2 + \text{H}_2\text{O}$ *Margarite* Not attacked by acids

$3\text{Al}_2\text{O}_3$, 4CaO , $6\text{SiO}_2 + \text{H}_2\text{O}$ *Zoisite* Partially decomp by HCl + Aq

$4\text{Al}_2\text{O}_3$, 6CaO , 9SiO_2 Min *Meionite* Completely sol in HCl + Aq

Aluminum calcium ferric silicate, $2\text{Al}_2\text{O}_3$, 4CaO , Fe_2O_3 , $6\text{SiO}_2 + \text{H}_2\text{O}$

Min *Epidote* Only sl attacked by HCl + Aq before ignition

Aluminum calcium ferric magnesium silicate, $\text{H}_{14}(\text{Ca}, \text{Mg})_{40}(\text{Al}_2, \text{Fe}_2)_{10}\text{Si}_{35}\text{O}_{147}$

Min *Vesuvianite* *Idocrase* Only partially decomp by HCl + Aq before ignition

Aluminum calcium iron, etc, silicate borate, $\text{H}_2\text{R}^{\text{I}}(\text{Al}_2, \text{B}_2)_3\text{Si}_8\text{O}_{32}$

Min *Axinite* Not attacked by HCl + Aq before ignition

Aluminum calcium magnesium silicate, $4\text{H}_4\text{Ca Mg}_8\text{Si}_6\text{O}_{24}$, $5\text{H}_2\text{CaMgAl}_5\text{O}_{12} = 15\text{Al}_2\text{O}_3$, 13CaO , 37MgO , $24\text{SiO}_2 + 13\text{H}_2\text{O}$

Min *Clintonite* Completely decomp by HCl + Aq without gelatinization

$3\text{H}_4\text{Ca}_2\text{Mg}_8\text{Si}_6\text{O}_{24}$, $4\text{H}_2\text{CaMgAl}_5\text{O}_{12}$ Min *Brandvite* Not attacked by HCl + Aq

Slowly decomp by boiling conc H_2SO_4

$5\text{H}_4\text{Ca}_2\text{Mg}_8\text{Si}_6\text{O}_{24}$, $8\text{H CaMgAl}_5\text{O}_{12}$ Min *Xanthophyllite* Very sl decomp by hot HCl + Aq

$3(\text{Ca}, \text{Mg})\text{O}$, Al_2O_3 , 2SiO_2 Min *Gehlenite* Easily decomp by acids

Aluminum calcium potassium silicate, $(\text{H}, \text{K})_2\text{CaAl}_2\text{Si}_5\text{O}_{15} + 6\text{H}_2\text{O}$

Min *Chabasite* Decomp by HCl + Aq
 $(\text{K}_2, \text{Ca})\text{Al}_2\text{Si}_5\text{O}_{10} + 4\text{H}_2\text{O}$ Min *Zeagonite* Completely sol in HCl + Aq

Aluminum calcium sodium silicate, $3\text{Al}_2\text{O}_3$, 8CaO , Na_2O , 9SiO_2

Min *Sarcosite* Decomp by acids

$2\text{Al}_2\text{O}_3$, $12(\text{Ca}, \text{Na}_2)\text{O}$, 9SiO_2 (?) Min *Melilite* Gelatinized by acids

$\text{Na}_2\text{CaAl}_4\text{Si}_2\text{O}_{12}$ (?) Min *Margarite*
 $\text{Na}_2\text{CaAl}_2\text{Si}_{10}\text{O}_{28}$ Min *Faujasite* Decomp by HCl + Aq

$(\text{Na}_2, \text{Ca})\text{Al}_2\text{Si}_4\text{O}_{12}$ Min *Gmelinite* Decomp by HCl + Aq

$(\text{Ca}, \text{Na}_2)\text{Al}_2\text{Si}_6\text{O}_{19} + 6\text{H}_2\text{O}$ Min *Foersite* Difficultly decomp by HCl + Aq

$(\text{Ca}, \text{Na}_2)\text{Al}_2\text{Si}_8\text{O}_{25} + 2\frac{1}{2}\text{H}_2\text{O}$ Min *Thomsonite* Gelatinizes with HCl + Aq

$x\text{Na}_2\text{Al}_2\text{Si}_6\text{O}_{16}$, $y\text{CaAl}_2\text{Si}_2\text{O}_8$ Min *Oligoclase*, *Labradorite* Sl decomp by acids, more easily the larger the amt of Ca present

Aluminum calcium sodium silicate sulphate, $2(\text{Na}_2, \text{Ca})\text{Al}_2(\text{SiO}_4)_2$, $(\text{Na}_2, \text{Ca})\text{SO}_4$

Min *Hawyn* Gelatinizes with HCl + Aq

Aluminum glaucinum silicate, Al_2O_3 , 3GfO , 6SiO_2

Min *Beryl* Emerald Not decomp by acids, excepting partially by H_2SO_4 after being ignited

Al_2O_3 , 2GfO , $2\text{SiO}_2 + \text{H}_2\text{O}$ Min *Euclase* Not attacked by acids

Aluminum ferrous silicate, $\text{Al}_2\text{Fe}(\text{SO}_4)_3$

Min *Garnet* Sl decomp by HCl + Aq
 $\text{H}_2\text{FeAl}_2\text{SiO}_7$ Min *Chloritoid* Not attacked by HCl + Aq Completely decomp by H_2SO_4

Al_2O_3 , 3FeO , $3\text{SiO}_2 + 3\text{H}_2\text{O}$ Min *Vorgrite*

Aluminum iron lithium potassium silicate, $\text{K}_3\text{Li}_3\text{FeAl}_2\text{Si}_{20}\text{O}_{65}$

Min *Zinnwaldite* Sl decomp by acids

Aluminum ferrous magnesium silicate, $6\text{Al}_2\text{O}_3$, $3(\text{Mg}, \text{Fe})\text{O}$, $6\text{SiO}_2 + \text{H}_2\text{O}$

Min *Staurolite* Not attacked by acids

Aluminum ferric magnesium silicate, $2(\text{Al}_2, \text{Fe}_2)\text{O}_3$, 2MgO , 5SiO_2

Min *Cordierite* Sl attacked by acids
 $+ 2\text{H}_2\text{O}$ Min *Fsmarkite*, *Chlorophyllite*

Aluminum ferrous manganous silicate, Al O_3 , FeO , 2MnO , 3SiO_2

Min *Partschmitze*

Aluminum ferrous sodium, etc, silicate borate, $\text{R}^{\text{I}}(\text{Al}_2)(\text{B}_2)\text{Si}_4\text{O}_{20} + \text{R}^{\text{II}}(\text{Al}_2)(\text{B}_2)\text{Si}_4\text{O}_{20}$, etc

Min *Tourmaline* Not decomp by HCl + Aq , very sl decomp by H_2SO_4

Aluminum lithium silicate, Al_2O_3 , Li O , 5SiO_2

Not attacked by acids (Hautfeuille, C R 90 541)

Al_2O_3 , Li_2O , 6SiO_2
 Al_2O_3 , Li_2O , 4SiO_2 {Min *Spodumene* Not attacked by acids

4Al₂C
attaque 3Li₂O, 30SiO₂ Min *Petalite* Not
by acids

Alumin n lithium potassium silicate,
(L) K₁₀Al₁₀Si₁₆O₅₂
Min *epidohite* SI decomp by acids

Alumin n magnesium silicate, 5Al₂O₃, 4MgO,
2Si₂
Min *apphurine*

Alumin n magnesium potassium silicate,
xH ζ_2 Al₆Si₆O₂₄, yMg₁₂Si₆O₂₁
Min *Lepidomelane* Easily decomp by
HCl or NO₃+Aq, with residue of a skeleton
of SiO₂
3Al₂C, 12MgO, 2K₂O, 12SiO₂+H₂O Min
Anomist
7Al₂C, 35MgO, 7K₂O, 36SiO₂ Min
Phlogoi e

Alumin n manganous silicate, 2Al₂O₃, 6MnO,
6S
Not comp by very dil HCl+Aq (Gor-
geu, C 97 1303)

Alumin m potassium silicate, Al₂O₃, K₂O,
Si
Very lowly decomp by cold H₂O, 12% is
dissolv- by hot H₂O Sol in alkali hydrox-
ides+Aq, but insol in carbonates+Aq
K₂O, Al₂O₃, 2SiO₂ Insol in cold H₂O, but
6% di solves on boiling Sol in dil acids
Insol 1 alkali hydroxides or carbonates+Aq
(Gorge A ch (6) 10 45)
K₂O, Al₂O₃, 3SiO₂+3H₂O Easily sol in
HNO₃ Aq (Deville, A ch (3) 61 313)
K₂O, Al₂O₃, 4SiO₂ Min *Leucite* De-
comp HCl+Aq with separation of pul-
veruler SiO₂
+4I O Ppt (Deville, C R 54 324)
H₄K d, Si₄O₄ Min *Muscovite*, "Mica"
Not at ck'd by HCl or H₂SO₄+Aq
K₂Al Si₂O₁₇+3H₂O Min *Pinite* Partly
decom by HCl+Aq
K₂Al Si₂O₁₁ Min *Orthoclase Feldspar*
Scarcl attacked by acids Slowly sol in
H₂SO₄ n HCl+Aq when finely powdered
(Rogci)

Alumin m potassium sodium silicate,
K L₂(SiO₃)₄, 5N₂Al₂(SiO₄)₂ (?)
Min *Vepheline* Decomp by HCl+Aq

Alumin m silver silicate, Al₂Ag₄Si₂O₄
Inso in NH₄OH+Aq (Silber, B 14 941)
Al₆A N₁₄Si₁₆O₄ As above (Silber)

Alumin m sodium silicate, Al₂O₃, Na₂O, SiO₂
Inso in cold H₂O, but 38-40% dissolves in
hot H₂ (Gorgeu)
Al₂C N₁O, 2SiO₂ Insol in cold H₂O,
boiling H₂O dissolves 1-2% Sol in HCl or
HNO₃ iluted with 10-20 vols H₂O Insol

in alkali hydroxides or carbonates+Aq
(Gorgeu, A ch (6) 10 145)

Not attacked by H₂O (Silber, B 14 941)
+3H₂O Easily sol in HCl+Aq (v
Ammon)

Al₂O₃, Na₂O, 3SiO₂+3H₂O Decomp by
acids (Deville, A ch (3) 61 326)

Al₂O₃, Na₂O, 4SiO₂+3H₂O Easily sol in
HCl+Aq (v Ammon)

2Al₂O₃, 3Na₂O, 3SiO₂ Insol in cold H₂O,
but 27-30% dissolves on boiling (Gorgeu)

H₄Na₂Al₆Si₆O₂₄ Min *Paragonite* De-
comp by conc H₂SO₄

Na₂Al₂Si₄O₁₂+2H₂O Min *Anachite*
Readily decomp by HCl+Aq

Na₂Al₂Si₂O₁₀+2H₂O Min *Natrohite* Sol
in H₂O with separation of SiO₂ Also sol in

H₂C₂O₄+Aq
Na₂Al₂Si₆O₁₈ Min *Albite* Not attacked
by acids

Aluminum sodium silicate chloride,
3Na₂Al₂(SiO₄)₂, 2NaCl

Min *Sodalite* Easily decomp by HCl,
and HNO₃+Aq

Aluminum sodium silicate sulphate,
3Na₂Al₂(SiO₄)₂, Na₂SO₄

Min *Nosean* Easily decomp by HCl+
Aq

Aluminum sodium silicate sulphide
See Ultramarine

Barium silicate, BaSiO₃

Somewhat sol in boiling H₂O Completely
sol in dil HCl+Aq (v Ammon)

+6H₂O, or 7H₂O Boiling H₂O decomp-
poses, and dissolves about 1/2 the weight of

this substance (le Chatelier, C R 92 931)
2BaO, SiO₂ Decomp by H₂O into BaSiO₃
+6H₂O (I audrin)

Bismuth silicate, 2Bi₂O₃, 3SiO₂

Min *Eulytite* Decomp by HCl+Aq

Bismuth ferric silicate, Bi₂Fe₄Si₄O₁₇

Min *Bismuthoferrite*

Boron calcium silicate

See Borate silicate, calcium, and Silicate
borate, calcium

Cadmium silicate, CdSiO₃+1 1/2 H₂O

Sol in HCl+Aq with deposition of pul-
verulent SiO₂, xH₂O (Roussieu and Tite,
C R 114 1262)

Cæsium silicate, Cs₂SiO₃

(Kahlenberg, J phys Chem 1898, 2
82)

Calcium silicate, CaSiO_3 Slowly sol in H_2O , sol in $\text{HCl} + \text{Aq}$ Sol in about 100,000 pts H_2O (Gorgeu, A ch 1885, (6) 4 550)100 cc sat aq solution of air dried calcium silicate contains 0.0046 g $\text{CaO} = 0.0095$ g CaSiO_3 at 17° (Weisberg, Bull Soc 1896, (3) 15 1097)100 cc sat solution of air dried calcium silicate in 10% sugar solution at 17° contains 0.0065 g $\text{CaO} = 0.0135$ g CaSiO_3 , 20% sugar solution, 0.0076 g $\text{CaO} = 0.0175$ g CaSiO_3 After boiling and filtering hot, 10% sugar solution contains 0.0094 g $\text{CaO} = 0.0195$ g CaSiO_3 , 20% sugar solution, 0.0120 g $\text{CaO} = 0.0249$ g CaSiO_3 (Weisberg, 0)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

 $4\text{CaO}, 3\text{SiO}_2$ (Laudrin) $5\text{CaO}, 3\text{SiO}_2 + 5\text{H}_2\text{O}$ When freshly precipitated is somewhat sol in H_2O and easily decomp by $\text{HCl} + \text{Aq}$ (v Ammon) $\text{CaO}, 3\text{SiO}_2 + 2\text{H}_2\text{O}$ (Hjeldt, J pr 94 129) $2\text{CaO}, 9\text{SiO}_2 + 3\text{H}_2\text{O}$ Ppt CaSiO_3 Min *Wollastonite* Gelatinizes with $\text{HCl} + \text{Aq}$ $\text{CaSi}_2\text{O}_5 + 2\text{H}_2\text{O}$ Min *Okenite* Easily decomp by cold $\text{HCl} + \text{Aq}$ when powdered**Calcium glucinum silicate sodium fluoride,**
(Ca, Gl) $_{16}\text{Si}_{14}\text{O}_{48}$, 6NaFMin *Leucophane* $7(\text{Ca}, \text{Gl})_3\text{Si}_2\text{O}_7$, 6NaF Min *Melnophane***Calcium ferrous silicate, $\text{CaSiO}_3, \text{FeSiO}_3$** Min *Hedenbergite, Pyroxene* Sl decomp by acids**Calcium ferric silicate, $\text{Ca}_3\text{Fe}_2(\text{SiO}_4)_3$** Min *Garnet* Sl decomp by $\text{HCl} + \text{Aq}$ $2\text{CaSiO}_3, 11 \text{Fe}_2(\text{SiO}_3)_3$ Min *Szabotite*Sl attacked by $\text{HCl} + \text{Aq}$, and still less by $\text{H}_2\text{SO}_4 + \text{Aq}$ **Calcium ferroferric silicate, $2\text{CaO}, 4\text{FeO}, \text{Fe}_2\text{O}_3, 4\text{SiO}_2 + \text{H}_2\text{O} = \text{H}_2\text{Ca}_2\text{Fe}_4\text{Fe}_2\text{Si}_4\text{O}_{18}$** Min *Luevite Ilvaite* Easily gelatinizes with $\text{HCl} + \text{Aq}$ **Calcium ferrous magnesium silicate,** $(\text{Ca}, \text{Fe}, \text{Mg})\text{SiO}_3$ Min *Amphibole, Hornblende, Asbestos, Actinolite, Tremolite* Only sl attacked by acids**Calcium ferroferric sodium silicate, $\text{CaSiO}_3, \text{FeSiO}_3, \text{Fe}_2(\text{SiO}_3)_3, \text{Na}_2\text{SiO}_3$** Min *Aegirite***Calcium magnesium silicate, $\text{CaO}, \text{MgO}, 4\text{SiO}_2$**

(Mutschler, A 176 86)

 $\text{Ca}_2\text{SiO}_4, \text{Mg}_2\text{SiO}_4$ Min *Monticellite* Completely sol in dil $\text{HCl} + \text{Aq}$ $(\text{Ca}, \text{Mg})\text{SiO}_3$ Min *Dropsite, Pyroxene*
Very sl attacked by acids**Calcium manganous silicate, $\text{CaSiO}_3, 2\text{MnSiO}_3$** Min *Bustamite***Calcium potassium silicate**

See under Glass

Calcium sodium silicate, $(\text{Ca}, \text{Na}_2, \text{H}_2)\text{SiO}_3$ Min *Pectolite* Decomp by $\text{HCl} + \text{Aq}$

See under glass

Calcium sodium silicate zirconate, $\text{Na}_4\text{Ca}(\text{Si}, \text{Zr})_2\text{O}_{21} + 9\text{H}_2\text{O}$ Min *Wohlerite* Decomp by $\text{HCl} + \text{Aq}$ **Calcium uranyl silicate, $3\text{CaO}, 5\text{UO}_3, 6\text{SiO}_2 + 18\text{H}_2\text{O}$** Min *Uranophane* Gelatinizes with acids
 $\text{CaO}, 3\text{UO}_3, 3\text{SiO}_2 + 9\text{H}_2\text{O}$ Min *Uranotile***Calcium silicate chloride, $2\text{CaO}, \text{SiO}_2, \text{CaCl}_2$** Insol in H_2O or alcohol Sol in $\text{HCl} + \text{Aq}$
(le Chatelier, C R 97 1510)**Calcium silicate fluoride, $2\text{CaO}, 3\text{SiO}_2, 6\text{CaF}_2$**

(Deville, C R 52 110)

Calcium silicate potassium fluoride, $4\text{H}_2\text{CaSi}_2\text{O}_8, \text{KF} + 4\text{H}_2\text{O}$ Min *Apophyllite* Decomp by $\text{HCl} + \text{Aq}$ **Calcium silicate stannate**

See Silicostannate, calcium

Calcium silicate titanate, $\text{CaO}, \text{SiO}_2, \text{TiO}_2$

(Hautefeuille, A ch (4) 4 154)

Min *Titanite* Incompletely decomp by $\text{HCl} + \text{Aq}$, wholly by $\text{H}_2\text{SO}_4 + \text{Aq}$ **Cerous silicate, $\text{Ce}_2(\text{SiO}_3)_3$** More or less attacked by HCl, HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$, according to the concentration
(Didier, C R 101 882)**Cerium didymium lanthanum silicate,** $2(\text{Ce}, \text{La}, \text{Di})_2\text{O}_3, 3\text{SiO}_2$ Min *Cerite* Gelatinizes with $\text{HCl} + \text{Aq}$ **Cerium glucinum yttrium silicate,** $(\text{Y}, \text{Ce}, \text{Gl})_2\text{SiO}_3$ Min *Gadolinite* Easily gelatinized by $\text{HCl} + \text{Aq}$ **Cerous silicate chloride, $2\text{Ce}_2\text{O}_3, 3\text{SiO}_2,$** $4\text{CeCl}_2 = \text{Ce}_4(\text{SiO}_4)_3, 4\text{CeCl}_3$ Insol in H_2O , but slowly decomp thereby
(Didier, C R 101 882)

Cobaltous silicate , Co_2SiO_4 Gelatinizes with $\text{HCl} + \text{Aq}$ (Bourgeois, C R 108 177)	Iron (ferrous) manganous silicate chloride , $7(\text{Fe}, \text{Mn})\text{SiO}_3, (\text{Fe}, \text{Mn})\text{Cl}_2 + 5\text{H}_2\text{O}$ Min <i>Pyroxmalite</i> Completely decomp by conc $\text{HNO}_3 + \text{Aq}$
Cupric silicate , CuH_2SiO_4 Min <i>loptase</i> Sol in HCl , HNO_3 , or $\text{NH}_4\text{OH} + \text{Aq}$ with separation of SiO_2 Not attacked by $\text{KOH} + \text{Aq}$ $\text{CuSiO}_3 \cdot 2\text{H}_2\text{O}$ Min <i>Chrysocolla</i> Decomp by $\text{HCl} + \text{Aq}$ $+ 3\text{H}_2\text{O}$ Min <i>Asperolite</i> Easily decomp by $\text{HCl} + \text{Aq}$ "Cupric silicate" is insol in methyl acetate (Naummar, B 1909, 42 3790)	Iron (ferric) potassium silicate , $\text{Fe}(\text{SiO}_3)_3, \text{K}_2\text{SiO}_3$ (Hautefeuille and Perrey, C R 107 1150)
Cupric silicate ammonia , $\text{CuSi}_2\text{O}_6, 2\text{NH}_3$ Ppt <i>schiff</i> , A 123 38)	Iron (ferric) sodium silicate , $\text{Na}_2\text{Fe}_2\text{Si}_4\text{O}_{12}$ Min <i>Crokydolite</i> Not attacked by acids
Glucinum silicate , Gl_2SiO_4 Min <i>phenacite</i> Not attacked by acids	Lead silicate Insol in acetone (Naumann, B 1904, 37 4329), methyl acetate (Naumann, B 1909, 42 3790) <i>See under Glass</i>
Glucinum ferrous manganous silicate ferrous manganous sulphide , $3(\text{Gl}, \text{Fe}, \text{Mn})_2\text{SiO}_4, (\text{Mn}, \text{Fe})\text{S}$ Min <i>Ielwne</i> Decomp by $\text{HCl} + \text{Aq}$	Lithium silicate , $\text{Li}_2\text{Si}_5\text{O}_{11}$ Li_4SiO_4 Li_2SiO_3 More stable towards H_2O than the other alkali metasilicates (Rieke and Endell, C C 1911, I 7) Decomp by boiling H_2O and acids (Friedel, C C 1901, II 89) Scarcely attacked by cold H_2O (Friedel, Bull Soc Min 1901, 24 141) Insol in ethyl acetate (Naumann, B 1904, 37 3601), methyl acetate (Naumann, B 1909, 42 3790)
Iron (ferrous) silicate , Fe_2SiO_4 Min <i>Fayalite</i> Gelatinizes with $\text{HCl} + \text{Aq}$ FeSiO_3 Min <i>Grunerite</i> $+ 6\text{H}_2\text{O}$ Min <i>Chlorophane</i> $4\text{FeO} \cdot \text{SiO}_2$ (Zobel, Dngl 154 111)	Magnesium silicate , $\text{Mg}_3\text{Si}_2\text{O}_7 + 2\text{H}_2\text{O}$ Min <i>Serpentine</i> Decomp by $\text{HCl} + \text{Aq}$, more easily by H_2SO_4 Min <i>Chrysotile</i> $\text{Mg}_4\text{Si}_3\text{O}_{10} + 6\text{H}_2\text{O}$ Min <i>Gymnrite</i> , <i>Soapstone</i> Decomp by H_2SO_4 MgSiO_3 Not completely decomp by $\text{HCl} + \text{Aq}$
Iron (ferric) silicate , $\text{Fe}_2\text{Si}_2\text{O}_6 + 5\text{H}_2\text{O}$ Min <i>Vontromite</i> Gelatinizes with hot acids $4\text{Fe}_2\text{C} \cdot 9\text{SiO}_2 + 18\text{H}_2\text{O}$ Min <i>Hisingerite</i> $2\text{Fe}_2\text{C} \cdot 9\text{SiO}_2 + 2\text{H}_2\text{O}$ Min <i>Anthosiderite</i>	$+ \frac{1}{4}\text{H}_2\text{O}$ Min <i>Aphrodite</i> Decomp by hot acids $+ \frac{1}{2}\text{H}_2\text{O}$ Min <i>Picrosmine</i> $+ 1\frac{1}{3}\text{H}_2\text{O}$ Sol in dil acids (v Ammon) Min <i>Forsterite</i> $3\text{MgO}, 4\text{SiO}_2 + \text{H}_2\text{O}$ or $4\text{MgO}, 5\text{SiO}_2 + \frac{3}{4}\text{H}_2\text{O}$ Min <i>Talc</i> or <i>Steatite</i> Not attacked by HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$
Iron (ferroferric) magnesium silicate , $(\text{Fe}, \text{Mg})_3\text{Fe}_2\text{Si}_2\text{O}_{10} + 4\text{H}_2\text{O}$ Min <i>Cronstadite</i> Gelatinizes with acids	$\text{Mg}_5\text{Si}_4\text{O}_{17} + 4\text{H}_2\text{O}$ Min <i>Spadarte</i> Decomp by conc $\text{HCl} + \text{Aq}$ $\text{Mg}_2\text{Si}_3\text{O}_8 + 4\text{H}_2\text{O}$ Min <i>Meerschaum</i> Decomp by $\text{HCl} + \text{Aq}$ "Magnesium silicate," is insol in methyl acetate (Naumann, B 1909, 42 3790)
Iron (ferroferric) sodium silicate , $5\text{Na}_2\text{SiO}_3, 2\text{Fe}_2\text{SiO}_3, 4\text{Fe}_2(\text{SiO}_3)_3$ Min <i>Aknite</i> Sl decomp by acids	Magnesium potassium silicate , $\text{MgO}, \text{K}_2\text{O}, 3\text{SiO}_2$ Easily sol in acids with decomp (Duboin, C R 1895, 120 681)
Iron (ferrous) magnesium silicate , $\text{Fe}_2\text{SiO}_4, \text{MgSiO}_4$ Min <i>Olivene</i> , <i>Chrysotile</i> , <i>Peridot</i> Gelatinizes with HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$ $(\text{Fe}, \text{Mg})\text{SiO}_3 + \frac{3}{4}\text{H}_2\text{O}$ Min <i>Picrophyllite</i> $+ \frac{1}{2}\text{H}_2\text{O}$ Min <i>Monradite</i> $(\text{Fe}, \text{Mg})\text{SiO}_3$ Min <i>Bronzite</i> , <i>Hypersthene</i> Not attacked by acids $x\text{MgSiO}_3, y\text{FeSiO}_3$ Min <i>Anthophyllite</i> Not attacked by acids	Magnesium silicate fluosilicate , $\text{Mg}_6\text{Si}_2\text{O}_9, \text{Mg}_8\text{Si}_2\text{F}_{18}$ Min <i>Humite</i> , <i>Chondrodite</i> Gelatinizes with HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$
Iron (ferrous) manganous silicate , $\text{Fe}_2\text{SiO}_4, \text{Mn}_2\text{SiO}_4$ Min <i>Knebelite</i> Gelatinizes with $\text{HCl} + \text{Aq}$	

Manganous silicate, Mn_2SiO_4

Min *Tephroite* Decomp by $HCl + Aq$ with formation of a stiff jelly
 $MnSiO_3$ Min *Rhodomite*, *Hermannite*
 Not attacked by $HCl + Aq$
 $Mn_2Si_2O_7 + 2H_2O$ Min *Friedelite*
 Easily gelatinized by $HCl + Aq$
 "Manganous silicate" is insol in ethyl acetate (Naumann, B 1910, 43 314)

Manganous zinc silicate, $(Mn, Zn)_2SiO_4$

Min *Troostite*

Manganous silicate chloride, $MnSiO_3$, MnO , $MnCl_2$

Decomp by H_2O (Gorgeu)

Nickel silicate, Ni_2SiO_4

Easily decomp by acids (Bourgeois, C R 108 1077)

Potassium silicate, K_2SiO_3

Completely sol in H_2O (Ordway, Sill Am J (2) 33 34)
 Insol in methyl acetate (Naumann, B 1909 42 3790)
 $K_2Si_2O_5$ Sol in H_2O Conc $K_2Si_2O_5 + Aq$ contains 28% of the salt, and has sp gr 1.25 (Luchs)

Hydroscopic Decomp at once by H_2O (Morey, J Am Chem Soc 1914, 36 222)
 $K_2Si_2O_5$ Partially sol in H_2O as K_2SiO_3
 $K_2Si_4O_{11} + 16H_2O$ Insol in H_2O (Forchhammer)

The K silicates are pptd from their aqueous solution by alcohol with partial decomp, but less readily than Na silicates

More sol in H_2O than the corresponding Na silts (Ordway, Sill Am J (2) 32 155)

Solution can be obtained which is perfectly clear when H_2SiO_3 are present to H_2O if there are no impurities present (Ordway)

The K silicates resemble the Na silts which see for further data

Potassium hydrogen silicate, $KHSiO_3$

Not readily affected by H_2O , even by treatment at 100 for several hours

Decomp by heating with dil HCl (Morey, J Am Chem Soc 1914, 36 222)

Potassium zinc silicate

Sol in $KOH + Aq$ (Schmidler)
 $K_4O, 6ZnO, 4SiO_2$ Sol in $HCl + Aq$ (Duboin, C R 1905, 141 255)

$8K_2O, 9ZnO, 17SiO_2$ Sol in $HCl + Aq$ (Duboin)

Potassium zirconium silicate, $K_2O, ZrO_2, 2SiO_2$

Decomp by $HCl + Aq$ (Melliss)

Rubidium silicate, Rb_2SiO_3

(Kahlenberg, J phys Chem 1898, 2 82)

Silver silicate, Ag_2SiO_3

Decomp by all acids, sol in $NH_4OH + Aq$ (Hawkins, Sill Am J 139 311)

Sodium silicate, Na_2SiO_3

Rapidly decomp by H_2O (Morey, J Am Chem Soc 1914, 36 224)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+5, 6, and $8H_2O$ Easily sol in H_2O
 + $9H_2O$ Solubility in $\frac{1}{2}$ -N $NaOH + Aq$

100 ccm of the solution contain 25.56 g $Na_2SiO_3 + 9H_2O$ at 17.5°

Sp gr of the solution = 1.129 (Vesterberg, C C 1913 777)

100 ccm of a sat solution of sodium silicate in $\frac{1}{2}$ -N $NaCl + Aq$ contain 3.83 g $Na_2SiO_3 + 9H_2O$ at 17.5° Sp gr of solution = 1.15

100 ccm of a sat solution of sodium silicate in sat $NaCl + Aq$ contain 20.64 g $Na_2SiO_3 + 9H_2O$ at 17.5° (Vesterberg)

$Na_2Si_2O_5$ Sol in H_2O

Slowly decomp by cold H_2O (Morey J Am Chem Soc 1914, 36 223)

$Na_4Si_6O_{12}$

$Na_2Si_2O_5$

$Na_2Si_4O_9$ Slowly sol in H_2O

+ $12H_2O$

Above compounds are all more or less indefinite

Water glass $xNa_2O, ySiO_2 + zH_2O$ Sol in H_2O , but solution is decomposed by all weak acids, even CO_2

Fused water glass is but little acted on by cold H_2O , but when pure, easily dissolves in H_2O by long boiling (Ordway, Am J Sci (2) 32 337)

When the SiO_2 is present in greater proportion than in $Na_2O, 3SiO_2$, it is very difficult to dissolve in H_2O

Na silicate is less easily sol in H_2O than the corresponding K compound

Solubility of water glass in H_2O is much impaired by earthy impurities, so that traces have great effect in preventing the solubility

NH_4 silts decomp water glass solutions. A solution containing $\frac{1}{2}\%$ Na_2SiO_3 is scarcely precipitated by NH_4Cl , but easily by NH_4NO_3 (Flückiger)

Precipitated by $NH_4OH + Aq$ as Na_2SiO_3

Many sodium and potassium silts (especially the chlorides and acetates) form precipitates in solutions of water glass; these precipitates are larger the more concentrated the solution is, and the greater amount of SiO_2 it contains. Heating hastens the precipitation by chlorides, nitrates, and sulphates, but delays that by acetates. $KOH + Aq$ does not precipitate

Cold sat $Na_2SO_4 + Aq$ does not precipitate even on heating, but 1 pt anhydrous Na_2SO_4 dissolved in 2 pts H_2O precipitates a hot solution of Na_2SiO_3

NaNO_3 dissolved in 1 pt H_2O precipitate Na_2SiO_3 Aq of 1392 sp gr, NaNO_3 in 2 pts H_2O when mixed with a solution of Na_2SiO_3 as above, if the two are present in equal vol, causes no ppt in the cold, but when warmed to 54° , and redissolving rapidly, but if 2 vols NaNO_3 present to 1 vol Na_2SiO_3 + Aq, the precipitate does not disappear on cooling

If 1 pt NH_4OH + Aq (0.921 sp gr) is added to but by 1 pt Na_2SiO_3 + Aq, no ppt forms, increasing the amt of NH_4OH + Aq to 2 pts the greater pt of the Na_2SiO_3 is redissolved on heating to 90° , separation on cooling. When 1 pt NH_4OH + Aq is added to 6-8 pts Na_2SiO_3 + Aq and to 30° , a clear liquid is formed which separates into two layers at ordinary temp

The most sol K, Na, Li, and NH_4 salts separate SiO_2 from conc Na_2SiO_3 + Aq. These salts lose this power by dilution, but the NH_4 salts and KSON keep this power unless the solution is very dil. This is the case with NH_4Cl and NH_4NO_3 , especially

Bromine, chloroform, propylamine, cresote, dissolved in glycerine, chloral hydrate, chloroform, and glue solution. SiO_2 from Na_2SiO_3 + Aq, but sugar, glycerine, urea, sl alkaline solution of urea, nitrate, conine, nicotine, saponine, me, jalappine, and colophonium dissolved in KOH + Aq do not ppt SiO_2 (Fluckiger, Arch Pharm (2) 144 97)

Alcohol ppt water glass as such from its solution, even when this is very dil. is some decomposition, the alcohol holds in solution a portion of a more alkaline than that previously in H_2O , while the ppt formed contains SiO_2 than the original silicate

neutral K or Na salts ppt water glass as like al silicate. When added to aqueous solutions of these solutions exert a decomposition, the ppt being always more than the original silicate. Na silicate gives a larger deposit than K silicate, when a silicate of one base is pptd by a salt of the other, both bases enter into the composition of the ppt, and the relative proportion of Na and K is very nearly the same as in the average of the liquids mixed

Diffic power, especially power of the acetates, sulphates, and nitrides diminishes that of the acetates. The efficiency gives even a slight ppt with Na_2O , $2\frac{1}{2}\text{SiO}_2$, or some time

Na_2O has but little effect on the more alkaline silicates

Na_2O has still less power than NaNO_3

Na_2O has no pptg power, and Na_2AsO_4 or Na_2O_4 have very little effect

MHSO_4 , MHCO_3 , MHP_4 , M_2HAsO_4 , ppt SiO_2 . NH_4 salts also have that effect

Pptd water glass, as mentioned above, is much more sol in H_2O than ordinary water glass, and dissolves in H_2O without decomposition. For numerous further details, see articles by Ordway in Sill Am J Sci vols 32 and 33, also Storer's Dict

Sp gr of water glass solution containing 14-15% SiO_2 , 13-14% Na_2O , and 70-72% H_2O is 1.30-1.35 (Hager, Comm 1883)

Sp gr of sat Na_2SiO_3 + Aq freshly prepared at 18° is 1.2600, and 1 litre contains 4.5 gramme-equivalents $\frac{1}{2}\text{Na}_2\text{SiO}_3$

Sp gr of sat solution of Na_2O , 3.4 SiO_2 is 1.366, and 1 litre contains 3.7 gramme-equivalents $\frac{1}{2}(\text{Na}_2\text{O}, 3.4\text{SiO}_2)$ (Kohlrausch, Z phys Ch 12 773)

Sodium zirconium silicate, Na_2O , ZrO_2 , SiO_2

Decomp by hot H_2O or HCl + Aq (Gibbs, Pogg 71 559)

Na_2O , 8 ZrO_2 , SiO_2 + 11 H_2O Decomp by H_2SO_4 (Melliss)

Strontium silicate, SrSiO_3

(Stein, Z anorg 1907, 55 164)

+ H_2O Sol in H_2O (Jordis and Kanter, Z anorg 1903, 35 90)

Sr_2SiO_4 (Stein, Z anorg 1907, 55 167)

3 SrO , SiO_2 . Sl sol in H_2O . Sol in acids (Vauquelin)

Thallous silicate, 3 Tl_2O , 10 SiO_2

100 pts of a solution of Tl_2O dissolve 4-17 pts SiO_2 by 24 hours' boiling. Sol in H_2O (Flemming, J B 1868 251)

Thorium silicate, ThO_2 , SiO_2

Insol in acids. Attacked by KHSO_4 (Troost and Ouvrard, C R 105 255)

+ $1\frac{1}{2}\text{H}_2\text{O}$ Min *Thorite* Decomp by HCl + Aq

ThO_2 , 2 SiO_2 Insol in acids or KHSO_4 (T and O)

Yttrium silicate, Y_2O_3 , SiO_2

Attacked by HCl , HNO_3 or H_2SO_4 + Aq (Duboué, C R 107 99)

Zinc silicate, ZnSiO_3

(Stein, Z anorg 1907, 55 160)

Zn_2SiO_4 Min *Willemite* Gelatinizes with HCl + Aq, sol in KOH + Aq

Decomp by cold sat citric acid + Aq (Bolton C N 1881 43 34)

+ H_2O Min *Calamine* Sol in HCl + Aq with separation of gelatinous SiO_2 , rH_2O

Sol in $\text{HC}_2\text{H}_3\text{O}_2$ + Aq, and KOH + Aq

Insol in NH_4OH + $(\text{NH}_4)_2\text{CO}_3$ + Aq (Brandhorst, Zeit angew Ch 1904, 17 513)

ZnO , 3 SiO_2 (Bornträger, Ch Z 1893, 8 186)

Zirconium silicate, SiO_2 , ZrO_2

Min *Zircon* Insol in acids, except H_2SO_4 , in which it is very slowly and sl sol
 3SiO_2 , 2ZrO_2 Min *Auerbachite*

"Silicium oxide," $\text{Si}_2\text{H}_2\text{O}_5$

(Geuther, J pr 95 430) This substance is identical with silicoformic anhydride according to Otto-Graham's Handb anorgan Chem 7te Aufl 2 953

Siliciuretted hydrogen

See Silicon hydride

Silicobromoform, HSiBr_3

Fumes on air, decomp by H_2O

Silicochloroform, HSiCl_3

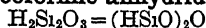
Decomp by H_2O and alcohol
 Completely miscible with CS_2 , CCl_4 , CHCl_3 , C_6H_6 , SiCl_4 , SnCl_4 , TiCl_4 , and AsCl_3 (Ruff, B 1905, 38 2230)

Silicoethane

See Silicon hydride

Silicofluoroform, SiHF_3

Decomp by H_2O Decomp by NaOH and abs alcohol with evolution of hydrogen
 Decomp by abs ether Sol in toluene (Ruff, B 1905, 38 63)

Silicoformic anhydride,

Somewhat sol in H_2O Acids, even conc $\text{HNO}_3 + \text{Aq}$, have no action, except HF , which dissolves it easily with evolution of hydrogen
 Solutions of alkali hydrates, ammonium hydrate, and alkali carbonates + Aq also dissolve with evolution of hydrogen (Ruff and Wohler, A 104 101)

Silicoiodoform, HSiI_3

Decomp by H_2O Sol in CS_2 (Friedel, A 149 96)
 Miscible with C_6H_6 and CS_2 (Ruff, B 1908, 41 3739)

Silicomethane, SiH_4

See Silicon hydride

Silicomethyl chloride, SiH_3Cl

Decomp by H_2O and by alkalis (Besson and Fournier, C R 1909, 148 556)

Silicomethylene chloride, SiH_2Cl_2

Decomp by H_2O and by alkalis (Besson and Fournier, C R 1909, 148 556)

Silicomolybdic acid, SiO_2 , $12\text{MoO}_3 + 26\text{H}_2\text{O}$

Very easily sol in H_2O and dil acids (Parmentier, C R 94 213)

Forms a solution with a little ether, which separates into two layers by addition of H_2O or more ether (Parmentier, C R 104 686) (Copaux, Bull Soc Min 1906, 29 79)
 $+32\text{H}_2\text{O}$ Decomp by alkali (Asch, Z anorg 1901, 28 293)
 $+33\text{H}_2\text{O}$ (Copaux, Bull Soc Min 1906, 29 79)

Aluminum silicomolybdate, $2\text{Al}_2\text{O}_3$, $3(\text{SiO}_2, 12\text{MoO}_3) + 93\text{H}_2\text{O}$

(Copaux, A ch 1906, (8) 7 118)

Aluminum sodium silicomolybdate, $4(\text{Na}_2\text{O}, \text{Al}_2\text{O}_3, 2\text{SiO}_2), \text{Na}_2\text{MoO}_4 + 7\text{H}_2\text{O}$

Sol in $\text{HCl} + \text{Aq}$ (Thugutt, Z anorg 1892, 2 87)

Ammonium silicomolybdate

Sol in H_2O (Parmentier, C R 94 213)

Barium silicomolybdate, 2BaO , SiO_2 , $12\text{MoO}_3 + 16\text{H}_2\text{O}$

(Copaux, A ch 1906, (8) 7 118)
 $+22\text{H}_2\text{O}$ Sol in 4 pts H_2O (Copaux, Bull Soc Min 1906, 29 80)
 $+24\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Asch, Z anorg 1901, 28 282)
 $+29\text{H}_2\text{O}$ Efflorescent (Copaux, A ch 1906, (8) 7 118)

Cadmium silicomolybdate, 2CdO , SiO_2 , $12\text{MoO}_3 + 22\text{H}_2\text{O}$

Very unusually sol in H_2O (Copaux, A ch 1906, (8) 7 140)

Cæsium silicomolybdate

Sl sol in H_2O , insol in silicomolybdic acid + Aq

Calcium silicomolybdate, 2CaO , SiO_2 , $12\text{MoO}_3 + 24\text{H}_2\text{O}$

Efflorescent Very sol in H_2O (Asch, Z anorg 1901, 28 282)
 $+26\text{H}_2\text{O}$ (Copaux, A ch 1906, (8) 7 118)
 $+31\text{H}_2\text{O}$ (Copaux)

Chromium silicomolybdate, $2\text{Cr}_2\text{O}_3$, $3(\text{SiO}_2, 12\text{MoO}_3) + 93\text{H}_2\text{O}$

(Copaux)

Cupric silicomolybdate, 2CuO , SiO_2 , $12\text{MoO}_3 + 31\text{H}_2\text{O}$

Very sol in H_2O (Copaux)

Lithium silicomolybdate, $2\text{Li}_2\text{O}$, SiO_2 , $12\text{MoO}_3 + 29\text{H}_2\text{O}$

Very sol in H_2O (Copaux)

Magnesium silicomolybdate, 2MgO , SiO_2 , $12\text{MoO}_3 + 30\text{H}_2\text{O}$

(Asch, Z anorg 1901, 28 282)
 $+31\text{H}_2\text{O}$ Very efflorescent and sol in H_2O (Copaux)

Potassium molybdate, $2K_2O, SiO_2, 12MoO_3 + 16H_2O$
 Effloresces Very sol in H_2O (Asch, Z anorg 1901, 282)
 $5K_2O, SiO_2, 12MoO_3 + 14H_2O$ (Asch)
 Sol in H_2O with decomp (Copaux)

Potassium silver molybdate, $K_2O, 3Ag_2O, 2(SiO_2, 12MoO_3) + 14H_2O, + 30H_2O$
 Sol in H_2O with decomp Sol unchanged in dil mol liquor (Copaux, Bull Soc Min 1907, 293)

Rubidium molybdate
 Sol in H_2O

Silver molybdate, $15Ag_2O, SiO_2, 12MoO_3 + 11H_2O$
 Sol in H_2O (Asch)
 $2Ag_2O, SiO_2, 12MoO_3 + 12H_2O$ Decomp by boiling
 $4Ag_2O, SiO_2, 12MoO_3 + 15H_2O$ (Asch)

Sodium molybdate, $2Na_2O, SiO_2, 12MoO_3 + 14H_2O$
 (Copaux)
 $2Na_2O, SiO_2, 12MoO_3 + 21H_2O$ Very sol in H_2O Efflorescent (Asch)
 $+ 22H_2O$ (Copaux)
 $15Na_2O, SiO_2, 12MoO_3 + 17H_2O$ (Asch)
 $3Na_2O, SiO_2, 12MoO_3 + 17H_2O$ (Copaux)

Strontium molybdate, $2SrO, SiO_2, 12MoO_3 + 26H_2O$
 (Copaux)

Zinc molybdate, $2ZnO, SiO_2, 12MoO_3 + 31H_2O$
 Extreme sol in H_2O (Copaux)

Silicon, S

Amorphous Insol in H_2O Sol before igniting in old HF Insol in other mineral acids and uregia Sol in conc KOH + Aq When amorphous Si is ignited, it becomes insol in H_2O and KOH + Aq

Amorphous Si is sol in aqua regia and in a mixture of HNO_3 and HF (Vigouroux-Moissan, C R 1895, 120 367)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 674)

Insol in liquid NH_3 (Gore, Am Ch J 1898 20 0)

Graphite Sol in $HNO_3 + HF$ (Berzelius, A 247)

Crystalline Insol in all acids, except a mixture of conc KOH and HNO_3 Sol in moderately + Aq even when cold (Deville)

Although it has been generally understood that crystallized Si is not attacked by HF, and that this applies only to HF +

Aq Gaseous HF readily attacks cryst Si (Newth, C N 1896, 72 287)

Si cryst from Ag is incompletely sol in HF According to the temp to which the Ag Si mixture has been heated, the following percentages of Si are dissolved in HF 970°, 58.02%, 1150°, 27.66%, 1250°, 19%, 1470°, 16% (Moissan and Siemens, C R 1904, 138 657, 1300)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Silicon amide, $Si(NH_2)_4$

Unstable, decomp by H_2O and partially decomp by HNO_3 , sol in most organic solvents (Lengfeld, Am Ch J 1899, 21 531)

Decomp by H_2O , insol in liquid NH_3 (Vigouroux, C R 1903, 136 1670)

Silicon triboride, SiB_3

Slowly attacked by HNO_3 Decomp by hot conc H_2SO_4 or fused KOH (Moissan, C R 1900, 131 142)

Silicon hexaboride, SiB_6

Readily attacked by HNO_3 Slowly decomp by hot conc H_2SO_4 Not attacked by fused KOH (Moissan, C R 1900, 131 142)

Silicon tribromide, Si_2Br_6

Decomp by KOH + Aq (Friedel and Ladenburg, A 203 253)

$HSiBr_3$ See Silicobromoform

Silicon tetrabromide, $SiBr_4$

Rapidly decomp by H_2O , decomp in several days by H_2SO_4 (Friedel and Ladenburg, A 147 362)

Silicon bromide, Si_3Br_8

(Besson, C R 1910, 151 1056)

Si_4Br_{10} (Besson)

Disilicon hydrogen pentabromide, $HSiBr_5$ or Si_2Br_5 (?)

Decomp by H_2O (Mahn, Zeit Chem (2) 5 279)

Silicon tetrabromide ammonia, $SiBr_4, 6NH_3$

Decomp by H_2O (Lav, Dissert 1910)
 $SiBr_4, 7NH_3$ Decomp by H_2O (Besson C R 110 240)

Silicon bromiodide, $SiBr_3I$

Decomp by H_2O Sol in CS (Friedel, B 2 60)

$SiBr_2I_2$ As above (F)

$SiBrI_3$ As above (F)

Silicon bromosulphide, $SiSBr_2$

Decomp in moist air Violently decomp by H_2O Sol in CS and other organic solvents (Blx, B 1903, 36 4218)

Silicon carbide, SiC

Very stable, insol in H_2SO_4 and HNO_3 , sol in fused KOH at red heat (Moissan, Bull Soc 1894, (3) 11 997)

Cryst modification Insol in acids, sol in fused alkalis (Moissan, C R 1893, 117 427)

Insol in all acids, sol in molten alkalis (Muhlhaeuser, Z anorg 1894, 5 116)

See *Silundum*

Silicon subchloride, SiCl_2 (?)

Decomp by H_2O (Troost and Hautefeuille, A ch (5) 7 463)

Silicon trichloride, Si_2Cl_6

Decomp by H_2O and alkalis (Troost and Hautefeuille A ch (5) 7 459)

SiHCl_3 See *Silicochloroform*

Silicon tetrachloride, SiCl_4

Decomp by H_2O and alcohol

Silicon octochloride, $\text{Si}_8\text{Cl}_{18}$

"Perchlorsilicopropane" Decomp by H_2O (Gattermann, B 1894, 27 1947)

36)
cobutane" Decomp
air (Besson)
cohexane" Decomp
1909, 148 841)

Silicon trichloride ammonia, $\text{Si}_2\text{Cl}_6, 5\text{NH}_3$

Slowly decomp by H_2O (Besson, C R 110 516)

Silicon tetrachloride ammonia, $\text{SiCl}_4, 6\text{NH}_3$

Decomp by H_2O (Persoz, A ch 44 319)

Silicon tetrachloride hydrazine, $\text{SiCl}_4, 4\text{N}_2\text{H}_4$

Extremely hygroscopic and quickly decomp by H_2O (Lay, Dissert 1910)

Silicon chlorobromide, SiCl_3Br

Decomp by H_2O (Friedel and Ladenburg, A 145 187)

SiCl_2Br_2 As above (Friedel and Ladenburg)

SiBr_3Cl Decomp by H_2O (Reynolds, Chem Soc 51 590)

Silicon chlorobromide ammonia, $2\text{SiCl}_3\text{Br}, 11\text{NH}_3$

Decomp by H_2O (Besson, C R 112 788)
 $\text{SiCl}_2\text{Br}_2, 5\text{NH}_3$ As above (B)
 $2\text{SiClBr}_3, 11\text{NH}_3$ As above (B)

Silicon chlorohydrosulphide, SiCl_3SH

Decomp by H_2O or alcohol (Pierre, A ch (3) 24 286)

Silicon chloriodide, SiCl_3I

Decomp by H_2O (Besson, C R 112 611)

SiCl_2I_2 As above (B)

SiClI_3 As above (B)

Silver chloriodide ammonia, $2\text{SiCl}_3\text{I}, 11\text{NH}_3$ (Besson)

$\text{SiCl}_2\text{I}_2, 5\text{NH}_3$

Silicon chloronitride, $\text{Si}_3\text{N}_6\text{Cl}_2$

(Schutzenberger, C R 92 1508)

Silicon chlorosulphide, $\text{Si}_2\text{Cl}_2\text{S}_2$

Decomp violently by H_2O Sol in CCl_4 (Besson, C R 113 1040)

Si_2SiCl_2 Violently decomp by H_2O , sol in CS_2 (Blax, B 1903, 36 4223)

Silicon difluoride, SiF_2 (?)

Decomp by H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ (Troost and Hautefeuille, A ch (5) 7 464)

Silicon tetrafluoride, SiF_4

Abundantly absorbed by H_2O with decomp
100 pts H_2O absorb 140 6 pts SiF_4 in 24 hours (Berzelius), 124 1 pts SiF_4 in 24 hours (Davy)

Absorbed abundantly by $\text{HNO}_3 + \text{Aq}$ (Kuhlmann, A 39 319)

Absorbed abundantly by alcohol, without separation of silicic acid, if the alcohol contains less than 8% of water

Sol in conc $\text{HF} + \text{Aq}$ Absorbed by ether
Sl sol in naptha, and oil of turpentine

Silicon hydrogen fluoride, H_2SiF_6

See *Fluosilicic acid*

Silicon fluoride with MF

See *Fluosilicate, M*

Silicon fluoride ammonia, $\text{SiF}_4, 2\text{NH}_3$

Decomp by H_2O (Davy)

Silicon hydride, SiH_4

Insol in H_2O Decomp by $\text{KOH} + \text{Aq}$
Not changed by $\text{NH}_4\text{OH} + \text{Aq}$, $\text{H}_2\text{SO}_4 + \text{Aq}$, or $\text{HCl} + \text{Aq}$

Si_2H_2 "Silicoacetylene"
Sol in 20% $\text{NaOH} + \text{Aq}$ with evolution of H_2 (Bradlev, C N 1900, 82 149)

Si_2H_6 "Silicoethane" (Lcbrau, C R 1909, 148 44)

Sl sol in H_2O Best solvent is ethyl orthosilicate (Moissan, Bull Soc 1903, (2) 29 443)

Silicon nitrogen hydride, SiHN

Decomp by H_2O and NaOH (Ruff, B 1905, 38 2241)

Silicon hydride , $\text{SiO}_2, x\text{H}_2\text{O}$ <i>See Silicic acid</i> $\text{Si}_2\text{H}_2\text{O}_4$ <i>See Silicooxalic acid</i> $\text{Si}_2\text{H}_2\text{O}_3$ <i>See Silicoformic anhydride</i> $\text{Si}_4\text{H}_4\text{O}_3$ <i>See Silicene</i>	Not decomposed by H_2O Sol in hot alkalis + Aq with decomp (Blx, B 1903, 36 4227)
Silicon imide , $(\text{Si}(\text{NH})_2)$ Decomp by H_2O (Vigouroux, C R 1903, 136 571)	Silicon suboxide , Si_3O_2 (Honigschmid, M 1909, 30 509)
Silicon diamide , $\text{Si}(\text{NH})_2$ Decomp by H_2O with evolution of much heat (Blx B 1903, 36 4224)	Silicon monoxide , SiO Much less easily sol in $\text{HF} + \text{Aq}$ but more easily sol in alkalis + Aq than SiO_2 (Potter, C C 1907, II 1952)
Silicon imide hydrochloride , $\text{Si}(\text{NH}_2)_2, 2\text{HCl}$ Rather stable in air (Blx, B 1903, 36 4225)	Silicon dioxide , SiO_2 <i>See also Silicic acid</i> (a) <i>Crystalline</i> Min <i>Quartz, Tridymite</i> Insol in H_2O , and acids, except HF Sl sol in boiling $\text{K CO}_3 + \text{Aq}$, and $\text{KOH} + \text{Aq}$, see below Insol in cold $\text{KOH} + \text{Aq}$, extremely slowly sol in boiling $\text{KOH} + \text{Aq}$ (Fuchs) Sol in HF with formation of SiF_4 and H_2O Insol in sugar + Aq, contrary to assertion of Verdel and Rissler (Petzholdt, J pr 60 368) (b) <i>Amorphous</i> Min <i>Opal</i> , etc Insol in H_2O , and acids except HF 100 pts H_2O containing CO dissolve 0 078 pt amorphous SiO_2 (Maschke), 0 0136 pt (Struckmann) 100 pts cold $\text{HCl} + \text{Aq}$ of 1 088 sp gr dissolve 0 017 pt SiO (Struckmann) 100 pts $\text{HCl} + \text{Aq}$ of 1 115 sp gr dissolve in the cold 0 009 pt SiO , and 0 018 pt on boiling 100 pts $\text{NH}_4\text{OH} + \text{Aq}$ (containing 10% NH_3) dissolve 0 017 pt quartz and 0 38 pt ignited SiO_2 (Pribram, Z anal 6 119) Sol in boiling K CO_3 or $\text{Na CO}_3 + \text{Aq}$, separating out on cooling as a gelatinous mass (Pfaff, Schw J 29 383) The different forms of SiO have different degrees of solubility in $\text{K}_2\text{CO}_3 + \text{Aq}$ Unignited amorphous SiO from SiF_4 dissolves most readily, then come opal, ignited amorphous SiO , fused SiO , and tridymite, quartz powder is the most difficultly soluble (Rose) A similar behaviour is shown to $\text{KOH} + \text{Aq}$ Opal is much more sol in $\text{KOH} + \text{Aq}$ than quartz, and hyalite is the least sol of the varieties of opal (Fuchs) Opal is easily sol in $\text{KOH} + \text{Aq}$ even after ignition (Schaffgotsch, Pogg 68 147) Rammelsberg (Pogg 112 177) made the following experiments on the solubility of SiO in $\text{KOH} + \text{Aq}$ The $\text{KOH} + \text{Aq}$ used contained 1 pt KOH to 5 pts H_2O 1 pt of the powdered mineral was boiled half an hour in a silver dish with such an amount of the $\text{KOH} + \text{Aq}$ that 20 pts KOH were present 7 75% of milky white quartz was dissolved by repeating the above process three times 12 8-15% of gray hornstone was dissolved by twice boiling, 2 43% of moderately finely powdered agate of 2 661 sp gr was dissolved by once boiling, 9 7% of unignited hyalite remained undissolved after thrice boiling,
Silicon diiodide , SiI_2 Insol in CS_2 , CHCl_3 , C_6H_6 , and SiCl_4 (Friedel and Ladenburg, A 203 247)	
Silicon triiodide , SiI_3 Decomp with H_2O even at 0° 100 pts SiI_3 dissolve 19 pts SiI_3 at 19° , 26 pts SiI_3 at 27° (Friedel and Ladenburg, Bull Soc 12 92) HSiI_3 <i>See Silicoiodideform</i>	
Silicon tetraiodide , SiI_4 Decomp by H_2O Acts on alcohol and ether 1 pt C_2 dissolves 2 2 pts SiI_4 at 27° (Friedel, Z 149 96)	
Silicon nitride , Si_3N_4 Partial decomp by boiling with conc H_2SO_4 Not attacked by dil acids with the exception of HCl Decomp by HF Partial decomp by boiling with alkalis + Aq (Weiss, Z anorg 1910, 65 89) Si_2N_3 Partially decomp by boiling with conc H_2SO_4 Not attacked by dil acids with the exception of HCl Decomp by HF Partial decomp by boiling with alkalis + Aq (Weiss, Z anorg 1910, 65 89) Si_3N_4 Not attacked by H_2O Partial decomp by boiling with conc H_2SO_4 Not attacked by dil acids with the exception of HCl Decomp by HF Partial decomp by boiling with alkalis + Aq (Weiss, Z anorg 1910, 65 89)	
Silicon nitride , $\text{Si}_3\text{N}_4\text{H}$ "Silicic" Sol in HF , and rapidly in $\text{KOH} + \text{Aq}$ (Schulze, C R 92 1508) Decomp by cold, more rapidly by hot H_2O and more rapidly by alkalis Sol in $\text{HF} + \text{Aq}$ Not attacked by HNO_3 Decomp by conc I_2SO_4 (Lay, Dissert 1910)	

21% of ignited hyalite remained undissolved after thrice boiling, 7.21% of semi-opal of 2101 sp gr remained undissolved after thrice boiling, 18.5-19.2% of impure semi-opal of 2101 sp gr remained undissolved after thrice boiling, 79.9% of chalcedony of 2624 sp gr remained undissolved after thrice boiling, 6.12% of chalcedony of 2567 sp gr remained undissolved after fourth boiling, 14.4% chrysoprase of 2623 sp gr remained undissolved after once boiling, 49.41% of chrysoprase of 2635 sp gr remained undissolved after thrice boiling, 6.62% of flint of 2606 sp gr remained undissolved after twice boiling, 38.1% of fire-opal of 2625 sp gr remained undissolved after fourth boiling, 26.6% of fire-opal of 2625 sp gr remained undissolved after fifth boiling

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Insol in acetone (Naumann, B 1904, 37 4329)

The solubility of crystals of quartz on different faces in HF has been determined by Lebrun (Belg Acad Bull 1913, 953)

Silicon thorium oxide

See Silicate, thorium

Silicon zirconium oxide

See Silicate, zirconium

Silicon oxychloride, Si_2OCl_6

Decomp by H_2O and alcohol Miscible with CS_2 , SiCl_4 , CCl_4 , CHCl_3 , or ether (Friedel and Ladenburg, A 147 355)

$\text{Si}_4\text{O}_3\text{Cl}_{10}$, $\text{Si}_4\text{O}_4\text{Cl}_8$, $\text{Si}_5\text{O}_{10}\text{Cl}_{12}$, $(\text{Si}_2\text{O}_3\text{Cl}_2)_n$, $\text{Si}_4\text{O}_7\text{Cl}_2$ Sol in above oxychlorides (Troost and Hautefeuille, Bull Soc (2) 35 360)

Silicon oxyfluorhydride, $\text{Si}_3\text{O}_3\text{F}^{\text{OH}}$

(Landolt, A Suppl 4 27)

Silicon selenide, SiSe_2

Decomp by H_2O or $\text{KOH} + \text{Aq}$ (Sabatier, C R 113 132)

Silicon sulphide, SiS_2

Sol in H_2O with decomp Acts on alcohol or ether in the cold (Fremy, A ch (3) 38 314)

SiS Decomp by H_2O , easily sol in dil alkalis (Schutzenberger, Bull Soc (2) 38 56)

Silicon sulphodiamide, $\text{SiS}(\text{NH}_2)_2$

Slowly decomp in the air Insol in cold liquid NH_3 (Blix, B 1903, 36 4219)

Silicon sulphobromide

See Silicon bromosulphide

Silicon sulphochloride

See Silicon chlorosulphide

Silicon sulphourea, $\text{SiS}(\text{NH}_2)_2$

Slowly decomp in air

Decomp by H_2O

Insol in cold liquid NH_3 (Blix, B 1903, 36 4219)

Silicone, $\text{Si}_4\text{H}_4\text{O}_3$

Insol in H_2O , but gives off hydrogen when warmed therewith Not attacked by chlorine or nitric or sulphuric acids even on heating, but is gradually sol in HF Decomp by alkalis, even by the most dil $\text{NH}_4\text{OH} + \text{Aq}$, with greatest violence and evolution of heat and hydrogen gas Insol in alcohol, SiCl_4 , PCl_3 , or CS_2 (Wohler, A 127 257)

$\text{H}_3\text{Si}_2\text{O}_2$ Decomp by H_2O and by dil acids Violently decomp by fuming HNO_3 Not attacked by conc H_2SO_4 Very slowly decomp by conc HCl , rapidly by alkalis + Aq and by pyridine (Hofschmidt, M 1909, 30 509)

Insol in H_2O , alcohol SiCl_4 , PCl_3 , and CS_2 Not attacked by acids except HF (Donath and Liesner, C C 1909, II 1707)

$\text{H}_{12}\text{Si}_{10}\text{O}_8$ Scarcely attacked by acids, but easily decomp by hot H_2O , $\text{NaOH} + \text{Aq}$ etc but not by $\text{NH}_4\text{OH} + \text{Aq}$ (Kolb, Z anorg 1909, 64, 353)

$\text{H}_{10}\text{Si}_{10}\text{O}_8$ (Kolb)

$\text{H}_8\text{Si}_8\text{O}_{13}$ As $\text{H}_{12}\text{Si}_{10}\text{O}_8$ (Kolb)

Silicomesoxalic acid, $\text{Si}(\text{OH})_2(\text{SiO OH})_2$

Insol in cold H_2O , decomp by hot H_2O (Gattermann, B 1899, 32 1116)

Silicooxalic acid, $\text{Si}_2\text{H}_2\text{O}_4 = \text{Si}_2\text{O}_2(\text{OH})_2$

Decomp by bases with evolution of hydrogen Takes up HNO_3 to form compound, but not HCl or H_2SO_4 (Troost and Hautefeuille, A ch (5) 7 463)

Silicophosphoric acid, $\text{SiO}_2, \text{P}_2\text{O}_5$

Slowly decomp by H_2O Unchanged by alcohol Exists also in two modifications which are not attacked by H_2O (Hautefeuille and Margottet, C R 99 789)

$\text{SiO}_2, 2\text{P O}_5 + 4\text{H}_2\text{O}$ Decomp by moist air Sol in H_2O at 0° , but decomp by warming to ordinary temp (Hautefeuille and Margottet, C R 104 56)

Calcium silicophosphate

See Phosphate silicate, calcium

Silicostannic acid

Calcium silicostannate, $\text{Ca}(\text{Si}, \text{Sn})\text{O}_3$

Not attacked by acids, KHSO_4 , or alkalis + Aq (Bourgeois, Bull Soc (2) 47 297)

Silicodectungstic acid, $H_5W_{10}SiO_{36} + 3H_2O$
 Somewhat soluble in H_2O , but usually separates out as a precipitate (Marignac, A ch (4) 3 5)
 See also **silicododecungstic acid**

Ammonium silicodectungstate, $(NH_4)_5W_{10}SiO_{36} + 8H_2O$
 Sol in 5 pts H_2O at 18° Very sol in hot H_2O (Marignac, A ch (4) 3 5a)
 $(NH_4)_5W_{10}SiO_{36} + 9H_2O$ (Marignac)

Ammonium potassium —, $(NH_4)_4K_4HSiW_{10}O_{36} + 15H_2O$
 (Marignac)

Barium —, $Ba_4SiW_{10}O_{36} + 22H_2O$
 Precipitate Insol in H_2O (Marignac)

Potassium —, $K_8SiW_{10}O_{36} + 17H_2O$
 Sol in H_2O (Marignac)
 $K_4H_4Si_{10}O_{36} + 8H_2O$ Sol in H_2O (Marignac)

Potassium — **silicotungstate** (?), $K_8Si_{11}O_{36} + 14H_2O$
 $K_4H_4Si_{11}O_{36} + 10H_2O$ (Marignac)

Silver —, $Ag_8W_{10}SiO_{36} + 3H_2O$
 Not appreciably sol in cold H_2O (Marignac, A ch (4) 3 65)

Silicotungstic acid or Silicododecungstic acid, $H_5SiW_{12}O_{42}$
 $(H_4SiW_{12}O_{40})$, according to Copaux (Bull Soc 1906 (4) 3 101)
 Behaves with ether as the acid with $22H_2O$ (Marignac, A ch (4) 3 10)
 + $22H_2O$ Solubility as acid with $29H_2O$
 100 pt deliquesces with 13 pts ether. To this mixture 20–25 pts of ether can be added, after which a quantity no longer mixes with, but floats above the mixture. The etheral solution is miscible with H_2O . Ether is taken up by the saturated aqueous solution with evolution of heat, until the volume has become doubled, whereafter the ether floats on the mixture. By warming the latter a liquid separates out which forms a layer between the two original layers. A alcoholic solution of the acid mixes with an equal vol of ether, but on adding more ether a conc etheral solution separates as a syrupy layer (Marignac, A ch (4) 3 10)
 + $29H_2O$ Efflorescent Sol in H_2O Saturated solution at 18° contains 1 pt crystallized acid to 0.104 pt H_2O , and has 2.843 sp gr. Melts in crystal H_2O . Easily sol in absolute alcohol and anhydrous ether
 + xH_2O (Drechsel, B 1887, 20 1452)

Aluminum silicotungstate, $Al_4H_{12}(SiW_{12}O_{42})_3 + 75H_2O$
 Not deliquescent, very sol in H_2O (Marignac)
 $Al_4(SiW_{12}O_{40})_3 + 60H_2O$ (Wyruboff)
 Chem Soc 1897, 72, (2) 174)
 + $87H_2O$ (Wyruboff)
 + $93H_2O$ Very efflorescent (Wyruboff)

Aluminum ammonium —, $Al_4(NH_4)_{18}(SiW_{12}O_{42})_3 + 75H_2O$
 Sol in H_2O (Marignac)

Ammonium —, basic, $(NH_4)_4SiW_{12}O_{40} + 4NH_4OH + 14H_2O$
 (Wyruboff, Chem Soc 1897, 72 (2) 174)

Ammonium —, $(NH_4)_8SiW_{12}O_{42} + 16H_2O$
 Very sol in hot H_2O (Marignac, A ch (4) 3 17)
 $(NH_4)_4H_4SiW_{12}O_{42} + 6H_2O$ Less soluble in H_2O than the preceding salt (Marignac)
 $(NH_4)_4SiW_{12}O_{40} + 8H_2O$ (Wyruboff, Chem Soc 1897, 72 (2) 174)

Barium —, $Ba_2H_4SiW_{12}O_{42} + 14H_2O$
 Sol in H_2O
 + $22H_2O$ Gradually efflorescent (Marignac)
 Sol in cold H_2O , 1.07 pts (Copaux, Bull Soc Min 1906, 29 80)
 Sol in 4 pts cold H_2O (Wyruboff, Bull Soc Min 1896, 19 278)
 $Ba_4SiW_{12}O_{42} + 27H_2O$ Nearly insol in cold, sl sol in hot H_2O (Marignac)
 $Ba_2SiW_{12}O_{40} + 16H_2O$ (Wyruboff)

Barium potassium —, $Ba_2K_2SiW_{12}O_{40} + 17H_2O$
 (Wyruboff, Chem Soc 1897, 72 (2) 176)

Barium sodium —, $Na_2Ba_2SiW_{12}O_{40} + 28H_2O$
 H_2O gradually dissolves out sodium silicotungstate

Cadmium —, $Cd_2SiW_{12}O_{40} + 23H_2O$, and + $27H_2O$
 (Wyruboff)
 $4CdO, 3(SiO_2, 12WO_3) + 4H_2O$ (Wyruboff)

Cæsium —, $Cs_8SiW_{12}O_{42}$
 100 pts H_2O dissolve only 0.005 pt at 20° , 0.52 pt at 100°
 Completely insol in alcohol, and $HCl + Aq$
 Somewhat sol in dil $NH_4OH + Aq$ (Godefroy, B 9 1363)

Cadmium hydrogen —, $2Cd_2SiW_{12}O_{40}, H_4SiW_{12}O_{40} + 42H_2O$
 (Wyruboff)

Calcium silicotungstate, $\text{Ca}_2\text{H}_4\text{SiW}_{12}\text{O}_{42} + 20\text{H}_2\text{O}$

Not deliquescent Extremely easily sol in H_2O (Marignac)
 $\text{Ca}_2\text{SiW}_{12}\text{O}_{40} + 18, 24 \text{ and } 27\text{H}_2\text{O}$ (Wyruboff)

Calcium silicotungstate nitrate, $\text{Ca}_2\text{SiW}_{12}\text{O}_{40}$,
 $\text{Ca}(\text{NO}_3)_2 + 15\text{H}_2\text{O}$
 (Wyruboff)

Cerous —, $\text{Ce}_2\text{SiW}_{12}\text{O}_{40} + 27\text{H}_2\text{O}$
 (Wyruboff)
 $\text{Ce}_2\text{SiW}_{12}\text{O}_{40}$, $\text{CeH}_2\text{SiW}_{12}\text{O}_{40} + 34\text{H}_2\text{O}$
 (Wyruboff)

Chromium —, $\text{Cr}_4(\text{SiW}_{12}\text{O}_{40})_3 + 60, 87 \text{ and } 93\text{H}_2\text{O}$
 (Wyruboff)

Cupric —, $\text{Cu}_2\text{SiW}_{12}\text{O}_{40} + 18, 27 \text{ and } 29\text{H}_2\text{O}$
 Very efflorescent (Wyruboff)

Didymium —, $\text{D}_{12}\text{SiW}_{12}\text{O}_{40} + 26 \text{ and } 27\text{H}_2\text{O}$
 (Wyruboff)
 $\text{D}_{12}\text{SiW}_{12}\text{O}_{40}$, $\text{D}_1\text{H}_2\text{SiW}_{12}\text{O}_{40} + 34\text{H}_2\text{O}$
 (Wyruboff)

Gallium —, $\text{Ga}_4(\text{SiW}_{12}\text{O}_{40})_3 + 60, 87, \text{ and } 93\text{H}_2\text{O}$
 (Wyruboff)
 $\text{Ga}_4(\text{SiW}_{12}\text{O}_{40})_3 + 45, 87 \text{ and } 93\text{H}_2\text{O}$
 (Wyruboff)

Indium —, In_2O_3 , H_2O , $2(\text{SiO}_2, 12\text{WO}_3) + 40\text{H}_2\text{O}$
 (Wyruboff)
 $2\text{In}_2\text{O}_3$, $3(\text{SiO}_2, 12\text{WO}_3) + 63 \text{ and } 93\text{H}_2\text{O}$
 (Wyruboff)

Iron (ferric) —, $\text{Fe}_4(\text{SiW}_{12}\text{O}_{40})_3 + 60 \text{ and } 93\text{H}_2\text{O}$
 (Wyruboff)

Lanthanum —, $\text{La}_2\text{SiW}_{12}\text{O}_{40} + 27\text{H}_2\text{O}$
 Efflorescent (Wyruboff)
 $\text{La}_2\text{SiW}_{12}\text{O}_{40}$, $\text{LaH}_2\text{SiW}_{12}\text{O}_{40} + 34\text{H}_2\text{O}$
 (Wyruboff)

Lead —, **basic**, $\text{Pb}_2\text{SiW}_{12}\text{O}_{40}$, $2\text{PbO} + 20\text{H}_2\text{O}$
 Sl sol in H_2O (Wyruboff)

Lead —, $\text{Pb}_2\text{SiW}_{12}\text{O}_{40} + 21\text{H}_2\text{O}$
 Sol in H_2O (Wyruboff)

Lithium —, Li_2O , SiO_2 , $12\text{WO}_3 + 14 \text{ and } 24\text{H}_2\text{O}$
 (Wyruboff)

Magnesium —, $\text{Mg}_2\text{H}_4\text{SiW}_{12}\text{O}_{42} + 16\text{H}_2\text{O}$
 Stable on the air (Marignac)

Mercurous silicotungstate, basic,
 $\text{Hg}_4\text{SiW}_{12}\text{O}_{40}$, $2\text{Hg}_2\text{O} + 5\text{H}_2\text{O}$

Insol in H_2O Insol in dil HNO_3 Slowly sol in conc warm HNO_3 (Wyruboff)

Mercurous —, $\text{Hg}_2\text{SiW}_{12}\text{O}_{42}$

Insol in H_2O Scarcely sol in dil $\text{HNO}_3 + \text{Aq}$ (Marignac, A ch (4) 3 43)

Mercuric —, $\text{Hg}_2\text{SiW}_{12}\text{O}_{40} + 15\text{H}_2\text{O}$

Very sol in H_2O Solution decomp on boiling (Wyruboff)

Potassium —, **basic**, $\text{K}_4\text{SiW}_{12}\text{O}_{40}$, $4\text{KOH} + 12\text{H}_2\text{O}$
 1 pt is sol in 10 pts H_2O at 18° (Wyruboff)

Potassium —, $\text{K}_3\text{SiW}_{12}\text{O}_{42} + 14\text{H}_2\text{O}$

Sol in 10 pts H_2O at 18° , and less than 3 pts at 100° (Marignac)
 $+ 20\text{H}_2\text{O}$ Much less sol in cold than hot H_2O Extremely sol in hot H_2O More sol than above comp (Marignac)
 $\text{K}_4\text{H}_4\text{SiW}_{12}\text{O}_{42} + 7\text{H}_2\text{O}$ Solubility as preceding salt

$\text{K}_4\text{H}_4\text{SiW}_{12}\text{O}_{42} + 16\text{H}_2\text{O}$ Sol in 3 pts H_2O at 20°

$\text{K}_6\text{H}_{10}(\text{SiW}_{12}\text{O}_{42})_2 + 25\text{H}_2\text{O}$ Decomp by dissolving in H_2O (Marignac)

$\text{K}_4\text{SiW}_{12}\text{O}_{40} + 6 \text{ and } 15\text{H}_2\text{O}$ (Wyruboff)
 $\text{K}_4\text{SiW}_{12}\text{O}_{40}$, $\text{K}_2\text{H}_2\text{SiW}_{12}\text{O}_{40} + 29\text{H}_2\text{O}$
 (Wyruboff)

Rubidium —, $\text{Rb}_3\text{SiW}_{12}\text{O}_{42}$

Sol in 145–150 pts H_2O at 20° and in 19–20 pts at 100° Insol in alcohol, difficultly sol in acidified, but extremely easily in ammoniacal H_2O (Godeffroy, B 9 1363)

$\text{Rb}_2\text{H}_2\text{SiW}_{12}\text{O}_{40} + 5\text{H}_2\text{O}$ (Wyruboff)
 $\text{Rb}_4\text{SiW}_{12}\text{O}_{40}$, $\text{Rb}_2\text{H}_2\text{SiW}_{10}\text{O}_{40} + 22\text{H}_2\text{O}$
 (Wyruboff)

Silver —, $\text{Ag}_4\text{H}_4\text{SiW}_{12}\text{O}_{42} + 7\text{H}_2\text{O}$

Very sl sol in H_2O , sol in dil $\text{HNO}_3 + \text{Aq}$ (Marignac)
 Sl sol in H_2O (Wyruboff)

Sodium —, **basic**, $\text{Na}_{14}\text{SiW}_{12}\text{O}_{40}$, $4\text{NaOH} + 5\text{H}_2\text{O}$
 (Wyruboff)

Sodium —, $\text{Na}_8\text{SiW}_{12}\text{O}_{42} + 7\text{H}_2\text{O}$

The saturated solution at 19° contains 0.21 pt H_2O to 1 pt of the salt dried at 100° , and has sp gr = 3.05 (Marignac)

$\text{Na}_4\text{H}_4\text{SiW}_{12}\text{O}_{42} + 11\text{H}_2\text{O}$ Stable on air
 $+ 18\text{H}_2\text{O}$ Efflorescent (Marignac)
 $\text{Na}_2\text{H}_2\text{SiW}_{12}\text{O}_{42} + 14\text{H}_2\text{O}$ Decomp by dissolving in H_2O (Marignac)
 $\text{Na}_4\text{SiW}_{12}\text{O}_{40} + 14, 16 \text{ and } 20\text{H}_2\text{O}$ (Wyruboff)

- Sodium silicotungstate nitrate**,
 $3\text{Na}_2\text{SiW}_{12}\text{O}_{42} \cdot 4\text{NaNO}_3 + 39\text{H}_2\text{O}$
 Slightly liquescent (Marignac)
- Strontium** —, $\text{Sr}_2\text{SiW}_{12}\text{O}_{40} + 16, 17, 23$ and $27\text{H}_2\text{O}$
 (Wyrout ff)
- Thallium** —, $\text{Tl}_2\text{H}_2\text{SiW}_{12}\text{O}_{40} + 9\text{H}_2\text{O}$
 (Wyrout ff)
- Thorium** —, basic
 Insol in I_2O (Wyroutboff)
- Thorium** —, $\text{Th}_2\text{SiW}_{12}\text{O}_{40} + 27\text{H}_2\text{O}$
 Very sol in H_2O (Wyroutboff)
 $\text{Th}_2\text{SiW}_{12}\text{O}_{40} + 2\text{H}_4\text{SiW}_{10}\text{O}_{40} + 45\text{H}_2\text{O}$
 (Wyroutbo)
- Uranium** —
 Thirteen salts are described by Wyroutboff
- Uranyl** —
 Seven salts are described by Wyroutboff
- Zinc** —, $\text{Zn}_2\text{SiW}_{12}\text{O}_{40} + 18, 27$ and $29\text{H}_2\text{O}$
 (Wyroutboff)

Silicovanadomolybdic acid

- Ammonium silicovanadomolybdate**,
 $3(\text{NH}_4)_2\text{O} \cdot \text{SiO}_2 \cdot \text{V}_2\text{O}_5 \cdot 9\text{MoO}_3 + 20\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.32016 g salt in 1 cc at $18^\circ = 1.21322$ (Friedheim, B 1900, 3 1624)
 $3(\text{NH}_4)_2\text{O} \cdot \text{SiO}_2 \cdot \text{V}_2\text{O}_5 \cdot 10\text{MoO}_3 + 21\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.35026 g of salt in 1 cc at $18^\circ = 1.25275$ (Friedheim)
 $3(\text{NH}_4)_2\text{O} \cdot \text{V}_2\text{O}_5 \cdot \text{SiO}_2 \cdot 11\text{MoO}_3 + 27\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.38086 g salt in 1 cc at $18^\circ = 1.29266$ (Friedheim)
 $3(\text{NH}_4)_2\text{O} \cdot \text{V}_2\text{O}_5 \cdot \text{SiO}_2 \cdot 15\text{MoO}_3 + 24\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.48997 g salt in 1 cc at $18^\circ = 1.43761$ (Friedheim)

- Ammonium potassium** —, $(\text{NH}_4)_2\text{O} \cdot 2\text{K}_2\text{O} \cdot \text{SiO}_2 \cdot 9\text{MoO}_3 + 20\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.24021 g salt in 1 cc at $18^\circ = 1.17031$ (Friedheim)
 $(\text{NH}_4)_2\text{O} \cdot 2\text{K}_2\text{O} \cdot \text{SiO}_2 \cdot \text{V}_2\text{O}_5 \cdot 10\text{MoO}_3 + 21\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.2591 g salt in 1 cc at $18^\circ = 1.19184$ (Friedheim)
 $(\text{NH}_4)_2\text{O} \cdot 2\text{K}_2\text{O} \cdot \text{SiO}_2 \cdot \text{V}_2\text{O}_5 \cdot 11\text{MoO}_3 + 12\text{H}_2\text{O}$
 Sp gr of sat solution containing 0.2791 g salt in 1 cc at $18^\circ = 1.21378$ (Friedheim)

- Ammonium zinc** —, $4(\text{NH}_4)_2\text{O} \cdot 2\text{ZnO} \cdot 2\text{SiO}_2 \cdot 3\text{V}_2\text{O}_5 \cdot 18\text{MoO}_3 + 15\text{H}_2\text{O}$
 Sl sol in H_2O (Blum, Dissert 1904)

Silicovanadiotungstic acid

- Ammonium silicovanadiotungstate**, $3(\text{NH}_4)_2\text{O} \cdot \text{SiO}_2 \cdot \text{V}_2\text{O}_5 \cdot 9\text{WO}_3 + 24\text{H}_2\text{O}$
 Can be cryst from H_2O (Friedheim, B 1902, 35 3244)
 $(\text{NH}_4)_2\text{SiV}_2\text{W}_{10}\text{O}_{40} + 21\text{H}_2\text{O}$ 1 cc of sat solution in H_2O at 17.5° contains 0.6652 g of the hydrated salt Sp gr of this solution = 1.4505 Decomp by conc acid and alkali (Friedheim)

- Ammonium barium potassium** —, $(\text{NH}_4)_2\text{K}_2\text{BaSiV}_2\text{W}_{10}\text{O}_{40} + 25\text{H}_2\text{O}$
 Sl sol in H_2O Decomp by conc acids and alkalis (Friedheim)

- Ammonium potassium** —, $(\text{NH}_4)_2\text{K}_2\text{SiV}_2\text{W}_{10}\text{O}_{40} + 23\text{H}_2\text{O}$
 1 ccm of sat solution at 17.5° contains 0.5072 g of the salt Sp gr of the solution at $20^\circ = 1.3462$ Can be cryst from H_2O Decomp by conc acids and alkalis (Friedheim)

- Barium** —, $\text{Ba}_3\text{SiV}_2\text{W}_{10}\text{O}_{40} + 28\text{H}_2\text{O}$
 1 ccm of the sat solution in H_2O at 17.5° contains 0.0384 g of the salt Sp gr of the solution = 1.0307 Decomp by conc acids and alkalis (Friedheim, B 1902, 35 3245)
 $6\text{BaO} \cdot 2\text{SiO}_2 \cdot 3\text{V}_2\text{O}_5 \cdot 18\text{WO}_3 + 50\text{H}_2\text{O}$
 Sl sol in H_2O (Friedheim)
 $7\text{BaO} \cdot 2\text{SiO}_2 \cdot 3\text{V}_2\text{O}_5 \cdot 18\text{WO}_3 + 83\text{H}_2\text{O}$
 Sl sol in H_2O (Friedheim)

- Potassium** —, $\text{K}_8\text{SiV}_2\text{W}_{10}\text{O}_{40} + 22\text{H}_2\text{O}$
 Sol in H_2O Can be cryst from H_2O without decomp Decomp by conc acids and alkalis (Friedheim)
 $6\text{K}_2\text{O} \cdot 2\text{SiO}_2 \cdot 3\text{V}_2\text{O}_5 \cdot 18\text{WO}_3 + 31\text{H}_2\text{O}$ Sol in H_2O (Friedheim)
 $7\text{K}_2\text{O} \cdot 2\text{SiO}_2 \cdot 3\text{V}_2\text{O}_5 \cdot 18\text{WO}_3 + 42\text{H}_2\text{O}$ Sol in H_2O (Friedheim)

- Sodium** —, $\text{Na}_6\text{SiV}_2\text{W}_{10}\text{O}_{40} + 29\text{H}_2\text{O}$
 Very sol in H_2O Decomp by conc acids and alkalis (Friedheim)

Silundum, Si_2C_y

- Not attacked by hot Cl or conc acids (Amburg, Z Elektrochem 1909, 15 725)

Silver, Ag

- Not attacked by H_2O Absolutely insol in HCl or $\text{HClH}_3\text{O}_2 + \text{Aq}$ (Lea, Sil Am J 144 444) Easily sol in $\text{HNO}_3 + \text{Aq}$ on warming, if not too conc Only a minute trace is dissolved in an hour by cold dil $\text{HNO}_3 + \text{Aq}$ (1 pt $\text{HNO}_3 + \text{Aq}$ of sp gr 1.40 10 pts H_2O) (Lea) Sol in hot conc H_2SO_4 with evolution of SO_2 Sl sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (1 4), but with more dil $\text{H}_2\text{SO}_4 + \text{Aq}$ the different forms of Ag behave differently (Lea)
 Sol in HI + Aq at ordinary temperature

Sol in KI+Aq with access of air Sol in hot KCN+Aq (Christomanos, Z anal 7 301)

Sol in chromic, iodic, chloric and bromic acids Dil H_2SO_4 alone is incapable of dissolving finely divided Ag, and the seeming solvent action is due to the oxygen of the air, oxygen dissolved in the acid, or derived from some external source (Hendrixson, J Am Chem Soc 1903, 25 637)

Boiling H_2SO_4 dissolves pure Ag only when concentration equals 60° B More dil acid dissolves only the impure metal (Pannam, Gazz ch it 1909, 39 (2) 234)

Slowly decomp into AgCl by alkali chlorides+Aq, also by CuCl_2 , etc +Aq

Somewhat sol in NH_4OH +Aq in presence of O (Lea, Sill Am J 144 444)

Sol in KMnO_4 +dil H_2SO_4 +Aq (Friedheim, B 20 2554)

Sol in $\text{Fe}_2(\text{SO}_4)_3$ +Aq, especially on heating, but completely insol in FeSO_4 +Aq (Vogel)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Allotropic forms—(a) Very sol in H_2O Solution is pptd by saline solutions or almost any neutral substance Alkali sulphates, nitrates, and citrates ppt it in a sol form, while MgSO_4 , CuSO_4 , FeSO_4 , NiSO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, $\text{K}_4\text{Fe}(\text{CN})_6$, $\text{Ba}(\text{NO}_3)_2$, and even AgNO_3 +Aq ppt it in an insol form, which, however, may be made sol again by treatment with many substances, as $\text{Na}_2\text{B}_4\text{O}_7$, K_2SO_4 , or Na_2SO_4 +Aq NaNO_2 +Aq ppts the Ag from its solution in a perfectly insol form

(b) The ppt from aqueous solution by salts is sol in NH_4OH +Aq (Lea, Sill Am J 137 476)

Many other allotropic forms exist (Lea) Pure colloidal silver is also sol in alcohol (Schneider, B 25 1164)

Entirely sol in H_2O , even when dry (Schneider, Z anorg 1894, 7 339)

Silver acetylde, Ag_2C_2

Sol in KCN+Aq with evolution of C_2H_2 Decomp by HCl +Aq (Arth, C R 1897, 124 1535)

Silver amide, AgNH_2

Ppt, sol in ammonium salts+Aq and in excess of potassium amide Sol in liquid NH_3 Insol in Ag salts+Aq (Franklin, J Am Chem Soc 1905, 27 833)

Sol in excess of KNH_2 (Franklin, Z anorg 1905, 46 16)

Silver antimonide, Ag_3Sb or Ag_3Sb

Min *Discrasite* Sol in HNO_3 +Aq Ag_3Sb Insol in HCl +Aq, decomp by HNO_3 +Aq (Christoffe)

Silver azoumide, AgN_3

Insol in hot or cold H_2O or dil acids, sol in conc mineral acids Sol in NH_4OH +Aq (Curtaus, B 23 3023)

Silver bromide, AgBr

Insol in H_2O , or H_2O acidulated with HNO_3 , H_2SO_4 , or $\text{HC}_2\text{H}_3\text{O}_2$ between 0° and 33° If flocculent or pulverulent, it is sensibly sol thereon above 33°, but if granular only above 50°, and then very slightly (Stas, A ch (5) 3 289) Ag can be detected as AgBr in 10,000,000 pts H_2O (Stas)

Calculated from the electrical conductivity of AgBr +Aq, AgBr is sol in 1,971,658 pts H_2O at 26°, and 775,400 pts at 38° (Holleman, Z phys Ch 12 133)

By same method Kohlrausch and Rose calculate that 1 l H_2O dissolves 0.4 mg AgBr at 18° (Z phys Ch 12 133)

Solubility in H_2O =0.109 mg per l (Prudhomme, J chim Phys 9 519)

Solubility in H_2O = 6×10^{-7} at 25° (Goodwin, Z phys Ch 1894, 13 645)

Solubility of AgBr in H_2O at 25° equals 8.1×10^{-7} g mols per l (Thiel, Z anorg 1900 24 57)

Aq solution sat at 21.1° contains 0.57 $\times 10^{-6}$ gr equiv per litre (Kohlrausch, C C 1901, II 1299)

1 l H_2O dissolves 0.000137 g AgBr at 25° (Abegg and Cox, Z phys Ch 1903, 46 11)

0.84×10^{-4} g are dissolved per liter of sat solution at 20° (Böttger, Z phys Ch 1903, 46 603)

1 l H_2O dissolves 0.107 mg AgBr at 21° (Kohlrausch, Z phys Ch 1904, 50 356)

3.7 mg AgBr are contained in 1 liter of sat solution at 100° (Böttger, Z phys Ch 1906, 56 93)

1 mg in 1 l of sat solution at 21° (Kohlrausch, Z phys Ch 1908, 64 168)

Solubility in H_2O = 8.8×10^{-7} g mol per litre at 25° (A E Hill, J Am Chem Soc 1908, 30 74)

Boiling H_2O dissolves 0.000003502 of its weight of AgBr HNO_3 +Aq (1% HNO_3) dissolves 0.00000543 of its weight of AgBr at 100° with sl decomposition The solution is pptd by AgNO_3 +Aq or HBr (or MBr) +Aq, but not completely 1 pt of AgBr in solution requires 3 pts of Br as MBr (or HBr), or of Ag as AgNO_3 in order to be wholly precipitated (Stas)

Not attacked by boiling HNO_3 +Aq, sl sol in conc HBr or HCl +Aq (Lowig) Boiling conc H_2SO_4 decomposes it (Balard), hardly acts on it (Dumas), dissolves a small quantity, which is reprecipitated by H_2O (Berzelius)

Very sl sol in dil, easily in conc NH_4OH +Aq 100 pts NH_4OH +Aq (0.986 sp gr) dissolve 0.51 pt AgBr (dried at 100°) at 80°, and about double that amount of freshly pptd AgBr (Pohl, W A B 41 267)

1 g freshly pptd AgBr is sol in 250 ccm 10% NH_4OH +Aq, but insol in an ammonia cal solution of AgCl (Seiner, Pharm J Trans (3) 14 1)

1 g AgBr dissolves in 8779.4 g 5% NH_4OH +Aq (sp gr=0.998) at 12°, and in 288.5 g

10% NH_4Cl (Long, Ga) + Aq (sp gr = 0.96) at 12° ch it 13 87)

Solubility of AgBr in NH_4OH + Aq at 15°
G mols per l

NH_3	AgBr	Sp gr 15.5°
1 085	0 0011	0 9932
2 365	0 0031	0 9853
3 410	0 0050	0 9793
4 590	0 0074	0 9720
5 725	0 0101	0 9655

(Bodlan, r, Z phys Ch 1892, 9 734)

Solubility in NH_4OH + Aq at 0°
10 ccm of the solution contain g NH_3 and mg Ag Br

g NH_3	Mg AgBr	g NH_3	Mg AgBr
0 307	8 0	2 627	106 7
0 488	9 6	3 126	156 8
0 669	17 2	3 389	198 7
0 829	21 2	3 652	266 9
1 151	34 9	3 722	288 8
1 532	55 7	3 770	293 0
1 809	72 2	3 926	289 2
1 953	74 1	3 995	285 0

(Jar, A ch 1899, (7) 17 364)

Solubility of AgBr in NH_4OH + Aq at 25°
G mols per l

NH_3	AgBr	NH_3	AgBr
0 1932	0 00060	1 965	0 00692
0 3849	0 00120	3 024	0 01163
0 7573	0 00223	5 244	0 02443

(Bodlander, nd Fittig, 1902, Z phys Ch 39 597)

Solubility in NH_4OH + Aq at 25°

g at 1°	per l	Mols NH_3 per l
0 00	70	0 450
0 00	59	0 497
0 00	341	0 268
0 00	17	0 273
0 00	391	0 115
0 00	386	0 118
0 00	276	0 0764
0 00	264	0 0777

(Whitney, id Melcher, J Am Chem Soc 1903, 25 79)

Sol in 1 t NH_4Cl + Aq Very sl sol in NH_4 carb, ate, sulphate, or succinate + Aq, and still l s in nitrate (Wittstein) Not very easily sol in $\text{Na}_2\text{S}_2\text{O}_3$ + Aq when suspended in H_2O , and is separated out again by Br + Aq (Field, C N 3 17)

Sol in 1 CN + Aq Sl sol in conc KCl,

KBr, NaCl, NaBr, NH_4Cl , or NH_4Br + Aq, but insol when dilute

Traces only dissolve in alkali nitrates + Aq (Fresenius, Quant Anal)

Abundantly sol in $\text{Hg}(\text{NO}_3)_2$ + Aq 100 ccm H_2O containing 10 ccm normal $\text{Hg}(\text{NO}_3)_2$ + Aq dissolve 0.0383 g AgBr (Stas)

Solubility of AgBr in $\text{Hg}(\text{NO}_3)_2$ + Aq at 25°
G mols per l

$\text{Hg}(\text{NO}_3)_2$ HNO_3	AgBr	$\text{Hg}(\text{NO}_3)_2$ HNO_3	AgBr
1	0 03660	0 025	0 00459
0 10	0 00873	0 0125	0 00329
0 05	0 00639	0 0100	0 00306

HNO_3 was present in all cases, and it was found that there was no difference in solubility of AgBr with concentrations between 0.1N and 2N HNO_3 . Cryst and amorphous AgBr showed the same solubility (Morse, Z phys Ch 1902, 45 708)

Difficultly sol in hot conc AgNO_3 + Aq (Risse, A 111 39)

100 ccm of a 3-N solution of AgNO_3 dissolve 0.04 g AgBr at 25°. Much less sol in AgNO_3 + Aq than AgI (Hellwig, Z, anorg 1900, 25 176)

Solubility in AgNO_3 + Aq

Volumetric measurements

AgNO ₃	N/10 KBr ccm	Opal escent at	G AgBr retained per 100 g AgNO ₃
10 g made up to 32 g per 100 g of solution	0 65	22°	0 129
	0 72	35	0 144
	0 8	44	0 159
	0 9	62	0 178
	1 0	67	0 188
	1 1	77	0 207
10 g made up to 70 g per 100 g of solution	1 2	79	0 226
	6 0	37	1 13
	8 0	53	1 50
	10 0	67	1 88
	11 25	72	2 12
	12 0	74	2 26
	12 75	79	2 40
	13 5	82	2 54
	15 5	85 5	2 92
	17 5	90	3 29

Gravimetric measurements at 14.5

G AgNO ₃	ccm H ₂ O	Strength of AgNO ₃ %	G AgBr re- tained per 100 g AgNO ₃
7 326	9 32	44	0 144
8 290	7 65	52	0 185
7 255	4 84	60	0 283
7 35	3 95	65	0 365

(Lowry, Roy Soc Proc 1914, 91 A, 65)

100 g KBr in conc KBr+*Aq* dissolve 3019 mg AgBr at 15°, 95 g NaCl+10 g KBr dissolve only 75 mg AgBr at 15° (Schierholz, W A B 101, 2b 4)

Solubility in KBr+*Aq* at 25°

Mol KBr in 1 litre	G AgBr in 1 litre
4 864	26 44
4 44	17 95
4 18	13 50
3 68	7 50
2 81	2 34
2 76	2 20

(Hellwig, Z anorg 1900, 25 183)

Sol in conc KBr or NaBr+*Aq* (Lowig), but less than AgI in KI+*Aq* (Field)

100 g NaCl in conc NaCl+*Aq* dissolve 474 mg AgBr at 15°, 100 g NaCl in 21% NaCl+*Aq* dissolve 188 mg AgBr at 15° (Schierholz, W A B 101, 2b 4)

Solubility of AgBr in Na₂SO₃+*Aq* at 25° G formula weights per l

So ₃	Ag	So ₃	Ag
0 232	0 0025	0 466	0 0053
0 406	0 0023	0 474	0 0055
0 448	0 0023	0 675	0 0084

(Luther and Leubner, Z anorg 1912, 74 393)

Solubility of AgBr in Na₂SO₃ at (?)° (g salts per l of solution)

Na ₂ SO ₃	AgBr	Na ₂ SO ₃	AgBr
83 75	0 790	2 08	0 0159
70 75	0 570	1 13	0 0086
38 2	0 265	0 59	0 0045
17 65	0 116	0 3	0 0039
9 47	0 0526	0 17	0 0022
4 85	0 0329	0 08	0 00075

(Mees and Piper, Photog J 1912, 36 234)

Solubility in Na₂S₂O₃+*Aq* at 35°

g Na ₂ S ₂ O ₃ in 1 liter	g AgBr corresponding to each g Na ₂ S ₂ O ₃
100	0 376
200	0 390
300	0 397
500	0 427

(Richards and Faber, Am Ch J 1899, 21 169)

(NH₄)₂S₂O₃+*Aq* dissolves AgBr more rapidly than does Na₂S₂O₃+*Aq* (Lumière and Seyewitz, C C 1908, II 1138)

Solubility in salts+*Aq*

Solvent	% Conc	Grams AgBr sol in 100 grams solvent
Sodium thiosulphate	1	0 35
" " "	5	1 90
" " "	10	3 50
" " "	15	4 20
" " "	20	5 80
Sodium sulphite	10	0 04
" " "	20	0 08
Ammonium sulphite	10	Traces
Potassium cyanide	5	6 55
Ammonium sulphocyanide	5	0 21
" " "	10	2 04
" " "	15	5 30
Potassium " "	10	0 73
Calcium " "	10	0 53
Barium " "	10	0 35
Aluminum " "	10	4 50
Thiocarbamide	10	1 87
Thiosinamine	1	0 08
"	5	0 35
"	10	0 72

(Valenti, M 1894, 15 250)

Solubility of AgBr in salts+*Aq* at (?)°
(G AgBr sol in 1 l of 1% solution of salts)

NaSCN	2 06
NH ₄ SCN	0 03
(NH ₄) ₂ CO ₃	0 004
Na ₂ SO ₄	0 055

(Mees and Piper, Photog J, 1912, 36 234)

In a solution of NaC₂H₃O₂+*Aq*, containing 10 ccm of sat NaC₂H₃O₂+*Aq* at 15° and 20 ccm normal HC₂H₃O₂+*Aq* mixed with 970 ccm H₂O, about double the amount of flocculent AgBr is dissolved in the cold that dissolved by boiling H₂O from granular AgBr. This solution required 3 pts of Ag or Br to ppt the AgBr in solution. Pulverulent or granular AgBr are wholly insol in dil conc acetates+*Aq* (Stas)

Sol in Hg(C₂H₃O₂)₂+*Aq*
100 ccm H₂O containing 10% of norm Hg(C₂H₃O₂)₂+*Aq* dissolves 0 0122 g AgI at 20° (Schierholz)

Very sol in liquid NH₄ (Linklin, Am Ch J 1898, 20 829)

Solubility in 10 cc methylamine+*Aq* at different concentrations at 11 5°

g NH ₂ CH ₃	4 844	4 311	3 562	3 22
mg AgBr	289	127	73	56

g NH ₂ CH ₃	1 797	1 513	1 317	1 10
mg AgBr	28	16	12	7

(Jarry, A ch 1899, (7) 17 378)

Solubility in methylamine + Aq at 25°	
G mol per l	
CH ₃ NH ₂	AgBr
0 0	0 00026
0 0	0 00034
0 0 4	0 000395
0 0 47	0 00041
0 1 50	0 00045

(V uth, B 1902, **35** 2416)

Solubility in methylamine + Aq at 25°			
G mol per l			
CH ₃ NH ₂	AgBr	CH ₃ NH ₂	AgBr
1 017	0 0025	0 102	0 00026
0 508	0 0013	0 051	0 00012
0 203	0 00049		

(Bodlander and Eberlein, B 1903, **36** 3948)

Solubility in ethylamine + Aq at 25°	
G mol per l	
C ₂ H ₅ NH ₂	AgBr
0 0 72	0 0000867
0 0 42	0 000137
0 0 12	0 000193
0 0 72	0 000258
0 1 300	0 000711

(V uth, B 1902, **35** 2416)

At 25°, 1 l ethylamine + Aq containing 0 483 g n 1 C₂H₅NH₂ dissolves 0 00231 g mol AgBr 0 200 g mol C₂H₅NH₂, 0 0097 g mol AgBr (Bodlander and Eberlein, B 1903, **36** 48)

Insol benzonitrile (Naumann, B 1914, **47** 70)
 Insol acetone (Eidmann, C C 1899, II, 1014) (Naumann, B 1904, **37** 4329)
 Sol in alcoholic thionurea (Reynolds, Chem Soc 1892, **61** 251)
 Insol in methyl acetate (B 1901, Dissert 1906), (N Naumann, B 1909, **42** 57) ethyl acetate (Fumers, Dissert 1906), (Naumann B 1910, **4** 314)
 1 49 g glBr is dissolved in 1 l of 1% thio-carbamide -Aq (Meis and Piper, Photog J 1912, **3** 239)
 Insol in warm pyridine
 Mol w determined in piperidine (Werner, Z an 1897, **15** 16)
 Min F myrrite, Bromate

Silver bromide ammonia, AgBr, NH₃ (Joann and Crozier, C R 894, **118** 1150)

AgBr, 1½NH₃ (Jarry, A ch 1899, (7) 17 356)
 2AgBr, 3NH₃ (Joannis and Crozier)
 AgBr, 3NH₃ Decomp by H₂O Sl sol in liquid NH₃ (Jarry)
 AgBr, 5NH₃ (Jarry, C R 1898, **126** 1141)

Silver carbide, Ag₂C

(Gay-Lussac)
 Ag₂C(?) Sol in HNO₃ + Aq with residue of C (Liebig, A 38 129)
 Ag₂C₂ Sol in HNO₃ + Aq with residue of C (Regnault, A 19 153)

Silver subchloride, Ag₂Cl₃

NH₄OH + Aq dissolves the greater part, the residue (20%) being sol in HNO₃ + Aq KCN dissolves the greater part, H₂SO₄ dissolves about 2%, acetic acid and KOH are without action (Bibra, J pr 1875, (2) 12 52)

Argentous chloride, Ag₂Cl

Obtained in a pure state by Guntz (C R 112 861) Dil HNO₃ + Aq does not attack but warm conc HNO₃ + Aq decomp Easily sol in KCN + Aq (Guntz, C R 112 1212)
 The following data are for a more or less impure Ag₂Cl

Boiling conc HCl + Aq NaCl + Aq or NH₄OH + Aq dissolve out AgCl and leave Ag (Schnee Wetzlar Dulk Wohler)

According to Berthollet wholly sol in NH₄OH + Aq Sol for the most part in NH₄OH + Aq and the residue is sol in HNO₃ + Aq (= Ag + AgCl) (V Bibra B 7 741)

Silver chloride, AgCl

Nearly insol in H₂O

When AgCl is left in contact for some hours with pure H₂O at 20-22°, and especially at 75°, traces go into solution, more Cl is dissolved than Ag When 1 pt Ag is pptd as AgCl in presence of 1 million pts H₂O a slight bluish milkiness is observed, but in order to have a distinct ppt 4 pts Ag should be present

Dil HNO₃ + Aq does not increase the solubility of AgCl, but AgCl is not absolutely insol in stronger HNO₃ + Aq (Mulder)

1 pt AgNO₃, when mixed with HCl + Aq in presence of 120 000 (Pfaff), 240,000 (Harting), pts H₂O, causes an opalescence

1 pt Ag gives a slight turbidity with HCl + Aq in presence of 200 000 pts H₂O, a scarcely opalescent cloudiness with 400,000 pts H₂O, and the same after the lapse of 15 minutes in presence of 800,000 pts H₂O (Lassaigne)

1 pt Ag can be detected as AgCl in 1 million parts H₂O at ordinary temp, but not in 2 million parts In NaNO₃ + Aq containing 0 79 pt NaNO₃ in 200,000 pts H₂O, 1 pt Ag can be detected as AgCl This dissolves at 75°, and is visible again on cooling

If the same liquid contains 1574 pts NaNO₃ the AgCl remains in solution after cooling

In 100 ccm H_2O containing 0.787 g $NaNO_3$, 13 drops of $NaCl$ and silver solution, each drop of which contains 0.05 mg Ag , cause a precipitate at 5° , 20 drops at $15-17^\circ$, 60 drops at $45-55^\circ$.

$AgCl$ is somewhat less sol in $HNO_3 + Aq$ than in $NaNO_3 + Aq$ when the amount of H_2O remains the same.

Therefore, if HCl is used instead of $NaCl$, about $\frac{1}{2}$ less $AgCl$ remains in solution.

In 100,000 pts of H_2O , which contain HNO_3 and an amount of HCl corresponding to the amount of Ag salt, 1.596 pts $AgCl$ dissolve at 25° . The solution is precipitated by either $AgNO_3$ or HCl (Mulder, Silber Probir-methode, Leipzig, 1859 62).

(For further older data, see Storer's Dictionary.)

White flaky $AgCl$ is appreciably sol in hot H_2O , 1000 ccm boiling H_2O dissolving about 2 mg $AgCl$. Far less sol in H_2O containing $AgNO_3$, being practically insol in H_2O containing 0.1 g $AgNO_3$ in a litre. Solubility is also diminished one-half by addition of HCl (Cooke, Sill Am J (3) 21 220).

Solubility in H_2O rapidly diminishes as the temp falls (Cooke, *l c*).

Not completely insol in H_2O . According to Stas (C R 73 998) there are four modifications: (1) gelatinous, (2) cheesy-flocculent, (3) pulverulent, (4) granular, crystalline, or fused. (4) is almost absolutely insol in H_2O at the ordinary temp, but the solubility increases with the temp, and is considerable at 100° , (2), which is formed by the precipitation of a cold dilute Ag solution, has the greatest solubility in pure H_2O , and it changes its solubility by standing, or if made pulverulent by shaking with H_2O , (3) is also sol in H_2O , the solution of (2) or (3) in pure H_2O , or H_2O acidified with HNO_3 , is precipitated by $AgNO_3$, or $NaCl + Aq$.

In order to ppt 1 pt $AgCl$ in above solution 3 pts of Cl as chloride or Ag as nitrate are necessary, the pptn is then complete.

Solubility of granular variety in boiling H_2O is proportionately large, and pptn is brought about by 3 pts Cl or Ag as above, but the pptn in this case is not complete.

The salts formed simultaneously with the $AgCl$ have no influence on the solubility of the $AgCl$. Presence of HNO_3 does not increase the solubility of (2), but has that effect on (3) in proportion to the amt of HNO_3 present (Stas, C R 73 998).

Further determination by Stas are as follows—

Between 0° and 30° granular $AgCl$ is insol in pure H_2O , or H_2O acidulated with HNO_3 .

Between 0° and 30° the flocculent and pulverulent forms of $AgCl$ dissolve without alteration in pure H_2O , in acidulated H_2O , in alkali acetates + Aq , and in $Hg(C_2H_3O_2)_2 + Aq$ containing an alkali acetate. Their degree of solubility is a function of the state of the chloride, of the temp, and of the nature

and quantity of the solvent within these limits of temp ($0^\circ-30^\circ$). These solvents, if they contain either Ag in the state of an Ag salt, or Cl as chloride or HCl in an amount three times that which they can dissolve as $AgCl$, exercise no solvent action on any of the modifications of $AgCl$. And reciprocally sat $AgCl + Aq$ is pptd instantly by a decinormal solution of $AgNO_3$ or MCl (or HCl). The $AgCl$ is wholly pptd when the quantity of the Ag or Cl thus added is equal to three times the quantity of the Ag or Cl dissolved as $AgCl$.

Between 50° and 100° , however, decinormal solutions of Ag or chlorides, which cause instant ppts in solutions sat with any of the modifications of $AgCl$, do not eliminate all the dissolved $AgCl$. At 100° , they only ppt 60% of the amt dissolved (Stas, A ch (5) 3 323).

Calculated from electrical conductivity of $AgCl + Aq$, $AgCl$ is sol in 715,800 pts H_2O at 13.8° , and 384,100 pts at 26.5° (Holleman, Z phys Ch 12 132).

Calculated in the same way, 1 l H_2O dissolves 0.76 mg at 2° , 0.97 mg at 10° , 1.52 mg at 18° , 2.24 mg at 26° , 3.03 mg at 34° , 4.05 mg at 42° (Kohlrausch and Rose, Z phys Ch 12 242).

Solubility in $H_2O = 1.25 \times 10^{-5}$ mol/l at 25° (Goodwin, Z phys Ch 1894, 13 645).

Solubility of $AgCl$ in H_2O at 25° is 1.41×10^{-5} (in normality) (Thiel, Z anorg 1900, 24 57).

2.16×10^{-5} moles are sol in 1 liter H_2O at 25° (Noyes and Kohr, Z phys Ch 1903, 42 341).

1.53×10^{-3} g per liter are dissolved in sat aq solution at 20° (Böttger, Z phys Ch 1903, 46 603).

1 l H_2O dissolves 1.6 mg $AgCl$ at 18° (Kohlrausch, Z phys Ch 1904, 50 356).

21.8 milligrams are dissolved in 1 liter of sat solution at 100° (Eöttger, Z phys Ch 1906, 56 93).

1.34 mg are contained in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168).

1 l sat solution at t° contains mg $AgCl$

t	mg $AgCl$	t	mg $AgCl$
1 55	0 56	17 51	1 31
4 68	0 66	25 86	1 935
9 97	0 89	34 12	2 74

(Kohlrausch, Z phys Ch 1908 64 168)

Solubility in $H_2O = 1.6 \times 10^{-5}$ g-mol per litre at 25° (A E Hill, J Am Chem Soc 1908, 30 74).

1 l H_2O dissolves 0.00154 g $AgCl$ at 21° 0.0217 g at 100° (Whitby, Z anorg 1910 67 108).

Calculated from electrical conductivity of
 AgCl + Aq 1 l H₂O dissolves
 0 0105 milliequivalents AgCl at 18°
 0 0365 " " " " 50°
 0 147 " " " " 100°
 (Melcher, J Am Chem Soc 1910, **32** 55)

1 l H₂O dissolves 1.02×10^{-5} g equiv at
 18°, 1 429 10^{-5} g equiv at 25° (van Rossen,
 C C 1915; I 1539)

The most probable average value for solubility of AgCl in H₂O is 1.04×10^{-5} g equiv per l at 25°, and 1.43×10^{-5} g equiv per l at 18° (van Rossen, C C 1912, II 1807)
 1.20×10^{-5} g AgCl are sol in 1 l H₂O at 18° (Główny, C A 1915, 741)

More soluble in H₂O than AgSCN (Normand, Chem Soc 1912, 101 1853)

Soluble in conc HCl + Aq, and also when not very conc thus the solution of 1 pt AgNO₃ + 10 pts H₂O is clouded by a little but clears up by the addition of HCl (Pierre, J Pharm (3) 12 237)

1 pt AgCl dissolves in 200 pts conc HCl + 600 pts HCl + Aq diluted with 2 pts H₂O (Pierre, J Pharm (3) 12 237)
 Somewhat sol in hot alcohol, to which HCl has been added, but is precipitated on cooling (Erdmann, J pr 19 341)

100 pt sat HCl + Aq (sp gr 1 165) dissolve 0 2 g AgCl, or AgCl is sol in 336 Aq at ord temp, 100 pts HCl + Aq (sp gr 1 165) at b-pt dissolve 0 56 g AgCl, or AgCl is sol in 178 pts HCl + Aq

Solubility of AgCl in dil HCl + Aq 100 ccm HC - Aq (sp gr 1 165), to which the given am H₂O has been added, dissolve g AgCl

ccm HCl	ccm H ₂ O	g AgCl	Pts HCl which dissolve 1 pt AgCl
100	10	0 056	1,785
100	20	0 018	5,555
100	30	0 0089	11,235
100	50	0 0035	18,571

(Vogel, N Pcp Pharm **23** 335)

If HCl is added to a solution in which Ag is suspended, the milkiness disappears. Solubility in HCl + Aq increases with the temp, the AgCl separating out on cooling (Mulder)

The amounts of AgCl which dissolve in HCl + Aq are directly proportional to the volumes of acid (of fixed concentration) used (Barlow, Am Chem Soc 1906, **28** 1448)

1 l 1% Cl dissolves 0 0002 g AgCl at 21°
 1 l 5% Cl dissolves 0 0033 g AgCl at 21°
 1 l 10% Cl dissolves 0 0555 g AgCl at 21°
 (Witby, Z anorg 1910, **67** 108)

Solubility in HCl + Aq at 25°

HCl g equivalents per l	Ag $\times 10^{-3}$ g -equivalents per l
0 649	0 032
1 300	0 126
1 911	0 266
2 149	0 374
2 569	0 610
2 975	0 814
3 576	1 358
4 182	2 147
4 735	3 168
5 508	4 126

(Forbes, J Am Chem Soc 1911, **33** 1941)

Solubility in 20% HCl + Aq

HCl	N/10 AgNO ₃ ccm	Opalescent at t°	G AgCl to 100 g anhydrous HCl
20 g of 20% acid	1 0		
	1 1	0 0	0 39
	2 0	29 5	0 72
	3 0	51 5	1 076
	3 75	70 0	1 346
	4 25	82 0	1 525
	4 75	90 0	1 74
	5 80	107 0	2 08

(Lowry, Roy, Soc Proc 1914, **91** A 62)

Soluble in conc HBr + Aq (Lowry)

Insoluble in HNO₃ + Aq (Wackenroder)
 Entirely unacted upon by HNO₃ of 1 43 sp gr (Wurtz, Am J Sci (2) **25** 382)

Solubility in dil HNO₃ + Aq is the same as solubility in H₂O, i.e. $1/2,000,000$ pt of Ag cannot be detected in H₂O with or without HNO₃, but $1/1,000,000$ pt can be detected in both cases (Mulder)

1 pt Ag in the form of AgCl dissolves at 25° in 83,000 pts H₂O containing free HNO₃ and 0 33 pt of HCl (Mulder)

100,000 pts conc HNO₃ + Aq dissolve about 2 pts AgCl, and solubility is not sensibly affected by lower nitrogen oxides (Thorpe, Chem Soc (2) **10** 453)

Solubility of AgCl in HNO₃ + Aq at 25°

G per liter			
HNO ₃	AgCl	HNO ₃	AgCl
0 0315	0 001647	18 9	0 00225
0 063	0 001705	94 5	0 0245
0 630	0 00176		

(Głowczyński, Kolloidchem Beih 1914, **6** 147)

Insol in cold conc H_2SO_4 , but on boiling is in part decomp and in part dissolved, and does not separate on cooling

AgCl is not more sol in dil H_2SO_4 +Aq than in dil HNO_3 +Aq

Unacted upon by cold H_2SO_4 +Aq, and but slightly decomp on heating (Vogel)

Abundantly sol in H_2PtCl_6 +Aq without decomp (Burnbaum, Z Ch 1867 520)

Insol in cold dil caustic alkalis+Aq but decomp by hot conc solutions (Gregory)

Decomp by K_2CO_3 +Aq

Sl sol in cold K_2CO_3 +Aq

Easily sol even in dil NH_4OH +Aq

1 pt AgCl dissolves in 1288 pts NH_4OH +Aq of 0.89 sp gr (Wallace and Lamont, Chem Gaz 1893 137)

100 pts NH_4OH +Aq of 0.986 sp gr dissolve at 80° 1.492 pts AgCl, dried at 100° (Pohl, W A B 41 627)

1 l NH_4OH +Aq of 0.949 sp gr dissolves 51.6 g Ag as freshly precipitated AgCl, and 47.6 g when diluted with 1 l H_2O

1 l NH_4OH +Aq of 0.924 sp gr dissolves 58 g Ag as freshly precipitated AgCl, 1 l NH_4OH +Aq of 0.899 sp gr dissolves 49.6 g, 0.5 l NH_4OH +Aq (of 0.049 sp gr)+0.5 l saturated NaCl+Aq dissolves 20.8 g, 0.5 l NH_4OH +Aq (of 0.949 sp gr)+0.5 l saturated KCl+Aq dissolves 20.4 g, 0.5 l NH_4OH +Aq (of 0.949 sp gr)+0.5 l saturated NH_4Cl +Aq dissolves 22.4 g Ag as freshly pptd AgCl (Milon and Commaille, C R 56 309)

1 g AgCl dissolves in 428.64 g 5% NH_4OH +Aq (sp gr 0.998) at 12° , 1 g AgCl dissolves in 12.76 g 10% NH_4OH +Aq (sp gr 0.96) at 18° (Longi, Gazz ch it 13 87)

1 g freshly pptd AgCl is sol in 17 cm 10% NH_4OH +Aq Solubility is diminished by presence of AgBr (Semier, Pharm J Trans (3) 14 1)

Solubility in NH_4OH +Aq at 0°

G per 100 g solution

NH_3	AgCl	NH_3	AgCl
1.45	0.49	28.16	5.69
1.94	1.36	29.80	7.09
5.60	3.44	30.19	7.25
6.24	4.00	32.43	5.87
11.77	4.68	34.56	4.77
16.36	5.18	37.48	3.90

(Jarvis, A ch 1899, (7) 17 342)

Solubility in NH_4OH +Aq increases with the temp (Jarvis)

Solubility in NH_4OH +Aq at 25°

g at Ag per l	Mols NH_3 per l	g at Ag per l	Mols NH_3 per l
0.151	2.042	0.0140	0.253
0.149	2.017	0.0140	0.253
0.149	2.013	0.0140	0.252
0.147	1.991	0.0139	0.252
0.0616	0.961	0.00621	0.118
0.0583	0.916	0.00621	0.118
0.0584	0.909	0.00619	0.118
0.0572	0.903	0.00625	0.118
0.0569	0.896	0.00304	0.0590
0.0555	0.873	0.00297	0.0589
0.0541	0.863	0.00300	0.0585
0.0514	0.818	0.005149	0.0288
0.0249	0.428	0.00143	0.0287
0.0240	0.416	0.00142	0.0285
0.0235	0.411	0.00141	0.0282
0.0227	0.397		

(Whitney and Melcher, J Am Chem Soc 1903, 25 78)

Solubility of AgCl in NH_4OH +Aq at 25°

Ag=g at Ag in 1000 g H_2O

NH_3 =g mol NH_3 in 1000 g H_2O

Conc = Molecular concentration of free NH_3

Ag	NH_3	Conc	Solid phase
0.023	0.437	0.391	AgCl
0.025	0.428	0.378	"
0.1197	1.700	1.461	"
0.1308	1.688	1.426	"
0.372	3.782	3.038	"
0.378	3.945	3.181	"
0.574	5.10	3.95	"
0.609	5.33	4.11	"
0.633	5.545	4.279	"
0.745	6.26	4.77	AgCl+2AgCl, 3NH ₃
0.754	6.27	4.76	"
0.757	6.25	4.74	"
0.760	6.25	4.73	"
0.775	6.52	4.97	2AgCl, 3NH ₃
0.848	8.28	6.58	"
0.968	11.19	9.25	"
0.980	11.78	9.82	"
0.978	12.23	10.27	"
0.965	12.26	10.33	"
1.03	12.68	10.62	"
1.09	12.96	10.78	"
1.049	14.34	12.24	"
1.039	14.47	12.39	"

(Straub, Z phys Ch 1911, 77 332)

Easily (Brett), difficultly (Wittstein), so in NH_4Cl +Aq, but not in other NH_4 salts

Solubility in $\text{NH}_4\text{Cl} + \text{Aq}$ at 15°		
% NH_4Cl		% AgCl
10		0 0050
14	)	0 0143
17	)	0 0354
19	)	0 0577
21	)	0 110
25	)	0 228
28	)	0 340*
Sat		0 177

*24 5°

(Schierholz, W A B, 1890, 101 2b 8)

Solubility in $\text{NH}_4\text{Cl} + \text{Aq}$ (26 31%) at t°		
t		% AgCl
1		0 276
2		0 329
6		0 421
8		0 592
9		0 711
10		0 856
11		1 053

(Schierholz)

At 25° , 1 g NH_4Cl dissolves 0 00053 g NH_4Cl , 0 001604 g AgCl , 0 00530 g NH_4Cl , 0 002379 g AgCl (Glowczynski, Kolloidchem Beih 1914, 6 147)

See also orbes, page 826
1 l $\text{KCl} + \text{Aq}$ dissolves 1 8 mg (Guye, J Chim Phys 10 145)
Sl sol 1 conc $\text{KCl} + \text{Aq}$, $\text{NaCl} + \text{Aq}$, and certain other chlorides

NaCl , KCl , NH_4Cl , CaCl_2 , $\text{ZnCl}_2 + \text{Aq}$, etc., dissolve appreciable quantities of AgCl , especially if hot and concentrated, but it separates out the most part on cooling

Sol in solutions of all the metallic chlorides 1 in H_2O , thus NaCl , KCl , CaCl_2 , $\text{BaCl}_2 + \text{Aq}$ all dissolve AgCl , especially if hot MgCl_2 , NH_4Cl , and HgCl_2 dissolve AgCl (Mulder)

Sol in conc $\text{CaCl}_2 + \text{Aq}$ (Wetzlar)
Sol in cobaltic chloride + Aq (Gibbs and Guntz)

Insol in SnCl_4 , HgCl_2 , CuCl_2 , ZnCl_2 , CdCl_2 , NiCl_2 , or $\text{CoCl}_2 + \text{Aq}$ (Vogel)

Solubility of AgCl in sat solutions of chlorides ordin var temperatures

Sal	100 pts sat solution dissolve pts AgCl	Pts solution required to dissolve 1 pt AgCl
BaCl_2	0 0143	6,993
SrCl_2	0 0884	1,185
CaCl_2	0 0930	1,075
NaCl	0 0950	1,050
KCl	0 0475	2,122
NH_4Cl	0 1575	634
MgCl_2	0 1710	584
HCl	0 2980	336

(Vogel, N Rep Pharm 23 335)

Experiments by Hahn give different results from those of Vogel as follows —

Solubility in various salts + Aq

Salt	% salt	Sat at t°	% AgCl
KCl	24 95	19 6	0 0776
NaCl	25 96	"	0 1053
NH_4Cl	28 45	24 5	0 3397
CaCl_2	41 26	"	0 5713
MgCl_2	36 35	"	0 5313
BaCl_2	27 32	"	0 0570
FeCl_2			0 1686
FeCl_3			0 0058
MnCl_2		24 5	0 1996
ZnCl_2			0 0134
CuCl_2		24 5	0 0532
PbCl_2		"	0 0000

(Hahn, Wyandotte Silver Smelting Works, 1877)

1 l 4-N $\text{KCl} + \text{Aq}$ dissolves 0 915 g KCl at 25° (Hellwig, Z anorg 1900, 25 166)

Solubility in $\text{KCl} + \text{Aq}$ at t°

t°	G equiv per l	
	$\text{Ag} \times 10^{-3}$	KCl
10	1 734	3 325
25 0	2 415	3 083
35 0	2 786	2 955

(Forbes, J Am Chem Soc 1911, 33 1937)

Solubility in $\text{KCl} + \text{Aq}$ at 25°
G per liter

KCl	AgCl	KCl	AgCl
0 00236	0 00184	0 01491	0 00305
0 00471	0 00218	0 02984	0 00321

(Glowczynski, Kolloidchem Beih 1914, 6 147)

Solubility in $\text{CaCl} + \text{Aq}$

t	G equiv per l	
	$\text{Ag} \times 10^3$	$\frac{\text{CaCl}}{2}$
10	0 964	3 512
25 0	1 514	3 320
35 0	1 806	3 221

(Forbes, l c)

Sat $\text{CuCl}_2 + \text{Aq}$ at 0° dissolves 2 835 g AgCl per l, at 100° , 8 147 g Solubility in sat $\text{MgCl}_2 + \text{Aq}$ is still greater (Hahn, Eng Min J 65 434)

More sol in $\text{HgCl}_2 + \text{Aq}$ than in H_2O (Finzi, Gazz ch it 1902, **32** (2) 324.)

At 15° , 100 g NaCl in 280 ccm H_2O dissolve 485 mg AgCl, 100 g KCl in 300 ccm H_2O dissolve 334 mg, 100 g NH_4Cl in 280 ccm H_2O dissolve 1051 mg

The solubility decreases with dilution rapidly at first until about an equal vol of H_2O has been added, and then much more slowly to a minimum quantity, when the dilution is 1 10 for NaCl and KCl, and 1 20 for NH_4Cl

100 g NaCl in 280 ccm H_2O dissolve 2170 mg AgCl at 109° 100 g NH_4Cl in 280 ccm H_2O dissolve 4000 mg AgCl at 110° , 100 g NaCl in 620 ccm H_2O (14% solution) dissolve 15 mg AgCl at 15° , and 774 mg at 104° (Schierholz, W A B 101, 2b 4.)

The solubility of AgCl in NaCl + Aq decreases with diminishing concentration of NaCl + Aq (Barlow, J Am Chem Soc 1906, **28** 1448.)

Solubility in NaCl + Aq

Gravimetric measurements 15°

Strength of salt solution	G AgCl retained per 100 g NaCl
15% NaCl	0 063
20% NaCl	0 134
28% NaCl	0 279

Volumetric measurements

NaCl	N/10 AgNO_3 ccm	Opal escent at t°	G AgCl retained per 100 g NaCl
20 g of 15% solution	0 25	28	0 119
	0 4	40	0 191
	0 7	64	0 335
	1 0	78	0 478
	1 25	89	0 598
	1 7	102 5	0 812
20 g of 20% solution	0 43	17 0	0 156
	0 65	26 0	0 234
	0 82	37 0	0 295
	1 2	51 5	0 430
	1 6	67 0	0 524
	2 12	79 5	0 765
	2 52	88 5	0 910
	3 08	97 0	1 10
20 g of 28% solution	3 52	105 0	1 27
	2 25	36 5	0 675
	2 75	45 0	0 704
	3 5	56 0	0 896
	4 5	69 0	1 153
	5 5	84 0	1 411
	6 5	94 0	1 664
	7 75	107 5	1 958

Solubility in salts + Aq at 25°

C = concentration of the salt in salt solution in g-equivalents per litre

Salt	C	$\text{Ag} \times 10^{-3}$ g-equivalents per l
NaCl	0 933	0 086
	1 190	0 130
	1 433	0 184
	1 617	0 245
	1 871	0 348
	2 094	0 446
	2 272	0 570
	2 449	0 684
	2 658	0 851
	2 841	1 040
	3 000	1 194
	3 270	1 583
$\frac{\text{CaCl}_2}{2}$	3 471	1 897
	3 747	4 462
	3 977	2 879
	4 170	3 335
	4 363	3 810
	4 535	4 298
	5 039	6 039
	1 748	0 289
	2 201	0 501
	2 741	0 900
	3 264	1 463
	3 737	2 182
NH_4Cl	4 033	2 802
	4 538	4 175
	5 005	5 823
	0 513	0 042
	0 926	0 113
	1 141	0 172
	1 574	0 365
	2 143	0 842
	2 566	1 425
	2 918	2 160
	3 162	2 795
	3 510	4 029
$\frac{\text{SrCl}_2}{2}$	4 363	9 353
	4 902	14 92
	5 503	24 04
	5 764	30 17
	0 550	0 033
	0 989	0 092
	1 359	0 173
	1 572	0 236
	1 698	0 284
	1 818	0 348
	2 140	0 510
	2 476	0 747
	2 992	1 252
	3 494	2 018
	4 152	3 594
	5 216	8 174
	5 775	12 04

Solubility 1 salts + Aq at 25°—Continued

Salt	C	AgX $\cdot 10^{-3}$ g equivalents per l
KCl	1 111	0 141
	1 425	0 235
	1 713	0 391
	2 022	0 616
	2 396	1 050
	2 628	1 390
	2 850	1 845
	3 081	2 435
	3 424	3 602
	3 843	5 725

BaCl ₂ 2	1 248	0 186
	1 610	0 339
	2 676	1 274
	3 260	2 366

(Forbes, Am Chem Soc 1911, 33, 1940)

Sol in 1 l HNO₃, KNO₃, Ca(NO₃)₂, Mg(NO₃)₂, O₂ + Aq, sl sol at ord temp, but s much increased by heat

Solubility in NaNO ₃ + Aq at 15–20°	ccm H ₂	g NaNO ₃	mg AgCl dissolved
	100	0 787	1 33
	200	0 787	1 93
	300	2 361	3 99
	100	2 787	2 53

Solubility increases with ascending temp	Temp	ccm H ₂ O	g NaNO ₃	mg AgCl dissolved
	5°	100	0 787	0 86
	15–17°	100	0 787	1 33
	18°	100	0 787	1 46
	30°	100	0 787	2 33
	45–55°	100	0 787	3 99

(Mulder)

At 25° 100,000 pts H₂O containing a little free HNO₃ and 0 787 g NaNO₃ dissolve 2 128 mg AgCl. By adding 2 g more NaNO₃ to above solution, 2 5269 mg (1/10 more) AgCl is dissolved (Mulder)

Solubility in H₂O is not appreciably influenced by 1/10 N to N-KNO₃ or NH₄NO₃ + Aq (v. Rossen, C 1912, II 1807)

In presence of NaNO₃ and excess of HCl, 1 l H₂O dissolves 0 03 mg AgCl (Richards and W)

Hg(NO₃)₂ + Aq dissolves considerable quantities of AgCl, but the other nitrates do not (Mulder)

Much more sol in hot than in cold Hg(NO₃)₂ + Aq, and much more sol therein than in NH₄NO₃ + Aq. NaCl ppts AgCl solution, much less sol therein in

presence of NaC₂H₃O₂ or NH₄OH + Aq. AgCl is pptd from above solution by NaC₂H₃O₂ + Aq (Mulder)

Sol in Hg(NO₃)₂ + Aq (Wackenroder, A 41 317), in considerable amount (Liebig, A 81 128), and is precipitated by HCl, NH₄Cl, NaCl, KC₂H₃O₂ (Debray, C R 70 849), incompletely precipitated by AgNO₃ and not by HNO₃ (Wackenroder)

Solubility of AgCl in Hg(NO₃)₂ + Aq at 25°
(G mols per l)

Hg(NO ₃) ₂ HNO ₃	AgCl	Hg(NO ₃) ₂ HNO ₃	AgCl
0 0100	0 00432	0 050	0 00914
0 0125	0 00499	0 100	0 01395
0 025	0 00690	1 000	0 04810

HNO₃ was present in all cases, and it was found that there was no difference in solubility of AgCl with concentrations between 0 1N and 2N HNO₃ (Morse, Z phys Ch 1902, 45 708)

Not sol to appreciable extent in Cu(NO₃)₂, Fe₂(NO₃)₆, Mn(NO₃)₂, Co(NO₃)₂, Zn(NO₃)₂, or Ni(NO₃)₂ + Aq, insol or exceedingly sl sol in Pb(NO₃)₂ + Aq (Mulder)

Imperfectly sol in AgNO₃ + Aq (Wackenroder)

Conc AgNO₃ + Aq dissolves AgCl perceptibly

Less sol in AgNO₃ + Aq than AgBr (Rasse, A 111 39)

Solubility in 0 02N AgNO₃ + Aq = 0 15 × 10⁻³ g mols per l (Böttger)

100 ccm of 3-N solution of AgNO₃ dissolve 0 08 g AgCl at 25°. More dil solutions dissolve very slight amounts of AgCl (Hellwig, Z anorg 1900, 25 177)

Solubility in 2-N AgNO₃ + Aq at ord temp = 0 03 × 10⁻³ g equiv AgCl (Forbes, J Am Chem Soc 1912, 33 1946)

Solubility in AgNO₃ + Aq at t°

(Det by volumetric method)

AgNO ₃ H O = 2 1				
C	AgNO ₃	n/10 NaCl ccm	t	h AgCl re- tained per 100 g AgNO ₃
	6	2	57	0 478
	7	2	45	0 410
	8	2	40	0 359
	9	2	35	0 319
	11	2	30	0 261
	7	1	26	0 205
	10	1	22	0 143
	10	4	65	0 572
	10	5	86	0 715

Solubility in $\text{AgNO}_3 + \text{Aq}$ at t° — *Continued* $\text{AgNO}_3 \cdot \text{H}_2\text{O} = 1$

5	1	94	0 286
6	1	84	0 239
7	1	75	0 205
8	1	66	0 179
9	1	58	0 159
5 5	0 5	48	0 130
6 5	0 5	40	0 110
12	0 5	23	0 060

 $\text{AgNO}_3 \cdot \text{H}_2\text{O} = 1.2$

6	0 5	104	0 120
7	0 5	92	0 103
8	0 5	85	0 090
10	0 5	73	0 072
12	0 5	61	0 060
8	0 25	45	0 045
12	0 25	28	0 030

(Lowry, Roy, Soc Proc 1914, **91** A 58)Solubility in $\text{AgNO}_3 + \text{Aq}$ at 20°
(Det by gravimetric method)

g AgNO_3	g H_2O	g AgCl retained per 100 g AgNO_3
220	110	0 1372
220	165	0 1009
220	220	0 0722
220	330	0 0402
220	440	0 0294

(Lowry, Roy, Soc Proc 1914, **91** A, 56)Insol in $\text{Na}_2\text{SO}_4 + \text{Aq}$ Solubility of AgCl in $\text{Na}_2\text{SO}_3 + \text{Aq}$ at 25°
G formula weights per l

SO_3	Ag	SO_3	Ag
0 080	0 011	0 483 *	0 059 *
0 106	0 017	0 470	0 070
0 220	0 033	0 652	0 103
0 234	0 036	0 890	0 140
0 478 *	0 057 *	0 937	0 142

* In presence of 0 05 Cl

(Luther and Leubner, Z anorg 1912, **74** 393)Easily sol in $\text{Na}_2\text{S}_2\text{O}_3$ or $\text{KCN} + \text{Aq}$

When freshly pptd, very sol in solutions of soluble thiosulphates, and especially in conc $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$, which dissolves AgCl almost as readily as H_2O dissolves sugar. $\text{K}_2\text{S}_2\text{O}_3 + \text{Aq}$, even when very dil, also dissolves AgCl , also $\text{SrS}_2\text{O}_3 + \text{Aq}$ (Herschel, 1819)

Sol in $\text{KAsO}_4 + \text{Aq}$ (Reynoso)

Cold $\text{NaHSO}_3 + \text{Aq}$ dissolves a considerable amount of AgCl (Rosenheim and Steinhauser, Z anorg 1900, **25** 78)

Sol in cold sat $(\text{NH}_4)_2\text{S}_2\text{O}_3 + \text{Aq}$ (Rosen-heim and Steinhauser, Z anorg 1900, **25** 103)Solubility in Na thiosulphate + Aq at 16°

g $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in 100 cc water	g dissolved AgCl	
	experimental	calculated
2 08	0 29	0 80
4 16	0 64	1 60
6 24	0 88	2 40
8 35	1 26	3 21
16 70	2 54	6 42
20 83	3 28	7 99

(Abney, Z phys Ch 1895, **18** 65)

A solution of $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ containing 200 g $\text{Na}_2\text{S}_2\text{O}_3$ per liter, dissolves 0 454 g AgCl per g of $\text{Na}_2\text{S}_2\text{O}_3$ at 35° (Richards and Faber, Am Ch J 1899, **21** 170)

Solubility in salts + Aq

Solvent	% Conc	Grams AgCl sol in 100 grams solvent
Sodium thiosulphate	1	0 40
	5	2 00
	10	4 10
	20	6 10
Ammonium thiosulphate	1	0 57
	5	1 32
	10	3 92
Sodium sulphite	10	0 44
	20	0 95
Ammonium sulphite	10	Trace
	carbonate	
Ammonia + Aq	10	0 05
	3	1 40
Magnesium chloride	15	7 58
	50	0 50
Potassium cyanide	5	2 75
Ammonium sulphocyanide	5	0 08
	10	0 54
Potassium	15	2 88
	10	0 11
Calcium	10	0 15
Barium	10	0 20
Aluminum	10	2 02
Thiocarbamide	10	0 83
Thiosinamine	1	0 40
	5	1 90
	10	3 90

(Valenta, M 1894, **15** 250)Solubility in salts + Aq

31 71 cc of a solution of sodium thiosulphate containing 31 869 g $\text{Na}_2\text{S}_2\text{O}_3$ per liter (i e 5 g of the hydrate in 100 cc of the solution) dissolve 0 6124 g AgCl

21 88 cc of a solution of ammonium thiosulphate containing 50 g $(\text{NH}_4)_2\text{S}_2\text{O}_3$ per liter dissolve 0 7024 g AgCl

27 34 cc of a solution of potassium cyanide containing 49 511 g KCN per liter dissolve

1.4926 g (18 63) gCl (Cohn, Z phys Ch 1895,

Solubility of AgCl in sodium thiosulphate and potassium cyanide solutions may be determined without reference to experimental date (Cohn)

Solubility in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Insoluble in moderately dil $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ normal $\text{Hg}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ containing 0.1 g dissolve 0.01892 g AgCl at 15° (Stas)

100 ccm of a solution of a mixture of Na and Hg states dissolve 0.00175 g AgCl (Stas, A (5) 3 145)

Only slightly soluble in liquid NH_3

Solubility curve for AgCl, AgCl, 3NH_3 , AgCl, 5N (Jarvis, A ch 1899, 17 342)

Insoluble in alcoholic ammonia (Bodlander, Z phys Ch 1892, 9 731)

Nearly insoluble in ether (Mylus and Huttner, B 10 1316)

Perceptibly soluble on warming with solution of tartaric acid, but nearly the whole is deposited on cooling

Insoluble in acetone (Naumann, B 1904, 37 4329), insoluble in acetone and in methylal (Eidmann, C C 1899, II 1014)

Insoluble in methyl acetate (Bezold, Dissert 1906, Naumann, B 1909, 42 3790)

Insoluble in ethyl acetate (Hamers, Dissert 1906, Naumann, B 1910, 43 314)

Soluble in methylamine + Aq (Wurtz, A ch (3) 30 45)

Solubility of AgCl in methylamine at 11.5°

% CH_3NH_2	% AgCl	% CH_3NH_2	% AgCl
1.78	0.16	13.70	3.29
4.44	0.62	18.69	5.43
5.51	0.83	36.69	9.93
7.66	1.32		

(Jarvis, A ch 1899, (7) 17 342)

Solubility in methylamine + Aq at 25°
G mols per l

$\text{C}_2\text{H}_5\text{NH}_2$	AgCl
0.200	0.000300
0.400	0.000370
0.740	0.000424
0.947	0.000447
1.950	0.000481

Wuth, B 1902, 35 2416)

Solubility in methylamine + Aq at t°
G mols per l

t°	CH_3NH_2	Ag
18	0.93	0.0315
25	0.93	0.0338
25	0.93	0.0335

Euler, B 1903, 36 2880)

At 25° , 1 l methylamine + Aq, containing 1.017 g mols CH_3NH_2 , dissolves 0.0387 g mol AgCl, 0.508 g mol CH_3NH_2 , 0.0178 g mol AgCl (Bodlander and Eberlein, B 1903, 36 3948)

Solubility in ethylamine + Aq at 25°
G mols per l

$\text{C}_2\text{H}_5\text{NH}_2$	AgCl
0.01272	0.000114
0.03942	0.000156
0.05512	0.000235
0.06572	0.000312
0.10300	0.000824

(Wuth, B 1902, 35 2416)

Solubility in ethylamine + Aq at t°
G mols per l

t°	$\text{C}_2\text{H}_5\text{NH}_2$	Ag
18	0.094	0.00458
25	0.093	0.00474
25	0.094	0.00478
18	0.236	0.0132
25	0.234	0.0136
18	0.462	0.0251

(Euler, B 1903, 36 2880)

At 25° , 1 l ethylamine + Aq, containing 0.483 g mol $\text{C}_2\text{H}_5\text{NH}_2$, dissolves 0.0314 g mols AgCl, 0.200 g mol $\text{C}_2\text{H}_5\text{NH}_2$, 0.0115 g mol AgCl, 0.100 g mol $\text{C}_2\text{H}_5\text{NH}_2$, 0.0062 g mol AgCl (Bodlander and Eberlein)

Soluble in amylamine + Aq, but less than in $\text{NH}_4\text{OH} + \text{Aq}$

Soluble in caprylamine + Aq

Easily soluble on warming in ethylene diamine + Aq (Kurnakow, Z anorg 1898, 17 220)

Easily soluble in alcoholic solution of thiocetamide (Kurnakow, J pr 1895, (2) 51 251)

Insoluble in benzonitrile (Naumann, B 1914, 47 1370)

Solubility in pyridine at t°

t	g AgCl sol in 100 g pyridine	Solid phase
-52	0.70	AgCl, $2\text{C}_5\text{H}_5\text{N}$
-49	0.77	
-35	0.99	
-30	1.36	
-25	1.80	
-22	2.20	
transition point	2.75	AgCl, $\text{C}_5\text{H}_5\text{N}$
-20	3.71	
-18	3.85	
-10	4.35	
-5	5.05	
-1	5.60	

Solubility in pyridine at t° —*Continued*

t°	g AgCl sol in 100 g pyridine	Solid phase
transition point		
0	5 35	AgCl
10	3 17	
20	1 91	
30	1 20	
40	0 80	
50	0 53	
60	0 403	
70	0 32	
80	0 25	
90	0 22	
100	0 18	
110	0 12	

(Kahlenberg, J phys Chem 1909, **13** 423)Easily sol in warm piperidine (Varet, C R 1892, **115** 335)Mol wt determined in piperidine (Werner, Z anorg 1897, **15** 16)Quinoline dissolves traces of AgCl (Varet, C R 1893, **116** 60)As sol in concn + Aq as in $\text{NH}_4\text{OH} + \text{Aq}$ (Blyth, Chem Soc 1 350)Sol in sinamine, and thiosinamine + Aq
Min *Cerargyrite***Silver chloride ammonia, $\text{AgCl}, 2\text{NH}_3$** Decomp by H_2O (Terrell, A Phys Beil **7** 149) $2\text{AgCl}, 3\text{NH}_3$ Decomp on air and in H_2O to AgCl Sol in conc $\text{NH}_4\text{OH} + \text{Aq}$, from which it can be crystallised (Rose)Sol in alcohol (Bodlander, Z phys Ch **9** 730) $\text{AgCl}, 3\text{NH}_3$ More easily decomp than $2\text{AgCl}, 3\text{NH}_3$ Sol in liq NH_3 (Jarry, A ch 1899, (7) **17** 343) $\text{AgCl}, 5\text{NH}_3$ Sol in liq NH_3 (Jarry, A ch 1899, (7) **17** 336)**Silver chlorobromiodides**(Rodwell, Proc Roy Soc **25** 292)**Silver subfluoride (argentous fluoride), Ag_2F** Decomp by H_2O into Ag and AgF (Guntz, C R **110** 1337)Decomp by H_2O Insol in abs alcohol, ether, acetone and xylene (Wohler and Rodewald, Z anorg 1909, **61** 63)Decomp by H_2O until the solution contains 64.5% AgF, independent of temp (Guntz, C R 1913, **157** 981)**Silver fluoride, AgF**

Extremely deliquescent (Gore)

Sol in 0.55 pt H_2O at 15.5° with evolution of heat Sp gr of sat solution at $15.5^\circ = 2.61$ (Gore)Solubility of AgF in H_2O at t°
G per 100 g H_2O

t°	AgF	Solid phase
-14 2	60	Ice + AgF, $4\text{H}_2\text{O}$
+18 5	165	AgF, $4\text{H}_2\text{O}$
18 65	169 5	" + AgF, $2\text{H}_2\text{O}$
20	172	AgF, $2\text{H}_2\text{O}$
24	178	"
25	179 5	"
28 5	215	"
32	193	"
39 5	222	AgF, $2\text{H}_2\text{O} + \text{AgF}$
108	205	AgF

(Guntz, A ch 1914, (9) **2** 101)Sp gr AgF + Aq at 18°

% AgF	Sp gr
7 20	1 07
29 60	1 38
49 20	1 82
56 40	2 09
66 20	2 62

(Guntz, A ch 1914, (9) **2** 104)

Data on solubility of AgF in HF + Aq are given by Guntz (l c)

Sol in liq NH_3 (Gore, Am Ch J 1898, **20** 829)+ H_2O Deliquescent Sol in H_2O (Guntz, A ch 1914, (9) **2** 101)+ $2\text{H}_2\text{O}$ Deliquescent Sol in H_2O (Guntz)+ $4\text{H}_2\text{O}$ Not deliquescent Sol in H_2O (Guntz)+ $\frac{5}{8}\text{H}_2\text{O}$ Unstable in the presence of crystals of $\text{AgF} + 2\text{H}_2\text{O}$ (Guntz, A ch 1914, (9) **2** 101)**Silver hydrogen fluoride, AgF, HF**

(Guntz)

 $\text{AgF}, 3\text{HF}$ Very unstableSol in HF (Guntz, Bull Soc 1895, (3) **13** 114)**Silver stannic fluoride**

See Fluostannate, silver

Silver tungstyl fluoride

See Fluoxtungstate, silver

Silver, fulminating

See Silver nitride

Silver hydride, AgHNot decomp by H_2O (Bartlett, Am Ch J 1896, **19** 52)**Argentous hydroxide, $\text{Ag}_2\text{O}_2\text{H}_2$** Sol in H_2O Known only in solution (Weltzen, A **142** 105)**Silver hydroxide, AgOH**Decomp into Ag_2O and H_2O above -40°

See Silver oxide

Argentous iodide, Ag₂I
(Guntz, R 112 861)

Silver iodide, AgI
Silver sulphamide, AgN(SO₂NH₂)₂+1½H₂O

Decomposes slowly in the air. Somewhat soluble in hot water, more soluble in boiling H₂O, from which it crystallizes on cooling. In aqueous solution it is precipitated by acids. Decomposes easily in dry pyridine, in pyridine + Aq (Hantzsch, B 1905, 38 15).

(SO₂)₂N₂ + 5½H₂O Nearly insol in hot H₂O (Ephraim and Michel, B 1909, 42 3845).

(SO₂)₂N₂ + 4H₂O (Ephraim and Michel)

(SO₂)₂N₂ + 1½, 11, and 28 H₂O in HNO₃ and NH₄OH + Aq

Sl sol in pyridine. Very sol in pyridine containing py nitrate and can be recryst (Ephraim and Michel)

(SO₂)₂N₂ + 8H₂O (Ephraim and Michel)

Silver iodide, AgI

Insol in H₂O

Calculate from electrical conductivity of AgI + Aq, AgI is sol in 1,074,040 pts H₂O at 28.4°, and 1420,260 pts at 40° (Holleman, Z phys C 12 130)

1 l H₂O dissolves 0.1 mg AgI at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

Solubility in H₂O = 1 × 10⁻⁸ N (Rolla)

Solubility in H₂O = 0.97 × 10⁻⁸ g mols per l (Edwin, Z phys Ch 1894, 13 645)

of AgI in H₂O at 25° is 1.05 × 10⁻⁸ (Thiel, Z anorg 1900, 24 57)

(in normal solution at 20.8° contains 0.0020 quiv per l (Kohlrausch, C C 1901, II 199)

A sat at × 10⁻⁸ g

1 l H₂O dissolves 0.0035 mg AgI at 21° (Kohlrausch, Z phys Ch 1904, 50 356)

1 l H₂O dissolves 0.00253 mg AgI at 60° (Sammet, Z phys Ch 1905, 53 644)

Solubility in H₂O = 1.23 × 10⁻⁸ g-mol per litre (A. F. Hill, J Am Chem Soc 1908, 30 74)

0.003 n are contained in 1 l of sat solution (Kohlrausch, Z phys Ch 1908, 64 168)

Insol in dil HNO₃ + Aq or H₃PO₄ + Aq

Decomposes in hot conc HNO₃ + Aq or H₂SO₄

Easily sol in conc HI + Aq

1 pt Aq dissolves in 2510 pts NH₄OH + sp gr (Martini, Schw J 56 154)

in 2453 pts of 0.89 sp gr (Wallace and Lamont, Chaz 1859 137)

1 g AgI dissolves in 26,300 g 10% NH₄OH-Aq (sp gr = 0.96) at 12°

Insol in 5% NH₄OH + Aq (Longi, Gazz ch it 13 87)

Coefficient of solubility in NH₄OH + Aq (density, 1.926) is found lower than previously observed and of the order of 1/8000 at 16° (Begniny, Bull Soc 1908, (4) 3 772)

According to Field, insol in cold conc KCl or NaCl + Aq, and only in traces on boiling, and separates out on cooling

100 g NaCl in conc NaCl + Aq dissolve 0.95 mg AgI at 15°, 100 g NH₄Cl in conc NH₄Cl + Aq dissolve 2.9 mg AgI at 15°, 95 g NaCl + 10 g KBr in conc solution dissolve 1.2 mg AgI at 15°, 100 g KBr + 225 g H₂O dissolve 430 mg AgI at 15°, 100 g KBr in conc KBr + Aq dissolve 525 mg AgI at 15°, 100 g KI + 69 g H₂O dissolve 89.8 g AgI at 15°, 100 g KI + 92 g H₂O dissolve 54.0 g AgI at 15°, 100 g KI + 366 g H₂O dissolve 7.25 g AgI at 15° (Schierholz, W A B 101, 2b 4)

Sol in conc KI + Aq, from which it is precipitated by H₂O (Field, C N 3 17)

KI gives a ppt with AgNO₃ in presence of 30,000 pts H₂O (Harting)

Solubility in KI + Aq at 15°

% KI	% AgI	% KI	% AgI
59 16	53 13	33 3	7 33
57 15	40	25 0	2 75
50 0	25 0	21 74	1 576
40 0	13 C	20	0 80

(Schierholz, W A B 1890, 101 2b 10)

Solubility in KI + Aq at 25°

Mol KI per l	g AgI per l
1 937	46 42
1 6304	24 01
1 482	15 46
1 406	12 55
1 018	3 47
1 008	3 32
0 734	1 032
0 586	0 512
0 335	0 0853

Hellwig, Z anorg 1900, 25 180)

Solubility in KI + Aq

t = 50

% AgI	% KI	Solid phase
2 5	24 8	AgI
16 0	33 8	"
28 0	36 7	"
39 0	38 1	"
51 8	36 2	"
53 5	36 5	"
53 5	36 6	AgI + AgI, KI
53 5	37 1	AgI, KI
53 4	37 6	KI + AgI, KI
50 4	40 2	KI
45 0	43 2	"
38 0	47 1	"
22 8	55 5	"
10 7	59 1	"

t = 30°		
% AgI	% KI	Solid phase
0 1	10 2	AgI
10 0	31 4	"
29 4	37 6	"
42 8	38 8	"
49 7	38 6	AgI + AgI, 2KI
49 6	39 5	AgI, 2KI
47 7	40 9	"
46 3	41 4	"
44 1	43 2	AgI, 2KI + KI
42 8	43 9	KI
35 8	46 9	"
16 0	55 5	"
0	60 35	"

t = 0°		
% AgI	% KI	Solid phase
0 2	9 8	AgI
1 5	20 5	"
6 5	26 1	"
26 6	34 6	"
28 1	36 4	"
38 0	41 3	AgI + AgI, KI
37 9	42 0	AgI, KI
37 6	42 7	"
37 9	44 0	AgI, KI + KI
31 3	46 6	KI
21 7	50 5	"
18 0	51 2	"
9 0	53 0	"
0	56 1	"
27 5	48 7	AgI, 2KI + KI
21 0	50 3	AgI, 2KI

(Van Dam and Donk, Chem Weekbl 1911, 8 848)

Very sol in KI₂ + Aq (Muth, Dissert 1895)

Very sol in H₂O in presence of NaI (Kurakow, Ch Z 1900, 24 60)

Solubility in KI + Aq at 15°

Composition of the sat solution in mols per 1000 mols H ₂ O		Solid phase
Mols Na ₂ I ₂	Mols Ag ₂ I ₂	
35 63	8 14	AgI
40 54	10 94	"
61 55	25 15	"
80 55	38 19	"
94 25	47 79	"
107 52	57 52	AgI + AgI, NaI, 3½H ₂ O
117 96	51 70	AgI, NaI, 3½H ₂ O
134 40	46 82	"
135 83	46 36	AgI, NaI, 3½H ₂ O + NaI
133 81	43 03	NaI
129 02	34 85	"
122 56	22 82	"
117 11	11 93	"
111 52		"

(Krym, J Russ Phys Chem Soc 1909, 41 382.)

Traces are dissolved by alkali nitrates + Aq. Easily sol in hot KOH + Aq, from which it is pptd by H₂O or alcohol. Not decomp by boiling KOH + Aq (Vogel, N Rep Pharm 20 129)

100 pts of AgNO₃ + Aq sat at 11° dissolve 2 3 pts AgI in the cold, and 12 3 pts on boiling (Schnauss)

Solubility of AgI in AgNO₃ + Aq at 25°

Mol AgNO ₃ in 1 l	g AgI in 1 l	Solid phase
0 20	0 0680	AgI
0 25	0 080	
0 30	0 090	
0 35	0 125	
0 40	0 167	
0 45	0 224	
0 50	0 299	
0 55	0 400	
0 60	0 528	
0 65	0 672	
0 70	0 850	
1 215	3 08	Ag ₂ INO ₃
1 63	6 26	
2 04	10 90	
2 54	16 1	Ag ₃ I(NO ₃) ₂
3 115	22 7	
3 75	33 2	
4 055	40 0	
4 69	53 2	
5 90	85 0	

(Hellwig, Z anorg 1900, 25 171)

Solubility of AgI in 25% AgNO₃ + Aq reaches a maximum at about 60° and at the point of maximum solubility the quantity dissolved amounts to about 5 g AgI per 100 g AgNO₃ (Lowry, Roy Soc Proc 1914, 91, A, 66)

Sol in hot Hg(NO₃)₂ + Aq, from which it crystallizes on cooling

Solubility of AgI in Hg(NO₃)₂ + Aq at 25°

Mols Hg(NO ₃) ₂ per l	g AgI per l	Mols Hg(NO ₃) ₂ per l	g AgI per l
0 010	0 800	0 050	1 737
0 0125	0 841	0 100	2 730
0 025	1 118	1 000	25 160

Solubility is not affected by presence of 0 1 to 2N HNO₃

(Morse, Z phys Ch 1902, 41 708)

Sol in KCN + Aq

Sl sol in Na₂S₂O₃ + Aq when suspended in much H₂O, but separates again on addition of KI + Aq (Field)

Insol in Na₂S₂O₃ + Aq (Fogh, C R 1890, 110 711)

Solubility in salts + Aq			
Solvent		% Conc	grams AgI sol in 100 grams solvent
Sodium thiosulphate		1	0.03
		5	0.15
		10	0.30
		15	0.40
		20	0.60
Sodium sulphite		10	0.01
		20	0.02
		Traces	
Ammonium sulphate		10	Traces
Potassium cyanide		5	8.23
Ammonium thiocyanide		5	0.02
		10	0.08
		15	0.13
Potassium		10	
Calcium		10	0.03
Barium		10	0.02
Aluminum		10	0.02
Thiocarbamide		10	0.79
Thiosemamine		1	0.008
		5	0.05
		10	0.09

(Valenta, M 1894 15 250)

Very soluble in liquid NH_3 (Franklin, Am Ch J 1898, 17 370)

Easily soluble in liquid NH_3 (Ruff and Geisel, B 1905, 38 62)

Insoluble in acetone (Eidmann, C C 1899, II, 1014), (Naumann, B 1904, 37 4329)

Insoluble in ethyl acetate (Bezold, Disserst 1906), (Naumann, B 1909, 42 3790)

Insoluble in C (Arcetowski, Z anorg 1894, 6 257)

Much less soluble in hot alcoholic thiourea than AgCl and AgBr (Reynolds, Chem Soc 1892, 61 253)

Insoluble in isonitrile (Naumann, B 1914, 47 137)

Slowly soluble in piperidine at 100° (Varet, C R 1892, 1 336)

0.10 pts dissolves in 100 pts pyridine at 10°

8.60 pts dissolve in 100 pts pyridine at 121° (Laszczyński, B 1894, 27 2288)

Mol wt determined in piperidine (Werner, Z anorg 1897, 15 16)

Min Iodine

Silver hydroiodide, 3AgI , $\text{HI} + 7\text{H}_2\text{O}$ (Berthelot, C R 91 1024)

Silver sodium iodide, 2AgI , NaI

Very soluble in acetone (Marsh, Chem Soc 1913, 103 78)

AgI , NaI $3\frac{1}{2}\text{H}_2\text{O}$ (Krym, J Russ Phys Chem Soc 1909, 41 382)

See $\text{AgI} + \text{I}$ under AgI

Silver iodide ammonia, AgI , NH_3

Soluble in liquid NH_3 (Jarry, A ch 1899, (7) 17 371)

2AgI , NH_3 (Rammelsberg, Pogg 48 170)

Composition is AgI , NH_3 (Longi, Gazz ch it 13 86)

Soluble in liquid NH_3 (Jarry, A ch 1899, (7) 17 371)

AgI , 2NH_3 (Terreil, C R 98 1279)

Silver nitride, Ag_3N

Berthollet's "knallsilber" Very explosive Insoluble in H_2O Soluble in $\text{KCN} + \text{Aq}$ Slowly soluble in $\text{NH}_4\text{OH} + \text{Aq}$ (Raschig, A 233 93) (Angeli, Chem Soc 1894, 66 (2) 93)

Argentous oxide, Ag_2O

Insoluble in H_2O Decomposed by acids into argentic oxide and silver Insoluble in $\text{NH}_4\text{OH} + \text{Aq}$ or $\text{HC}_2\text{H}_3\text{O}_2$ (v der Pfordten, B 20 1458)

Contains H, and is a hydroxide $\text{Ag}_4\text{H}_2\text{O}$ (v der Pfordten, B 21 2288)

The above substance is a mixture, according to Friedheim (B 20 2557)

Silver oxide, Ag_2O

Somewhat soluble in H_2O (Bucholz)

Soluble in 3000 pts H_2O (Bineau C R 41 509) sol in 96 pts H_2O (Abl)

Soluble in 15,360 pts H_2O (Levi, Gazz ch it 1901, 31 (1) 1)

Solubility in H_2O at $25^\circ = 2.16 \times 10^{-4}$ mols AgOH per litre (Noyes, J Am Chem Soc 1902, 24 1147)

1 liter sat aqueous solution at 19.96° contains 2.14×10^{-2} g, at 24.94° contains 2.5×10^{-2} g Ag_2O (Böttger, Z phys Ch 1903, 46 603)

1 l H_2O at 25° dissolves 1.8×10^{-4} gram—atoms of silver Determined from its solubility in NH_3 (Abegg and Cox, Z phys Ch 1903, 46 11)

1 l H_2O dissolves 0.0215 g Ag_2O at 20° (Whitby, Z anorg 1910, 67 108)

The solubility of Ag_2O in H_2O varies with the method of preparation

Solubility of Ag_2O (prepared by action of NaOH , freshly prepared by the solution of Na in H_2O , on a dil solution of AgNO_3) = 2.16×10^{-4} g-mol in 1 l H_2O at 25° , 2.97×10^{-4} g-mol at 50°

Solubility of Ag_2O (prepared by action of aqueous barium hydroxide on AgNO_3) = 2.23×10^{-4} g-mol in 1 l H_2O at 25° , 3.09×10^{-4} g-mol in 1 l H_2O at 50°

Solubility of Ag_2O (prepared by action of conc $\text{NaOH} + \text{Aq}$ on moist, freshly pptd AgCl) = 2.32×10^{-4} g-mol in 1 l H_2O at 25° , 3.55×10^{-4} g-mol at 50°

Solubility of Ag_2O (prepared by action of conc $\text{NaOH} + \text{Aq}$ on moist, freshly pptd Ag_2CO_3) = 2.95×10^{-4} g-mol in 1 l H_2O at 25° , 3.89×10^{-4} g-mol at 50° (Rebiere, Bull Soc 1915, (4) 7 311)

Soluble in acids, NH_4OH , and $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ Decomposed by alkali chlorides, bromides,

and iodides + Aq Sol in alkali cyanides, and thiosulphates + Aq Sl sol in nitrates + Aq, insol in sulphates + Aq When freshly pptd, sol in NH_4SCN + Aq Sl sol in NH_4NO_3 + Aq Abundantly sol in $\text{Ba}(\text{NO}_3)_2$ + Aq without pptn of BaO_2H_2 Sol in boiling $\text{Mn}(\text{NO}_3)_2$, $\text{Ni}(\text{NO}_3)_2$, $\text{Co}(\text{NO}_3)_2$, $\text{Cu}(\text{NO}_3)_2$, and $\text{Ce}_2(\text{NO}_3)_6$ + Aq with pptn of oxides (Persoz)

Insol in KOH, and NaOH + Aq Sl sol in BaO_2H_2 + Aq (Berzelius ?)

Solubility in NH_4OH + Aq at 25°

G at Ag per l	Mol NH_3 per l
0 0654	0 214
0 0658	0 220
0 134	0 458
0 140	0 469
0 205	0 671
0 205	0 684
0 225	0 720
0 224	0 733
0 251	0 811
0 248	0 827
0 242	0 830
0 257	0 876
0 278	0 899
0 276	0 915
0 299	0 999
0 343	1 147
0 454	1 498
0 470	1 522

(Whitney and Melcher, J Am Chem Soc 1903, 25 78)

Insol in liquid NH_3 (Franklin, Am ch J 1898, 20 829)

Insol in acetone (Eidmann, C C 1899, II 1014), (Naumann, B 1904, 37 4329)

Insol in ethyl acetate (Hamers, Dissert 1906, Naumann, B 1910, 43 314)

Sl sol in amylamine + Aq, easily in methylamine + Aq (Wurtz, A ch 30 453), also in ethylamine, and thiosinamine + Aq

Solubility in methylamine + Aq at 18°

G mols per l

CH_3NH_2	Ag
0 1	0 0221
0 5	0 118
1 0	0 228

(Euler, B 1903, 36 2879)

Solubility in ethylamine + Aq at 18°

G mols per l

$\text{C}_2\text{H}_5\text{NH}_2$	Ag
0 1	0 0322
0 5 (interpolated)	0 160
1 0 "	0 314
0 561	0 180
0 927	0 291

(Euler)

Silver peroxide, Ag_2O_2

Sol in conc H_2SO_4 (Rose), and in pure HNO_3 + Aq without decomp Sol in NH_4OH + Aq (Schönbein, J pr 41 321)

Sol in HNO_3 and H_2SO_4 with decomp (Mulder, R t c 1898, 17 151)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Silver oxide ammonia

See Silver nitride

Silver oxybromide, Ag_7OBr_7

Insol in H_2O Insol in HNO_3 Sol in hot ammonia and in NaOCl + Aq (Seyewetz C R 1912, 154 357)

Silver oxyfluoride, AgF , AgOH

Decomp by H_2O with separation of Ag_2O (Pfaundler)

Silver per oxyfluoride, $2\text{Ag}_2\text{O}_4$, AgF

(Tanatar, Z anorg 1901, 28 335)

$4\text{Ag}_2\text{O}_4$, 3AgF (Tanatar, Z anorg 1901 28 335)

Silver oxyiodide, Ag_2O , Ag_5I_7

(Seyewitz, Bull Soc 1894, (3) 11 452)

Silver phosphide, AgP_2

Sol in HNO_3 Attacked by aqua regia (Granger, C R 1897, 124 897)

Ag_3P_5 Insol in HCl + Aq, easily sol in HNO_3 + Aq (Schrotter, J B 1849 247)

Ag_2P_5 (Hackspill, C R 1913, 157 720)
 Ag_3P (?) (Fresenius and Neubauer, anal 1 340)

Silver phosphoselenide, Ag_2Se , P_2Se

Insol in H_2O or HCl + Aq Sol in HNO_3 Ac Insol in cold, decomp by hot alkalis Aq (Hahn, J pr 93 436)

$2\text{Ag}_2\text{Se}$, P_2Se_3 Insol in H_2O , HCl , HNO_3 + Aq, slowly sol in red fuming HNO_3 (Hahn, J pr 93 440)

$2\text{Ag}_2\text{Se}$, P_2Se_5 Sol only in fuming HNO_3 (Hahn)

Silver phosphosulphide, $2\text{Ag}_2\text{S}$, P_2S

Ag_2S , P_2S_3 (Berzelius, A 46 254)

$2\text{Ag}_2\text{S}$, P_2S_5 Easily sol in HNO_3 + A without separation of P (Berzelius)

$\text{Ag}_3\text{P}_2\text{S}$ (Berzelius)

$\text{Ag}_3\text{P}_2\text{S}_3$ Easily attacked by hot conc HCl Sl decomp Insol in hot HNO_3 D comp by aqua regia (Ferrand, A ch 189 (7) 17 413)

Silver selenide, Ag_2Se

Sol in boiling HNO_3 + Aq as Ag_2SeCl which separates out by dilution with H_2O (Berzelius)

Insol in $\text{Hg}_2(\text{NO}_3)_2$ + Aq (Wackenrodt, A 41 327)

Min Na *nannte* Insol in dil, but sol
in conc H₂O₂+Aq

Silver sulphide (silver thionyl amide),
SO₂(N₂Ag)₂
Insol in yridine (Hantzsch and Holl, B
1901, **34** 3
+H₂O (Ephraim and Gurevitch, B
1910, **43** 1)

Argentous sulphide, Ag₂S
Easily sol in warm dil HNO₃+Aq, and in
conc H₂SC without separation of S Sol in
conc KCN +Aq (v der Pfordten, B **20**
1458, Gunt C R **112** 861)

Silver sulphide, Ag₂S
Less sol in H₂O than AgI (Lucas, Z
anorg **190** **41** 210)
1 l H₂O dissolves about 4×10⁻¹¹ g at Ag
as Ag₂S at 3° (Bernfeld, Z phys Ch **1898**,
25 72)
1 l H₂O dissolves 0.8×10⁻⁶ g mols at
16-18° (Hantzsch, Z phys Ch **1907**, **58** 291)
1 l H₂O dissolves 0.552×10⁻⁶ g mols
Ag₂S at 18° (Weigel, Z phys Ch **1907**, **58**
294)

Sol in conc HNO₃+Aq with separation
of S Sol in hot conc HCl+Aq Not decomp
by CuCl₂+Aq, but by CuCl₂+NaCl
+Aq Insol in NH₄OH+Aq Insol in
H₂SO₄+Aq or in Hg(NO₃)₂+Aq
Insol in H₂O, dil acids, alkalis, and alkali
sulphides+Aq (Fresenius)
Sol in CN+Aq (Hahn, C C **1870**
240)

Pptd Ag₂S is very sol in HNO₃ containing
more than 5% HNO₃ (Gruener, J Am
Chem Soc **1910**, **32** 1032)

Only very sol in AgNO₃+Aq, even at
100° (Lowe, Roy Soc Proc **1914**, **91**, A
70)

Sol in CN+Aq (Hahn, C C **1870**
240)

Difficult sol in KCN+Aq, less difficultly
if Ag₂S is pptd from a very dil solution
Amt of K₂CN present also has influence on
the solubility Ag₂S dissolved in conc KCN
+Aq separates out on dilution (Béchamp,
J pr **60** 6)

Insol in H₄Cl or NH₄NO₃+Aq (Brett)
Min Ar *nannte* *Acanthite* Sol in conc
HNO₃+Aq with separation of S
Sol in tritic acid+Aq with addition of
KNO₃ (Hilton, C N **37** 48)

Silver disulphide, Ag₂S₂

Sol in H₂O with decomp, also sol with
decomp in Cl₂, HNO₃, CS₂ does not dissolve
out S (Hantzsch, Z anorg **1898**, **19** 105)

Silver sodium sulphide, 3Ag₂S, Na₂S+2H₂O
Sol in conc Na₂S+Aq with decomp, sol
in H₂O with decomp (Ditte, C R **1895**,
120 93)

Silver zinc sulphide, Ag₂S, 3ZnS
(Schneider, J pr (2) **8** 29)

Silver sulphamide (silver thionyl amide),
SO₂N₂Ag

Very sol in cold, more sol in hot H₂O
Very sol in dil HNO₃ (Traube, B **1892**,
25 2474)

Silver sulphophosphide

See Silver phosphosulphide

Silver telluride, Ag₂Te

Min *Hessite* Sol in warm HNO₃+Aq

Sodammonium, Na₂(NH₃)₂

100 g liq NH₃ dissolve 60.5 g at -23°,
56.4 g at 0°, 56 g at +5°, 55 g at 9° (Joannis
A ch **1906**, (8) **7** 41)

Sodium, Na₂

Violently decomposes H₂O, alcohol, etc
Insol in hydrocarbons Easily sol in acids
with violent action

Solubility in fused NaOH

G sol in 100 g fused NaOH at temp

t°	G per 100 g NaOH
480	25.3
600	10.1
610	9.9
670	9.5
760	7.9
800	6.9

(Hevesy, Z Elektrochem **1909**, **15** 531)

Insol in liquid CO₂ (Buchner, Z phys
Ch **1906**, **54** 674)

Sol in liquid NH₃ (Franklin, Am Ch J
1898, **20** 829)

1 gr atom dissolves —

at +22° in 6.14 mol liquid NH ₃	
" 0° " 5.87	" "
" -30° " 5.52	" "
" -50° " 5.39	" "
" -70° " 5.20	" "
" -105° " 4.98	" "

(Ruff, B **1900**, **39** 839)

½ ccn oleic acid dissolves 0.0449 g Na₂
in 6 days (Gates, J phys Chem **1911**, **15**
143)

Insol in ethylamine and in secondary and
tertiary amines (Krius, J Am Chem Soc
1907, **29** 1561)

Sodium acetylde acetylene, Na₂C₂, C₂H₂

Very deliquescent Decomp by H₂O and
by absolute alcohol Insol in ether, ligroin,
etc (Moissan, C R **1898**, **127** 915)

Sodium amalgam

NaHg_8 Stable in contact with the liquid amalgam from 0° – 40.5° . Can be cryst from Hg without decomp at any temp between these limits

NaHg_8 Stable in contact with the liquid amalgam from 40.5° – 150° . Can be cryst from Hg without decomp at any temp between these limits (Kerp, Z anorg 1900, '5 68)

sodium amide, NaNH_2

Decomp by H_2O and alcohol

undipchloride, $\text{Na}_2\text{NH}_2\text{Cl}$

H_2O with decomp (Joannis, C R)

" arsenide, Na_3As

mp H_2O (Lebeau, C R 1900, 130

sodium arsenide ammonia, $\text{Na}_3\text{As}, \text{NH}_3$

Easily sol in liquid NH_3 (Lebeau, C R 1900, 130 502)

Sl sol in liquid NH_3 (Hugot, C R 1898, 127 554)

Sodium azomide, NaN_3

Not hygroscopic Sol in H_2O Insol in alcohol and ether (Curtius, B 24 3344)

40.16 pts are sol in 100 pts H_2O at 10°

40.7 " " " " 100 " H_2O " 15.2

41.7 " " " " 100 " H_2O " 17.0

0.3153 pt is sol in 100 pts abs alcohol at 16°

Insol in pure ether (Curtius, J pr 1898, (2) 58 279)

Sodium bromide, NaBr , and $+2\text{H}_2\text{O}$

Not deliquescent Solubility in H_2O differs according as NaBr or $\text{NaBr}+2\text{H}_2\text{O}$ is used. The following data for anhydrous NaBr were found

Pts NaBr dissolved by 100 pts H_2O at t°

t°	Pts NaBr	t°	Pts NaBr	t°	Pts NaBr
44.1	115.6	74.5	118.4	97.2	119.9
51.5	116.2	80.5	118.6	100.3	120.6
55.1	116.8	86.0	118.8	110.6	122.7
60.3	117.0	90.5	119.7	114.3	124.0
64.5	117.3				

Solubility is represented by a straight line of the formula $S = 110.34 + 0.1075t$

Below 50° the salt usually crystallizes with

$2\text{H}_2\text{O}$, of which the solubility in 100 pts H_2O was found to be as follows

t°	Pts NaBr	t°	Pts NaBr	t°	Pts NaBr
-21	71.1	+5	82.0	30	97.3
-20	71.4	10	84.5	35	101.3
-15	73.1	15	87.3	40	105.8
-10	75.1	20	90.3	45	110.6
-5	77.1	25	93.8	50	116.0
0	79.5				

(Coppet, A ch (5) 30 420)

If solubility $S = \text{pts NaBr in 100 pts solution}$, $S = 40.0 + 0.1746t$ from -20° to $+40^\circ$, $S = 52.3 + 0.0125t$ from 50° to 150° (Étard, C R 98 1432)

100 pts H_2O dissolve at 0° , 77.5 pts NaBr , at 20° , 88.4 pts, at 40° , 104.2 pts, at 60° , 111.1 pts, at 80° , 112.4 pts, at 100° , 114.9 pts (Kremers)

Sat solution boils at 121° (Kremers, Pogg 97 14)

Sat $\text{NaBr} + \text{Aq}$ contains at

-22°	-10°	$+140^\circ$	163°
40.1	42.5	56.5	57.5% NaBr

180°	180°	210°	212°	230°
59.5	59.0	60.9	61.0	62.0% NaBr

(Étard, A ch 1894, (7) 2 539)

100 g sat $\text{NaBr} + \text{Aq}$ at 16.4° contain 47 g NaBr (Greenish, Pharm J 1900, 65 190)

Solubility of $\text{NaBr} + 2\text{H}_2\text{O}$ in H_2O at $30^\circ = 65.5\%$ anhydrous NaBr (Cocheret, Dissert 1911)

Sp gr of $\text{NaBr} + \text{Aq}$ at 19.5° containing

5	10	15	20	25 % NaBr
1.040	1.080	1.125	1.174	1.226

30	35	40	45	50 % NaBr
1.281	1.334	1.410	1.483	1.565

(Gerlach, Z anal 8 285)

$\text{NaBr} + \text{Aq}$ containing 17.15% NaBr has sp gr $20^\circ/20^\circ = 1.1473$

$\text{NaBr} + \text{Aq}$ containing 22.72% NaBr has sp gr $20^\circ/20^\circ = 1.2060$

(Le Blanc and Rohland, Z phys Ch 1896, 19 278)

Sp gr of $\text{NaBr} + \text{Aq}$ at 20.5°

Normalty of $\text{NaBr} + \text{Aq}$	g NaBr in 100 g of solution	Sp gr $20.5^\circ/4^\circ$
4.33	33.57	1.3284
3.00	25.10	1.2284
1.99	17.77	1.1526
0.98	9.41	1.0750

(Oppenheimer, Z phys Ch 1898, 27 452)

Sp gr	gr	t 20° of NaBr+Aq containing
M g	mols	NaBr per liter
M	(0	0 025 0 05 0 075
Sp gr	1 0	1 732 1 002177 1 004074 1 005972
M	(0	0 25 0 50 0 75
Sp gr	1 0	1 088 1 01964 1 03908 1 05811
M	(1	1 5 2 0
Sp gr	1 0	1 032 1 11963 1 15240

(Jones and Pearce, Am Ch J 1907, 38 728)

Sol in H_2SO_4 (Walden, Z anorg 1902, 29 384)

100 pts NaBr+Aq sat at 18-19° contain 46 05 pts NaBr, 100 pts NaBr+NaCl+Aq sat at 18 9° contain 46 59 pts of the two salts, 100 s NaBr+NaI+Aq sat at 18-19° contain 6 15 pts of the two salts, 100 pts NaBr+N 1+NaI+Aq sat at 18-19° contain 63 20 pts of the three salts (v Hauer, J pr 98 17)

Solubili of NaBr in NaOH+Aq at 17°
(G per 100 g H_2O)

NaOH	NaBr	NaOH	NaBr
0 0	91 38	22 35	59 60
3 26	79 86	24 74	55 03
9 24	68 85	28 43	48 00
13 43	64 90	36 61	38 41
17 17	63 06	46 96	29 37
19 12	62 51	54 52	24 76

(Attc, C R 1897, 124 30)

Easily sol in liquid HF (Franklin, Z anorg 1907, 46 2)

Very sl sol in alcohol
NaBr+ H_2O is sol in 1 10 pts H_2O at 15°, in 1 pts absolute alcohol at 15°, in 1200 pts absolute ether at 15° (Fder, Dingl 22 89)

NaBr+ H_2O is sol in 2 25 pts 60% alcohol, and 90% alcohol NaBr is sol in 3 pts 60% alcohol, and 10 pts 90% alcohol (Hager)

100 pt absolute methyl alcohol dissolve at 19 5° (de Bruyn, Z phys Ch 10 783)

100 g aBr+ CH_3OH contain 0 9 g NaBr at the critical temp (Centnerszwer, Z phys Ch 1910, 72 437)

At room temp, 1 pt NaBr by weight is sol in

4 6 ts methyl alcohol D^{15} 0 7990
14 0 " ethyl " D^{15} 0 8100
49 7 " propyl " D^{15} 0 8160

(Rol and, Z anorg 1898, 18 325)

Solubility in ethyl alcohol at 30°

Wt %		Solid phase
Alcohol	NaBr	
0	59 4	NaBr, $2\text{H}_2\text{O}$
11 79	42 90	"
31 78	32 12	"
43 22	26 79	"
54 59	20 83	"
65 51	16 08	"
72 36	13 41	"
76 92	12 03	NaBr, $2\text{H}_2\text{O}$ +NaBr
87 35	7 44	NaBr
97 08	3 01	"

(Cocheret, Dissert 1911)

Solubility in mixtures of methyl and ethyl alcohol at 25°

P = % methyl alcohol in the solvent
G = g NaBr in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0 00	0 293	0 8189
4 37	0 365	0 8265
10 40	0 404	0 8273
41 02	0 724	0 8593
80 69	1 251	0 9079
84 77	1 286	0 9104
91 25	1 432	0 9235
100 00	1 440	0 9238

(Herz and Kuhn, Z anorg 1908, 60 155)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NaBr in 10 ccm of the solution
S = Sp gr of the sat solution

I	G	S 25 /4
0	1 440	0 9238
11 11	1 243	0 9048
23 8	1 053	0 8887
65 2	0 442	0 8390
91 8	0 147	0 8153
93 75	0 126	0 8144
100	0 074	0 8093

(Herz and Kuhn, Z anorg 1908, 60 156)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NaBr in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	0 293	0 8189
8 1	0 249	0 8147
17 85	0 247	0 8145
56 6	0 190	0 8107
88 6	0 111	0 8116
91 2	0 083	0 8083
95 2	0 082	0 8090
100	0 074	0 8093

(Herz and Kuhn, Z anorg 1908, 60 159)

2 05 g are sol in 100 g propyl alcohol (Schlamp, Z phys Ch 1894, 14 276)

Sl sol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

100 g 95% formic acid dissolve 22 3 g NaBr at 18 5° (Aschan, Ch Ztg 1913, 37 1117)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314), benzonitrile (Naumann, B 1914, 47 1370)

The composition of the hydrates formed by NaBr at different dilutions is calculated from determinations of the lowering of the frpt produced by NaBr and of the conductivity and sp gr of NaBr + Aq (Jones, Am Ch J 1905, 34 303)

Sodium stannic bromide

See Bromostannate, sodium

Sodium uranous bromide, Na₂UBr₃

As K salt (Aloy, Bull Soc 1899, (3) 21 264)

Sodium zinc bromide, NaBr, ZnBr₂ + H₂O

Hygroscopic (Ephraim, Z anorg 1908, 59 63)

2NaBr, ZnBr₂ + 5H₂O Hygroscopic (Ephraim)

Sodium carbide, Na₂C₂

Insol in all neutral solvents, decomp on heating and by H₂O (Matignon, C R 1897, 125 1034)

Sodium carbonyl, Na₂C₂O₂

Decomp by H₂O with explosion (Joannis, C R 116 1518)

Sodium subchloride, NaCl₂

Decomp by H₂O into NaCl and NaOH + Aq (Kreutz, B 1897, 30 403)

Sodium chloride, NaCl

Sol in H₂O

100 pts H₂O at t° dissolve pts NaCl

t°	Pts NaCl	Authority
0	More than at 13 89°	Gay Lussac A ch (2) 11 310
13 89	35 81	
16 90	35 88	
59 93	37 14	
109 73	40 38	
120	35 91	Fehling A 77 382
100	39 92	
18 75	37 731	Bischof
10-15	35 42	Bergmann
106+	42 86	Griffiths 1825
20	35 9	Schiff A 109 326
All temps	37	Fuchs and Reichenbach 1826
25	35 7	Kopp A 34 262
18 75	36 53	C J B Karsten 1840
1	36 121	
18 75	36 724	
100	41 076	G Karsten
1 25 Boiling	36 119	Unger J pr 8 285
	39 324	
18 75	35 40	Karsten (?) cited by Unger l c
100	36 95	
15 56	34 2-35 42	Ure s Diet
100	36 16	
15	35 837	Michel and Kraft

1 pt NaCl is sol in 2 789 pts H₂O at 15° (Gerlach) in 3 pts H₂O at 18 75° (Abt) in 2 8235 pts H₂O at ord temp (Bergmann) in 2 7647 pts boiling H₂O (Bergmann) in 2 857 pts hot or cold H₂O (Fourcroy)

Not deposited from boiling aqueous solution unless the vessel containing it is open to the air (Unger l c)

Solubility in 100 pts H₂O at t°

t°	Pts NaCl	t°	Pts NaCl
1 5	33 6	70	38 1
13 75	35 8	108 5	39 4

(Nordenskjöld Pogg 136 315)

Solubility in 100 pts H₂O at t°

t°	Pts NaCl	t°	Pts NaCl
13 89	35 8	59 93	37 1
16 90	35 9	109 73	40 4

(Gay Lussac A ch 11 296)

Solubility of NaCl at various pressures The figures represent pts NaCl in 100 pts sat NaCl + Aq at t° and A pressure in atmospheres

A	0°	9°	12°	15°	20°	25	30°
1	26 25	26 32	26 35	26 30	26 35	26 37	26 47
20	26 35	26 38		26 39	26 37	26 47	26 53
40	26 44			26 40			

(Müller Pogg 117 386)

10	pts H ₂ O dissolve at t°		
t°	Pts NaCl	t°	Pts NaCl
-15	32 73	40	36 64
-10	33 49	50	36 98
-5	34 22	60	37 25
0	35 52	70	37 88
5	35 63	80	38 22
9	35 74	90	38 87
14	35 87	100	39 61
25	36 13	109 7	40 35

(P gale, A ch (3) 8 649)

100 pts	H ₂ O dissolve at		
0°	12°	15°	
35 59	37 72	35 77	35 68 pts NaCl,

20°	25°	30°	
35 7	35 81	36 00	pts NaCl
(Fuller, Pogg 122 337)			

100 pts	H ₂ O dissolve			35 76-36 26 pts
NaCl at 1'	° and the sp gr of sat solution			
= 1.204	Page and Keightley, Chem Soc			
(2) 10 566	NaCl + Aq sat at 18-19° contain			
100 pts	aCl (v Hauer, J pr 98 137)			
26 47 pts				

Solubility of NaCl in 100 pts H₂O at t°

t°	Pts Na	t	Pts NaCl	t°	Pts NaCl
0	35	30	36 3	60	37 3
1	35	31	36 3	61	37 3
2	35	32	36 3	62	37 4
3	35	33	36 4	63	37 4
4	35	34	36 4	64	37 5
5	35	35	36 4	65	37 5
6	35	36	36 5	66	37 6
7	35	37	36 5	67	37 7
8	35	38	36 5	68	37 7
9	35	39	36 6	69	37 8
10	35	40	36 6	70	37 9
11	35	41	36 6	71	37 9
12	35	42	36 7	72	38 0
13	35	43	36 7	73	38 0
14	35	44	36 8	74	38 1
15	35	45	36 8	75	38 2
16	35	46	36 8	76	38 2
17	35	47	36 9	77	38 2
18	35	48	36 9	78	38 2
19	36	49	36 9	79	38 3
20	36	50	37 0	80	38 4
21	36	51	37 0	81	38 4
22	36	52	37 0	82	38 5
23	36	53	37 1	83	38 6
24	36	54	37 1	84	38 6
25	36	55	37 1	85	38 7
26	36	56	37 2	86	38 7
27	36	57	37 2	87	38 8
28	36	58	37 2	88	38 9
29	36	59	37 3	89	39 0

Solubility of NaCl in 100 pts H₂O at t° —
Continued

t	Pts NaCl	t°	Pts NaCl	t°	Pts NaCl
90	39 1	97	39 5	104	40 0
91	39 1	98	39 6	105	40 1
92	39 2	99	39 7	106	40 1
93	39 3	100	39 8	107	40 2
94	39 3	101	39 8	108	40 3
95	39 4	102	39 9	109	40 3
96	39 4	103	40 0	109 7	40 4

(Calculated by Mulder from his own and other observations, Scheik Verhandel 1864 37)

Solubility in 100 pts H₂O at

0-4°	20°	40°	60°	80°
35 630	35 825	36 32	37 06	38 00

(Andreae, J pr (2) 29 456)

Solubility in 100 pts H₂O from most careful experiments

0°	20°	60°	80°
35 571	35 853	37 091	38 046
(Raupenstrauch, M Ch 6 563)			

Solubility of NaCl in 100 pts H₂O at t°

t	Pts NaCl	t°	Pts NaCl
-14 0	32 5	44 75	36 64
-13 8	32 15	52 5	37 04
-6 25	34 22	55 0	36 99
-5 95	34 15	59 75	37 31
0	35 7	71 3	37 96
3 6	35 79	74 45	37 96
5 3	35 8	82 05	38 41
14 45	35 94	86 7	38 47
20 85	35 63	93 65	38 90
25 45	35 90	101 7	40 76
38 55	36 52		

Solubility above 20° is represented by the formula $S = 34.359 + 0.0527t$ (Coppet, A ch (5) 30 426)Solubility of NaCl in 100 pts H₂O at high temp

t°	Pts NaCl	t°	Pts NaCl
118	39 8	160	43 6
140	42 1	180	44 9

(Tilden and Shenstone, Phil Trans 1884 23)

Sat NaCl+Aq contains % NaCl at t°

t°	% NaCl	t°	% NaCl
-21	23 7	77	28 0
-21	23 4	90	28 2
-18	23 5	115	29 1
-17	23 3	135	28 9
- 7	25 5	140	28 8
0	25 8	150	29 6
+15	26 7	180	30 2
55	26 8	215	31 6

(Étard, A ch 1894, (7) 2 532)

100 g H₂O dissolve 0.616 gram-equivalent NaCl at 25° (Van't Hoff and Meyerhoffer, Z phys Ch 1904, 49 315)

Solubility of NaCl in H₂O at t°

Most careful experiments

t°	g NaCl per 100 g H ₂ O	Sp gr	t	g NaCl per 100 g H ₂ O	Sp gr
		.090	61 70	37 28	1 1823
		.020	75 65	37 82	1 1764
		.956	90 50	38 53	1 1701
		1.891	107	39 65	1 1631

(Berkeley, Phil Trans Roy Soc 1904, 203 A 189)

Sat NaCl+Aq at 25° contains 26.5% NaCl (Foote, Am Ch J 1906, 35 239)

100 g H₂O dissolve 35.80 g NaCl at 25° (Cameron, Bell and Robinson, J phys Ch 1907, 11 396)

100 g NaCl+Aq sat at 15° contains 26.3 g NaCl, at 30°, 26.47 g (Schreinemakers, Arch neér Sc 1910, (2) 15 81)

5.456 g mol are contained in 1 l NaCl+Aq sat at 25° (Herz, Z anorg 1911, 73 274)

5.40 g mol are contained in 1 l NaCl+Aq sat at 30° (Masson, Chem Soc 1911, 99 1136)

26.47 g NaCl are contained in 100 g NaCl+Aq sat at 30° (Cocheret, Dissert 1911)

35.79 g NaCl are sol in 100 g H₂O at room temp (Frankforter, J Am Chem Soc 1914, 36 1106)

100 mol H₂O dissolve at

19 3° 29 7° 40 1° 54 5°
11 04 11 06 11 15 11 35 mol NaCl

(Sudhaus, Miner Jahrb Beil Bd 1914, 37 18)

Solubility of NaCl in H₂O at 24.5° at varying pressures

S = g NaCl in 100 g solvent

P = pressure in atmospheres

P	S	100 g of solution contains g NaCl
1	35 90	26 42
250	36 25	26 61
500	36 55	26 77
1000	37 02	27 02
1500	37 36	27 20

(Cohen, Inouye and Euwen, Z phys Ch 1910, 75 257)

Sp gr of NaCl+Aq containing 15% NaCl is 1.109 at 15° (Francœur) 1.116 at 15° (Soubeiran) 1.1107 at 15° (Couher) 1.111 at 15° (Baudin C R 63 932)

Sp gr of NaCl+Aq saturated at 15° is 1.20715 (Michel and Kraft) at 17.5° is 1.2046 (Karsten) at 8° is 1.205 (Anthon)

Sp gr of NaCl+Aq

% NaCl	Sp gr	% NaCl	Sp gr	% NaCl	Sp gr
5	1 037	15	1 112	25	1 192
10	1 074	20	1 154	26 43	1 204

(Dahlmann J B 7 321)

Sp gr of NaCl+Aq at 20°

% NaCl	Sp gr	% NaCl	Sp gr
1	1 0066	15	1 1090
2	1 0133	16	1 1168
3	1 0201	17	1 1247
4	1 0270	18	1 1327
5	1 0340	19	1 1408
6	1 0411	20	1 1490
7	1 0483	21	1 1572
8	1 0556	22	1 1655
9	1 0630	23	1 1738
10	1 0705	24	1 1822
11	1 0781	25	1 1906
12	1 0857	26	1 1990
13	1 0934	27	1 2075
14	1 1012		

(Schiff, A 110 76)

Sp gr of NaCl+Aq at 19.5°

% NaCl	Sp gr	% NaCl	Sp gr
6 402	1 0460	22 631	1 1712
12 265	1 0895	26 530	1 2036
17 533	1 1303		

(Kremers, Pogg 95 120)

Sp gr of NaCl+Aq at 15°

% NaCl	Sp gr	% NaCl	Sp gr
1	1 00725	15	1 11146
2	1 01450	16	1 11938
3	1 02174	17	1 12730
4	1 02899	18	1 13523
5	1 03624	19	1 14315
6	1 04366	20	1 15107
7	1 05108	21	1 15931
8	1 05851	22	1 16755
9	1 06593	23	1 17580
10	1 07335	24	1 18404
11	1 08097	25	1 19228
12	1 08859	26	1 20098
13	1 09622	26 395	1 20433
14	1 10384		

Gerlach, Z anal 8 279)

Sp gr of NaCl+Aq at 18°

% NaCl	Sp gr	% NaCl	Sp gr
5	1 0345	25	1 1898
10	1 0707	26	1 1982
15	1 1087	26 4	1 2014
20	1 1477		

(Kohlrausch, W Ann 1879 1)

Sp gr of NaCl+Aq at 20°, containing
mols H₂O to 1 mol NaCl

n	Sp gr	n	Sp gr
12 5	1 15292	100	1 02069
25	1 08207	200	1 00965
50	1 04227		

Mirignac, J B 1870 110)

Sp gr of NaCl+Aq at 0° N₁Cl=g NaCl
to 0 g H₂O, d°=sp gr at 0°, d^r=
max sp gr, l=temp of maximum

G NaCl	d	d ^r	l
0	1 00000	1 000130	+ 4°
0 5	1 003925	1 003988	+ 3
1	1 007634	1 007666	+ 1 77
2	1 015366	1 015367	— 0 58
3	1 023530	1 023583	— 3 24
4	1 030669	1 030890	— 5 63
6	1 045975	1 046952	—11 07

Rosetti, A ch (4) 17 382)

Sp gr of NaCl+Aq at 20° x=mols NaCl
to 100 mols H₂O

x	Sp gr	x	Sp gr
0 5	1 01145	4 0	1 08408
1 0	1 02255	5 0	1 10276
2 0	1 04393		

(Nicol, Phil Mag (5) 16 122)

Sp gr of NaCl+Aq at 0° S=weight of salt
in 100 g of solution of the given sp gr,
S₁=No mols of salt contained in 100
mols of the solution

S	S ₁	Sp gr
23 0821	8 627	1 1821
19 1932	6 769	1 1502
14 3415	4 898	1 1111
9 4120	3 097	1 0722
5 1536	1 644	1 0394

(Charpy, A ch (6) 29 23)

Sp gr of NaCl+Aq

G equivalents NaCl per liter	t°	Sp gr t°/t°
0 005028	18 549	1 0002119
0 01005	18 550	1 0004258
0 02005	18 538	1 000848
0 04983	18 509	1 002101
0 09873	18 525	1 004143
0 19388	18 542	1 008093
0 28999	18 559	1 012053
0 47574	18 558	1 019627
0 49860	18 06	1 02054
4 9860	17 85	1 18783
0 00259	14 07	1 0001108
0 005178	14 076	1 0002210
0 010318	14 097	1 0004401
0 12580	14 097	1 005315
0 25019	14 076	1 010505

(Kohlrausch, W Ann 1894, 53 26)

Sp gr of NaCl+Aq at 18°/18°

g equivalents of NaCl in 1 liter of solution	Sp gr
0 005	1 0002104
0 010	1 0004206
0 020	1 0008476
0 050	1 002109
0 100	1 004205

(Tammann, Z phys Ch 1895, 16 93)

Sp gr of NaCl+Aq sat 18°0', when p=percent strength of solution, d=observed density, and w=volume conc in grams per cc ($\frac{pd}{100}=w$)

p	d	w
25 37	1 1928	0 30263
21 25	1 1592	0 24637
17 35	1 1277	0 19503
13 25	1 0958	0 14518
9 34	1 0665	0 09960
4 810	1 0332	0 04969
2 991	1 0202	0 03052
2 593	1 0173	0 2638
1 746	1 0111	0 01765

(Barnes J Phys Chem 1898, 2 544)

Sp gr of NaCl+Aq at 20 5°

Normality of NaCl+Aq	G NaCl in 100 g of solution	Sp gr 20 5°/4°
3 97	20 22	1 1489
2 96	15 56	1 1124
2 01	10 90	1 0775
0 97	5 49	1 0373

(Oppenheimer Z phys Ch 1898, 27 451)

Sp gr of NaCl+Aq at 15°

Per cent NaCl	Sp gr
0	1 00000
5	1 03624
10	1 07335
15	1 11146
20	1 15107
25	1 19228
Sat at 15°	1 20433

(H C Hahn, J Am Chem Soc 1898, 20 622)

Sp gr of NaCl+Aq at 18°/4°

g NaCl in 100 g of solution	Sp gr
0 19560	1 0001
0 097952	0 9994
0 065410	0 99918
0 048977	0 99905

(Jahn, Z phys Ch 1900, 33 572)

Sp gr 20°/4° of a normal solution of NaCl =1 03866 (Haugh, J Am Chem Soc 1912, 34 1151)

Sp gr of sat NaCl+Aq at t°

t°	g NaCl sol in 100 g H ₂ O	Sp gr
-10°	32 90	1 200
0	35 63	1 210
10	35 69	1 205
20	35 82	1 202
30	36 03	1 198
40	36 32	1 193
50	36 67	1 189
60	37 06	1 184
70	37 51	1 178

(Tscherna, J Russ Phys Chem Soc 1912, 44 1565)

Sp gr of dil NaCl+Aq at 20 004°

Conc=g equiv NaCl per l at 20 004°

Sp gr compared with H₂O at 20 004°=1

Conc	Sp gr
0 0000	1 000,000,0
0 0001	1 000,004,2
0 0002	1 000,008,5
0 0005	1 000,021,3
0 0010	1 000,042,7
0 0020	1 000,085,1
0 0040	1 000,169,6
0 0050	1 000,211,7
0 0100	1 000,423,3

(Lamb and Lee, J Am Chem Soc 1913, 35 1686)

The saturated solution boils at 109° (Kremers)

NaCl+Aq containing 42 9 pts NaCl to 100 pts H₂O boils at 106 8° (Griffiths), containing 41 2 pts NaCl to 100 pts H₂O boils at 108 2° (Legrand), containing 40 38 pts NaCl to 100 pts H₂O boils at 109 73° (Gay-Lussac), containing 38 7 pts NaCl to 100 pts H₂O forms a crust at 108 3°, highest point observed, 108 8° (Gerlach, Z anal 26 426)

Boiling-point of NaCl+Aq

% NaCl	B pt according to	
	Bischof	G Karsten
5	101 50°	101 10°
10	103 03	102 38
15	104 63	103 83
20	106 26	105 46
25	107 93	107 27
29 4	107 9-108 99	

% NaCl	B pt according to	
	Legrand	Gerlach
5	100 80°	100 9°
10	101 75	101 9
15	103 00	103 3
20	104 60	105 3
25	106 60	107 6

B-pt of NaCl + Aq containing pts NaCl to 100 pt H₂O G=according to Gerlach (Z ar 26 438, L=according to Le-grand A ch (2) 59 431)

B pt	L	B pt	G	L
100 5°	4 4 4	105 5°	27 5	29 8
101	6 7 7	106	29 5	31 8
101 5	6 10 8	106 5	31 5	33 9
102	1 4 13 4	107	33 5	35 8
102 5	1 9 15 9	107 5	35 5	37 7
103	1 2 18 3	108	37 5	39 7
103 5	1 4 20 7	108 4		41 2
104	2 5 23 1	108 5	39 5	
104 5	2 5 25 5	108 8	40 7	
105	2 5 27 7			

B-pt of NaCl + Aq containing g NaCl in 100 g H₂O
 g NaCl 7 6 11 0 14 9 16 1 18 8
 B-pt 2 2° 103 104 2 104 8 106 1

g NaCl 2 3 24 0 26 0 28 7
 B-pt 7 1 107 7 108 7 109 5

(Rich ond, Analyst, 1893, 18 142)

If NaCl is dissolved in 15 pts H₂O, heat is absorbed if the temp is 15°, but much less if temp is 86°, at 100° there is neither absorption nor evolution of heat (Berthelot, C R 78 22)

36 pts NaCl mixed with 100 pts H₂O at 12.6° lower the temp 2.5° (Rudorff, B 2 68)

33 pts NaCl with 100 pts snow at -1° gave a temp of -21.3° (Rudorff, Pogg 122 337)

The freezing-point of NaCl + Aq is lowered 0.60° for every gram NaCl up to 10 g. When more NaCl is added the freezing-point sinks proportionally. For 100 g NaCl, 2H₂O, 0.342° for every gram of salt (Rudorff, Pogg 113 163)

Insol in conc HCl + Aq

Solubility of NaCl in HCl + Aq at 0° NaCl = mols NaCl (in milligrams) dissolved in 10 m of liquid, HCl = mols HCl (in mms) dissolved in 10 cem of liquid

NaCl	HCl	Sum of mols	Sp gr
53 5	1	54 5	1 2045
52 2	1 85	54 05	1 2025
48 5	5 1	53 6	1 196
44 0	9 275	53 275	1 185
37 95	15 05	53 00	1 1725
23 5	30 75	54 95	1 141
6 1	56 35	62 45	1 1159

(F gel, Bull Soc (2) 45 654)

Solubility in HCl + Aq at 10-10 5°

g per 100 cc		G per 100 cc	
HCl	NaCl	HCl	NaCl
0 0	35 77	26 06	30 89
9 84	33 76	94 77	20 01
12 76	33 19	102 1	19 04
15 68	32 71	120 6	16 03
20 78	31 77		

(Enklaar, R t c 1901, 20 183)

Solubility in HCl + Aq at 30°

Composition of the solution	
% by wt HCl	% by wt NaCl
0	26 47
6 93	16 16
12 50	9 35
17 35	4 52
35 60	0 11

(Schreinemakers, Z phys Ch 1909, 68 85)

Solubility in HCl + Aq

Conc = concentration of HCl g mol per 1,000 g H₂O
 NaCl = wt NaCl dissolved in 1,000 g H₂O

t°	Conc	NaCl	Molecular solubility
0	0	357 75	6 13
	0 25	341 70	5 85
	0 50	324 45	5 56
	1 00	291 20	4 99
25	0	360 80	6 18
	0 25	344 50	5 90
	0 50	329 05	5 64
	1 00	298 10	5 10

(Armstrong and Eyre, Proc R Soc 1910, (A) 84 127)

Solubility in HCl + Aq at 30°

G mols per l

HCl	NaCl	Sp gr 30	HCl	NaCl	Sp gr 30
0 0	5 400	1 2018	3 052	2 463	1 1427
0 4575	4 932	1 1906	4 152	1 628	1 1289
0 969	4 386	1 1801	5 950	0 630	1 1188
1 786	3 589	1 1633	7 205	0 268	1 1258
2 412	2 412	1 1512			

(Masson, Chem Soc 1911, 99 1132)

Solubility in HCl+Aq at 25°

Millimols HCl in 10 ccm	Millimols NaCl in 10 ccm
	54 56
6 07	48 50
10 32	44 67
15 90	37 82
21 17	32 97
32 83	23 43

(Herz, Z anorg 1912, **73** 274)

Moderately dil H_2SO_4 or HNO_3 +Aq precipitate NaCl from NaCl+Aq (Karsten)
 Sol in H_2SO_4 (Walden, Z anorg 1902, **29** 384)

Solubility of NaCl in NH_4OH +Aq at 30°
 (G in 1 l sat solution)

Sp gr	NH_3	NaCl	Sp gr	NH_3	NaCl
1 1735	29 535	293 38	1 1406	72 07	283 38
1 1656	40 655	292 5	1 1395	72 715	283 06
1 160	47 26	289 7	1 1301	81 855	277 49
1 1494	60 78	286 5	1 205	97 49	270 57

(Hempel and Tedesco, Z anorg 1911, **24** 2467)Solubility of NaCl in NH_4Cl +Aq at t°

t°	G per 100 g H_2O		Sp gr
	NH_4Cl	NaCl	
0	0	356 3	1 185
	146 1	286 4	
15	0	357 6	1 200
	57 3	326 4	1 191
	118 9	300	1 183
	186 4	271 6	1 176
	198 8	266 8	1 175
30	0	360 3	1 166
	255 4	249	
45	0	365	233 9
	322 1	233 9	

(Fedotieff, Z phys Ch 1904, **49** 168)See also under NH_4Cl

Solubility in NaOH+Aq at 0° NaCl=mols
 NaCl (in milligrams) in 10 ccm solution,
 Na_2O =mols Na_2O (in milligrams) in
 10 ccm solution

NaCl	Na_2O	$\text{Na}_2\text{O} + \text{NaCl}$	Sp gr
54 7	0	54 7	1 207
49 375	4 8	54 175	1 221
47 212	6 725	53 937	1 225
42 375	10 406	52 781	1 236
39 55	14 78	54 33	1 249
24 95	30 5	55 45	1 295
19 3	37 875	57 175	1 314
9 408	53 25	62 66	1 362

(Engel, C R **112** 1130)

Solubility in NaOH+Aq at 20°

G NaOH in 1 liter	G NaCl in 1 liter	Sp gr	deg Baumé
10	308	1 200	23 5
20	308	1 210	24 0
30	306	1 215	25 5
40	302	1 225	26 4
50	297	1 230	26 9
60	286	1 235	27 4
70	277	1 240	27 9
80	269	1 245	28 4
90	261	1 250	28 8
100	253	1 250	28 8
110	244	1 252	29 0
120	236	1 252	29 0
130	229	1 260	29 7
140	221	1 265	30 2
150	213	1 270	30 6
160	205	1 275	31 1
170	197	1 275	31 1
180	189	1 280	31 5
190	181	1 285	32 0
200	173	1 290	32 4
210	165	1 295	32 8
220	159	1 295	32 8
230	152	1 300	33 3
240	146	1 303	33 5
250	139	1 305	33 7
260	134	1 310	34 2
270	129	1 315	34 6
280	124	1 320	35 0
290	118	1 325	35 4
300	112	1 330	35 8
310	107	1 333	36 0
320	101	1 335	36 2
330	96	1 340	36 6
340	90	1 345	37 0
350	85	1 350	37 4
360	80	1 355	37 8
370	76	1 360	38 2
380	71	1 365	38 6
390	66	1 370	39 0
400	61	1 375	39 4
410	56	1 380	40 0
420	52	1 385	40 2
430	48	1 390	40 6

Solubility in NaOH + Aq at 20° — *Continued*

G NaOH in 1 liter	G NaCl in 1 liter	Sp gr	deg Baumé
440	45	1 395	41 0
450	42	1 400	41 5
460	39	1 405	41 9
470	37	1 410	42 0
480	34	1 415	42 3
490	32	1 420	42 6
500	30	1 425	43 0
510	28	1 430	43 5
520	27	1 435	43 7
530	27	1 440	44 0
540	26	1 445	44 3
550	26	1 450	44 6
560	25	1 450	44 6
570	24	1 455	45 0
580	23	1 460	45 5
590	23	1 465	45 9
600	22	1 470	46 2
610	21	1 475	46 5
620	20	1 480	46 8
630	19	1 485	47 0
640	18	1 490	47 5

(Wintre r, Z Elektrochem, 1900, 7 360)

Solubility in Na₂O + Aq at 30°

Composition of the solution		Solid phase
% by w Na ₂ O	% by wt NaCl	
0	26 47	NaCl
4 4	21 49	"
12 2	13 62	"
24 4	4 36	"
29 3	2 40	"
37 8	1 12	"
41 4	0 97	NaCl + NaOH, H ₂ O
42	0	NaOH, H ₂ O

(Schreiner, Z phys Ch 1909, 68 85)

The presence of other salts increases the solubility of NaCl in H₂O

Sol in sat NH₄Cl + Aq with pptn of NH₄Cl. When the reaction is complete, the solution has sp gr 1 1788, and contains 32 62% mixed salts, or 100 pts H₂O dissolve 48 42 p mixed salts, viz., 26 36 pts NaCl and 22 6 pts NH₄Cl (Karsten) (See under NaCl)

Sol in sat BaCl₂ + Aq with pptn of BaCl₂ until a state of equilibrium is reached, when 100 pts H₂O at 17° dissolve 38 6 pts of mixed salts, of which 4 1 pts are BaCl₂ (Karsten) (See under BaCl₂)

Sol in sat CaCl₂ + Aq (Vauquelin, Ann de Chim 13 95)

Much more sol in hot than in cold H₂O contain g MgCl₂ or CaCl₂, but NaCl is pptd from sat NaCl + Aq when that solution is mixed with MgCl₂ or CaCl₂ + Aq (Fuchs and G Reinbach, 1826) (See under MgCl₂)

Less sol in conc CaCl₂ + Aq than in H₂O (Hermann)

Solubility of NaCl + CaCl₂ in H₂O at 25°
G per 100 g H₂O

NaCl	CaCl ₂	Sp gr 25°/25°	Solid phase
0	84		CaCl ₂ , 6H ₂ O
1 846	78 49	1 4441	" + NaCl
1 637	58 48	1 3651	NaCl
1 799	53 47	1 3463	"
7 77	36 80	1 2831	"
10 70	30 08	1 2653	"
18 85	19 53	1 2367	"
32 48	3 92	1 2080	"
35 80	0	1 2030	"

(Cameron, Bell and Robinson, J phys Chem 1907, 11 396)

Solubility of NaCl in NaHCO₃ sat with CO₂ at t°

t°	G per 1000 g H ₂ O	
	NaHCO ₃	NaCl
0	6 0	356 3
"	7 7	350 1
15	0 0	357 6
"	10 0	354 6
30	0 0	360 3
"	13 9	358 1
45	0 0	356 0
"	0 23	361 5

(Fedotieff, Z phys Ch 1904, 49 170)

Sol in sat KClO₃ + Aq, the solution can then dissolve more KClO₃ (Marguerite, C R 38 305)

In solution containing Na, K, Cl and NO₃ ions, the solubility—relations between the four salts NaCl, KCl, NaNO₃ and KNO₃ have been studied (Uyeda, Z anorg 1911, 71 2)

Sol in sat NH₄NO₃ + Aq, without causing pptn (Karsten)

Sol in sat NH₄NO₃ + Aq, from which solution it is not pptd by salts which would cause its pptn in aqueous solution (Marguerite, C R 38 307)

Sol in sat Ba(NO₃)₂ + Aq without causing pptn

Sol in Ca(NO₃)₂ + Aq

Sol in Mg(NO₃)₂ + Aq with pptn of small portion of Mg(NO₃)

Sol in sat KNO₃ + Aq, the mixed solution having the power to dissolve more KNO₃, and the solubility of the KNO₃ apparently increasing in the same ratio as the amount of NaCl present (Fourcroy and Vauquelin, Ann de Chim 11 130)

Sol in sat KNO₃ + Aq, the solution thus

obtained at 18 13° contains 40 34% of the mixed salts, or 100 pts H₂O dissolve 67 72 pts of the mixed salts, viz, 38 25 pts NaCl and 29 45 pts KNO₃ (Karsten)

Solubility of NaCl in KNO₃+Aq at 25°
KNO₃=g KNO₃ in 100 cc of solution
NaCl=g mol per l

KNO ₃	NaCl	KNO ₃	NaCl
0	5 44	12	5 28
4	5 52	16	5 21
8	5 45	20	5 15

(Ritzel, Z Krist 1911, 49 152)
(See also under KNO₃)

Solubility of NaCl in NaNO₃+Aq at 15 5°

Sp gr	g per 100 cc sat solution		
	NaNO ₃	NaCl	H ₂ O
1 2025	0	31 78	88 47
1 2305	7 53	27 89	87 63
1 2580	13 24	26 31	86 25
1 2810	21 58	23 98	82 66
1 3090	28 18	22 30	80 42
1 3345	33 80	20 40	79 25
1 3465	37 88*	19 40*	77 37
1 3465	37 64*	19 67*	77 34

*Solutions sat with both salts

(Bodlander, Z phys Ch 1891, 1 361)

Sol in sat NaNO₃+Aq with pptn of NaNO₃

Solubility of NaCl in NaNO₃+Aq

Conc = concentration of NaNO₃ in g mol per 1,000 g H₂O

NaCl=g NaCl dissolved in 1,000 g H₂O

t°	Conc	NaCl	Molecular solubility
0	0	359 65	6 16
	0 25	355 90	6 09
	0 50	351 20	6 02
	1	342 15	5 86
25	0	362 95	6 20
	0 25	356 65	6 11
	0 50	352 30	6 03
	1	343 65	5 88
	2	325 50	5 58

(Armstrong and Eyre, Proc R Soc 1910, A 84 127)

(See also under NaNO₃)

Sol in sat KCl+Aq with elevation of temp (Vauquelin)

100 g H₂O sat with KCl dissolve 0 494 gram-equivalent NaCl at 25° (Fuler, Z phys Ch 1904, 49 315)

Solubility in KCl+Aq at t°

t°	Sat solution contains	
	% NaCl	% KCl
-20	21 3	5 7
-10	21 3	6 7
0	21 3	7 7
+10	21 3	8 6
20	21 3	9 6
30	21 3	10 6
40	21 3	11 5
50	21 3	12 5
60	21 3	13 5
70	21 3	14 4
80	20 7	15 8
90	19 9	17 8
100	18 8	19 8
110	17 2	22 4
120	16 5	24 1
130	16 4	25 1
140	16 4	26 1
150	16 4	27 1
160	16 4	28 0
170	16 4	29 0
180	16 4	30 0

(Etard A ch 1894, (7) 3 277)

(See under KCl)

100 pts NaCl+NaI+Aq sat at 18-19° contain 62 33 pts of the two salts (v Hauer)

Sol in sat Al₂(SO₄)₃+Aq with no pptn (Vauquelin)

Sol in sat (NH₄)₂SO₄+Aq with pptn of considerable amt of (NH₄)₂SO₄+Aq (Vauquelin)

Sol in sat CuSO₄+Aq

100 pts H₂O dissolve 36 71 pts NaCl and 7 19 pts K₂SO₄ at 15°, and solution has sp gr 1 24 (Page and Keightey)

NaCl is sol in K₂SO₄+Aq, and vice versa, without separation of a salt

100 pts H₂O dissolve 7 03 pts K₂SO₄ and 37 60 pts NaCl, when warmed and cooled to 14° (Rudorff)

Solubility of NaCl and K₂SO₄ in H₂O at t°
100 pts H₂O contain pts NaCl, K₂SO₄, and KCl

t	Pts NaCl	Pts K ₂ SO ₄	Pts KCl
10	33 43	8 10	3 18
20	34 01	8 90	3 06
30	34 56	9 56	2 95
40	35 16	10 38	2 81
50	35 77	11 07	2 84
60	36 40	11 93	2 72
70	36 64	12 82	3 20
80	36 04	12 26	5 06
90	35 86	12 42	6 98
100	35 63	12 56	8 79

(Precht and Wittgen, B 15 1666)

Sol in cold sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ at first without pptn, afterwards Na_2SO_4 separates out (Karsten)

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing 7.45 g Na_2SO_4 in 100 g of the solution

t°	g NaCl in 100 g of the solution
80	23.30
90	23.33
85	23.45
60	23.485
75	23.525
18	23.55
28	23.68

(Marie and Marquis, C R 1903, 136 684)
See also under Na_2SO_4

Sol in sat $\text{ZnSO}_4 + \text{Aq}$ with separation of Na_2SO_4 (Karsten)

Insol in liquid CO_2 (Büchner, Z phys Ch 1905, 54 674)

Modestly sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

12.2 g NaCl are sol in 1 pt hydrazine at 12.5–13° (de Bruyn, R t c 1899, 18 297)

100 g hydroxylamine dissolve 14.7 g NaCl at 17.5° (de Bruyn, Z phys Ch 1892, 10 782)

100 g 95% formic acid dissolve 5.8 g at 19.7° (Schan, Ch Ztg 1913, 37 1117)

Solubility in alcohol

100 pts alcohol of 0.900 sp gr dissolve 5.8 pts NaCl of 0.872 sp gr dissolve 6.7 pts NaCl (Kirwan)

100 pts alcohol containing given % by weight of salt dissolve pts NaCl at 25°

% alcohol	Pts NaCl	% alcohol	Pts NaCl	% alcohol	Pts NaCl
0.0	3.70	33.4	16.08	66.9	5.95
8.4	30.49	41.8	13.28	75.2	3.75
16.7	24.84	50.2	11.28	83.6	1.59
25.1	19.30	58.6	7.96		

(Kopp A 40 206)

100 pts alcohol of 75% by weight dissolve at

14 15.2 38 71.5°
0.66 0.700 0.736 1.033 pts NaCl

100 pts alcohol of 90.5% by weight dissolve at

15° 77.2°
0.174 0.171 pts NaCl

(Wagner A 64 293)

100 pts alcohol containing % alcohol by weight dissolve pts NaCl at 15°, or 100 pts solution contain % NaCl

10 20 30 40 % alcohol,
28.5 22.55 17.51 13.25 pts NaCl ,
22.2 18.4 14.9 11.7 % NaCl ,

50 60 80 % alcohol,
9.77 5.93 1.22 pts NaCl ,
8.9 5.6 1.2 % NaCl

(Schiff, A 118 365)

Solubility of NaCl in alcohol increases with the temperature

100 pts (by weight) of alcohol of 0.9282 sp gr (50.5% by weight) dissolve at

4° 10° 13° 23° 32°
10.9 11.1 11.43 11.9 12.3 pts NaCl ,

33° 44° 51° 60°
12.5 13.1 13.8 14.1 pts NaCl

(Gerardin, A ch (4) 5 146)

Solubility in alcohol at 13°

Sp gr	100 ccm contain in g		
	Alcohol	Water	Salt
1.2030	0	88.70	31.60
1.1348	11.81	78.41	23.26
1.1144	15.99	74.64	20.81
1.0970	19.39	71.45	18.86
1.0698	24.95	65.80	16.23
1.0295	32.33	57.96	12.66
0.9880	40.33	49.34	9.13
0.9445	49.28	38.54	5.93
0.9075	57.91	29.37	3.47
0.8700	63.86	21.62	1.52
0.8400	72.26	11.24	0.50

(Bodlander, Z phys Ch 7 317)

Solubility in ethyl alcohol + Aq at 30°

wt % alcohol	g NaCl per 100 g		wt % alcohol	g NaCl per 100 g	
	solution	H ₂ O		solution	H ₂ O
0	26.50	36.05	50	9.34	20.60
5	24.59	34.29	60	6.36	16.96
10	22.56	32.57	70	3.36	12.75
20	19.05	29.40	80	1.56	7.95
30	15.67	26.53	90	0.43	4.30
40	12.45	23.70			

(Taylor, J phys Ch 1897, 1 723)

Solubility in ethyl alcohol + Aq at 40°

wt % alcohol	g NaCl per 100 g		wt % alcohol	g NaCl + 100 g	
	solution	H ₂ O		solution	H ₂ O
0	26.68	36.38	50	9.67	21.42
5	24.79	34.69	60	6.65	17.82
10	22.90	33.00	70	3.87	13.10
20	19.46	30.20	80	1.69	8.68
30	16.02	27.25	90	0.50	5.10
40	12.75	24.37			

(Taylor, l c)

Solubility of NaCl in ethyl alcohol+Aq at 25°

% C ₂ H ₅ OH	% H ₂ O	% NaCl	% C ₂ H ₅ OH	% H ₂ O	% NaCl
0	73 53	26 47	45 35	45 35	9 3
3 8	71 6	24 6	56 2	37 5	6 3
7 7	69 7	22 6	67 4	28 9	3 7
16 1	64 6	19 3	78 8	19 7	1 5
25 3	58 9	15 8	89 6	10	0 4
35 0	52 5	12 5			

(Fonten, Z phys Ch 1904, 73 212)

Solubility of NaCl in ethyl alcohol+Aq at 25°

Conc = concentration of alcohol in g mol per 1,000 g H₂O
NaCl = g in 1,000 g H₂O

Conc	NaCl	Molecular solubility
0	359 65	6 16
0 25	355 15	6 08
0 50	349 65	5 98
1	337 80	5 79
3	301 60	5 16

(Armstrong and Eyre, Proc R Soc 1910, (A) 84 127)

100 pts absolute methyl alcohol dissolve 1 41 pts at 18 5°, 100 pts absolute ethyl alcohol dissolve 0 065 pt at 18 5° (de Bruyn, Z phys Ch 10 782)

100 pts wood-spirit of 40% (by weight) dissolve 13 0 pts NaCl (Schiff, A 118 365)

100 g NaCl+CH₃OH contain 0 1 g NaCl at the critical temp (Centnerszwer, Z phys Ch 1910, 72 437)

Solubility of NaCl in methyl alcohol+Aq at 25°

Conc = concentration of alcohol in g mol per 1,000 g H₂O
NaCl = g in 1,000 g H₂O

t	Conc	NaCl	Molecular solubility
0°	0	357 75	6 13
	0 25	355 20	6 08
	0 50	353 10	6 05
	1	347 45	5 95
25°	0	362 95	6 20
	0 25	359 40	6 14
	0 50	357 60	6 11
	1	353 20	6 04
	3	336 25	5 75

(Armstrong and Eyre, Proc R Soc 1910, (A) 84 127)

1 16 cc dissolve in propyl alcohol (Schlamp Z phys Ch 1894, 14 276)

Solubility of NaCl in propyl alcohol+Aq at 25°

Conc = concentration of alcohol in g mol per 1,000 g H₂O
NaCl = g NaCl in 1,000 g H₂O

t°	Conc	NaCl	Molecular solubility
0	0	357 75	6 13
	0 25	351 20	6 01
	0 50	345 55	5 91
25	0	362 95	6 20
	0 25	355 75	6 10
	0 50	350 20	6 00

(Armstrong and Eyre, Proc R Soc 1910, A 84 127)

Solubility of NaCl in propyl alcohol+Aq at 23-25°

% NaCl	% C ₂ H ₅ OH	% H ₂ O	% NaCl	% C ₂ H ₅ OH	% H ₂ O
0 55	87 7	11 75	14 38	5 39	80 23
2 23	51 57	46 20	15 42	5 11	79 47
3 55	18 99	77 46	16 38	4 47	79 14
3 90	14 78	81 32	18 08	3 83	78 09
5 27	12 77	81 96	20 12	3 27	76 61
8 04	9 49	82 47	22 35	2 64	75 01
10 49	7 79	81 72	24 50	2 13	75 37
12 20	6 57	81 23	24 90	2 3	72 80

(Frankforter and Frary, J phys Ch 1913, 17 402)

100 g sat solution of NaCl in 99 6% propyl alcohol contain 0 04 g NaCl at 25° (Frankforter and Frary)

Insol in fusel oil (Gooch, Am Ch J 9 53)

Solubility of NaCl in amyl alcohol+Aq Liquid phases conjugated at 28°

Upper layer			Lower layer		
NaCl	amyl alcohol	H ₂ O	NaCl	amyl alcohol	H ₂ O
0 05	95 45	4 5	26 36	0 22	73 42
"	94 1	5 9	19	0 4	80 4
"	92 9	7 1	12 7	0 8	86 5
"	91 6	8 4	6 2	1 5	92 3
0	90 2	9 8	0	2 3	97 7

(Fonten, Z phys Ch 1910, 73 226)

At room temp 1 pt by weight is sol in 75 pts methyl alcohol D₁₅ 0 7990

566 " ethyl " D₁₅ 0 5100

3000 " propyl " D₁₅ 0 5160

(Rohland Z anorg 1898, 18 325)

100 g methyl alcohol dissolve 1 31 g NaCl at 25°

100 g ethyl alcohol dissolve 0.065 g NaCl at 25°
 100 g propyl alcohol dissolve 0.012 g NaCl at 25°
 100 g isopropyl alcohol dissolve 0.002 g NaCl at 25°
 (Turner and Bissett, Chem Soc 1913, 103 1909)

Solubility of NaCl in ethyl+amyl alcohol at 28°

Upper layer			Lower layer			
% NaCl	% alc	% ethyl alcohol	% NaCl	% alc	% ethyl alcohol	
0.05	95	5	0	26.35	0.22	0
0.10	86		9.5	25.30	0.25	1.9
0.25	75		19.1	24.02	0.3	9.5
0.58	59		30.9	22.64	0.4	6.9
1.23	47		38.7	21.19	0.5	10.3
2.81	31		44.8	19.26	1.3	15.2
6.56	17		41.5	15.81	3.69	22.1

Critical solution amyl alcohol, 10%, ethyl alcohol, 32.5%, NaCl, 11%, H₂O, 46.5%

(Fontana, Z phys Ch 1910, 73 244)

Ether pts NaCl from NaCl+Aq (Gmelin)
 Very slight sol in a mixture of equal pts of alcohol and ether (Berzelius)
 500 mg NaCl treated with above mixture yielded on 0.5 mg to the liquid (Lawrence Smith, Am J Sci (2) 16 57)
 100 pts of a mixture of 1 pt 96% alcohol and 1 pt 3% ether dissolve 0.11 pt NaCl (Mayer, A 98 205)
 Insol in acetone (Krug and M'Elroy, J Anal Ch 184, Friedman, C C 1899, II 1014)

Solubility in acetone+Aq at 20°

A = ccm acetone in 100 ccm of the solvent
 NaCl = millimols NaCl in 100 ccm of the solution

		NaCl
0		537.9
10		464.6
20		394.8
30		330.1
32	2 phases	lower layer 308.5
to 87		upper layer 7.7
88		7.3
89		5.6
90		4.3
100		

(Herz and Knoch, Z anorg 1904, 41 318)

Solubility in acetone+Aq at 20°

% NaCl	% H ₂ O	% acetone
25.9	73.06	1.04
24.19	71.18	4.03
25.06	72.00	2.94
20.85	66.78	12.37
20.17	66.01	13.82
18.32	63.16	18.52
20.44	66.19	13.37
17.89	62.21	19.90
0.32	13.92	85.76
0.19	10.82	88.99
0.15	9.62	90.23
0.12	8.94	90.94

(Frankforter and Cohen, J Am Chem Soc 1914, 36 1127)

Solubility in glycol at 14.8° = 31.7% (de Coninck, Belg Acad Bull 1905 275)
 Sol in glycerine (Pelouze)

Solubility of NaCl in glycerine+Aq at 25°
 G = g glycerine in 100 g glycerine+Aq
 NaCl = millimols NaCl in 100 cc of the solution

G	NaCl	Sp gr
0	545.6	1.1960
13.28	501.1	1.2048
25.98	448.4	1.2133
45.36	370.2	1.2283
54.23	333.9	1.2381
83.84	220.8	1.2696
100	167.1	1.2964

(Herz and Knoch, Z anorg 1905, 45 267)

Insol in benzonitrile (Naumann B 1914, 47 1370)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602)

Solubility of NaCl in solutions of HgCl₂ in ethyl acetate

100 mols ethyl acetate dissolve			
Mols H ₂ Cl ₂	Mols NaCl	Mols H ₂ Cl	Mols NaCl
40.0	20.0	18.0	5.1
38.1	19.6	16.4	4.3
36.0	19.2	14.1	3.8
34.9	18.5	13.2	2.9
34.8	18.3	12.4	2.3
32.1	13.8	12.0	1.6
28.0	9.1	12.2	1.3
22.8	7.0	12.9	0.8
22.9	7.0		

(Linebarger, Am Ch J 1894, 16 215)

Solubility of NaCl in urea + Aq at 25°

% urea	% NaCl	% urea	% NaCl
0	31 80	18	27 65
5	30 63	23	27 24
9 6	29 05	28	26 56
13	28 46		

(Ritzel, Z Kryst Min 1911, 49 152)

Solubility of NaCl in urea + Aq at (?)°

g = g urea in 100 cc of solution
 sol = increase of solubility of NaCl in
 g per 100 cc of the solution

g	sol	g	sol
5	0 044	30	0 709
10	0 124	35	0 910
15	0 234	40	1 134
20	0 372	45	1 370
25	0 529	50	1 602

(Fastert, N Jahrb Min Beil Bd 1912, 23 286)

Solubility of NaCl in formamide + Aq at 25°

% HCONH ₂	% NaCl	% HCONH	% NaCl
0	31 80	11	29 11
2 3	30 98	15	28 52
5 3	30 86	18 8	27 76
8	30 40		

(Ritzel, Z Kryst Min 1911, 49 152)

Insol in anhydrous and in 97% pyridine
 Very sl sol in 95% pyridine + Aq Sl sol
 in 93% pyridine + Aq (Kahlenberg, J Am
 Chem Soc 1908, 30 1107)

Insol in oil of turpentine (T S Hunt,
 Am J Sci (2) 19 417)

100 g H₂O dissolve 236 3 g sugar + 42 3 g
 NaCl at 31 25°, or 100 g sat aq solution
 contain 62 17 g sugar + 11 13 g NaCl
 (Kohler, Z Ver Zuckerind, 1897, 47 447)

Solubility of NaCl in glucose + Aq at 25°

Conc = concentration of glucose + Aq in g
 mol per 1,000 g H₂O

Sol = Solubility in 1,000 g H₂O

Conc	Sol	Molecular solubility
0	361 40	6 18
0 25	364 15	6 22
0 50	364 30	6 23
1 0	369 90	6 32

(Armstrong and Evre, Proc R Soc 1910,
(A) 84 127)

Min Halite

+ 2H₂O Efflorescent below 0°, sl deli-
 quescient at temps above 0° (Fuchs, 1826)

The solubility in H₂O at -12 25° corre-
 sponds to 32 9 pts of NaCl per 100 pts H₂O
 (Matignon, C R 1909, 148 551)

Sodium stannic chloride, 2NaCl, SnCl₄·
6H₂O

See Chlorostannate, sodium

Sodium thallic chloride, 3NaCl, TlCl₃
12H₂O

Very sol in H₂O (Pratt, Am J Sc
 1895, (3) 49 404)

Sodium uranium chloride, 2NaCl, UCl₄

Non volatile and not hygroscopic (Mor
 san, C R 1896, 122 1089)

Sol in H₂O (Colani, A ch 1907, (8) 1
 59)

Sodium uranyl chloride, Na₂(UO₂)Cl₄

As K salt (Aloy, Bull Soc 1899, (3) 2
 264)

Sodium zinc chloride, 2NaCl, ZnCl₂ + 3H₂O

Deliquescent Easily sol in H₂O (Schm
 ler, Mag Pharm 36 48)

Sodium zirconium chloride, 2NaCl, ZrCl₄

(Paykull)

Sodium chloriodide, NaCl₄I + 2H₂O

Easily decomp by alcohol or ether (W
 and Wheeler, Sil Am J 143 42)

Sodium fluoride, NaF

Very sl sol in cold, and not more abun-
 antly in boiling H₂O (Rose)

100 pts H₂O dissolve 4 78 pts at 16° (B
 zelus)

100 pts H₂O dissolve 4 pts at 15° (Frer
 A ch (3) 47 32)

Sp gr of aqueous solutions containing
 100 pts H₂O

1 1081 2 2162 3 3243 pts NaF

1 0110 1 0221 1 0333

Sat solution has sp gr 1 0486 (Gerls
 Z anal 27 277)

Sp gr of solution sat at 18° = 1 044, c
 taining 4 3% NaF (Mylus and Funk,
 1897, 30 1718)

Solubility of NaF in HF + Aq at 21°

g per 1000 g H ₂ O		g per 1000 g H ₂ O	
HF	NaF	Hf	NaF
0 0	41 7	83 8	22 4
10 0	41 4	129 7	23 4
45 8	22 5	596 4	48
56 5	22 7	777 4	81

(Ditte, C R 1896, 123 1282)

Easily sol in liquid HF (Franklin
 anorg 1905, 46 2)

Sl sol in conc KC₂H₃O₂ + Aq (St
 eyer)

Almost insol in alcohol (Berzelius, P
 1 13)

Insol in methyl acetate (Naumann
 1909, 42 3790)

Sodium hydrogen fluoride, NaHF₂

Rather difficultly sol in cold, more easily in hot H₂O (Berzelius, Pogg 1 13)

Sodium tantalum fluoride

See Fluotantalate, sodium

Sodium tin (stannous) fluoride, 2NaF, 3SnF₂

Sol in H₂O (Wagner B 19 896)

Sodium tin (stannic) fluoride

See Fluostannate, sodium

Sodium tantalum fluoride

See Fluotantalate, sodium

Sodium tellurium fluoride, NaF, TeF₄

Decomp by H₂O (Berzelius)

Sodium titanium fluoride

See Fluotitanate, sodium

Sodium tungstic fluoride

See Fluoxytungstate, sodium

Sodium uranium fluoride, NaF, UF₄ (?)

Somewhat soluble in H₂O (Bolton)

Sodium uranyl fluoride

See Fluoxyuranate, sodium

Sodium vanadium sesquifluoride

See Fluovanadate, sodium

Sodium zinc fluoride, NaF, ZnF₂

Sol in H₂O (R Wagner)

Sodium zirconium fluoride, 5NaF, 2ZrF₄

See Fluozirconate, sodium

Sodium fluoride vanadium pentoxide

See Fluoxyvanadate, sodium

Sodium hydrazide, NH₂, NHNa

Decomp by H₂O with explosive violence

Decomp by alcohol (Schlenk, B 1915, 48 670)

Sodium hydride, NaH

Decomp by H₂O and by acids

Sol in fused Na or Na amalgam Insol in liquid NH₃ Insol in CS₂, CCl₄, C₆H₆ and terebenthene (Moissan, C R 1902, 134 73)

NaH₄ Decomp violently by H₂O

Sodium hydrosulphide, NaSH

Deliquescent Sol in H₂O and alcohol

+3H₂O Difficultly sol in H₂O (Damoiseau, C C 1885 36)

Sodium hydroxide, NaOH

Very deliquescent 100 pts NaOH under a bell jar with H₂O at 16–20° absorb 552 pts in 56 days (Mulder)

Very sol in H₂O with evolution of much heat Sol in 0.47 pt H₂O (Bineau, C R 41 509)

Solubility of NaOH in H₂O

t°	g per 100 g		Solid phase
	Solu- tion	H ₂ O	
— 7 8	8 0	8 7	Ice
—20	16 0	19 1	
—28	19 0	23 5	
—24	22 2	28 5	Ice + NaOH 7H ₂ O NaOH 7H ₂ O + NaOH 5H ₂ O NaOH 5H ₂ O + NaOH 4H ₂ O NaOH 4H ₂ O
—17 7	24 5	32 5	
0	29 6	42 0	
+ 5	32 2	47 5	NaOH 4H ₂ O + NaOH 3½H ₂ O NaOH 3½H ₂ O f pt
10	34 0	51 5	
15 5	38 9	63 53	
5	45 5	83 5	NaOH 3½H ₂ O + NaOH 2H ₂ O NaOH 2H ₂ O + NaOH H ₂ O NaOH H ₂ O
12	50 7	103 0	
20	52 2	109	
30	54 3	119	f pt NaOH H ₂ O + NaOH NaOH (?)
40	56 3	129	
50	59 2	145	
60	63 5	174	f pt NaOH H ₂ O + NaOH NaOH (?)
64 3	69 0	222 3	
61 8	74 2	288	
80	75 8	313	
110	78 5	365	
192	83 9	521	

(Pickering, Chem Soc 1893, 63 890, Mylius and Funk, W A B 1900, 3 450 Calc by Seidell, Solubilities, 2d Edition, p 653)

100 g sat NaOH + Aq at 15° contain 46.36 g NaOH (de Forcrand, C R 149 1344)

Sp gr and b pt of NaOH + Aq

% Na ₂ O	Sp gr	B pt	% Na ₂ O	Sp gr	B pt
4 7	1 06	100.56	31 0	1 44	120 00
9 0	1 12	101 11	34 0	1 47	123 89
13 0	1 18	102 75	36 8	1 50	129 44
16 0	1 23	104 44	41 2	1 56	137 78
19 0	1 29	106 66	46 6	1 63	148 89
23 0	1 32	108 89	53 8	1 72	204 44
26 0	1 36	112 78	63 6	1 85	315.56
29 0	1 40	116 66	77 8	2 00	red heat

(Dalton)

Sp gr of NaOH + Aq at 15°

% Na ₂ O	Sp gr	% Na ₂ O	Sp gr	% Na ₂ O	Sp gr
0 302	1 0040	10 879	1 1630	21 154	1 3053
0 601	1 0081	11 484	1 1734	21 758	1 3125
1 209	1 0163	12 088	1 1841	21 891	1 3143
1 813	1 0246	12 692	1 1948	22 363	1 3198
2 418	1 0330	13 297	1 2058	22 967	1 3273
3 022	1 0414	13 901	1 2176	23 572	1 3349
3 626	1 0500	14 506	1 2280	24 176	1 3426
4 231	1 0587	15 110	1 2392	24 780	1 3505
4 835	1 0675	15 714	1 2453	25 385	1 3586
5 440	1 0764	16 319	1 2515	25 989	1 3668
6 044	1 0855	16 923	1 2578	26 594	1 3751
6 648	1 0948	17 528	1 2642	27 200	1 3836
7 253	1 1042	18 132	1 2708	27 802	1 3923
7 857	1 1137	18 736	1 2775	28 407	1 4011
8 462	1 1233	19 341	1 2843	29 011	1 4101
9 066	1 1330	19 954	1 2912	29 616	1 4193
9 670	1 1428	20 550	1 2982	30 220	1 4285
10 275	1 1528				

(Tünnerman N J Pharm 18 2)

Sp gr of NaOH+Aq					
% Na ₂ O	Sp gr	% Na ₂ O	Sp gr	% Na ₂ O	Sp gr
2 07	1 02	14 73	1 16	28 16	1 30
4 02	1 04	16 73	1 18	29 96	1 32
5 89	1 06	18 71	1 20	31 67	1 34
7 69	1 08	20 66	1 22	32 40	1 35
9 43	1 10	22 58	1 24	33 08	1 36
11 10	1 12	24 47	1 26	34 41	1 38
12 81	1 14	26 33	1 28		

(Richter)

Sp gr of NaOH+Aq at 15°					
°C	Sp gr if % Na ₂ O	Sp gr if % NaOH	%	Sp gr if % Na ₂ O	Sp gr if % NaOH
1	1 015	1 012	32	1 450	1 351
2	1 020	1 023	33	1 462	1 363
3	1 043	1 035	34	1 475	1 374
4	1 058	1 046	35	1 488	1 384
5	1 074	1 059	36	1 500	1 395
6	1 089	1 070	37	1 515	1 405
7	1 104	1 081	38	1 530	1 415
8	1 119	1 092	39	1 543	1 426
9	1 132	1 103	40	1 558	1 437
10	1 145	1 115	41	1 570	1 447
11	1 160	1 126	42	1 583	1 456
12	1 175	1 137	43	1 597	1 468
13	1 190	1 148	44	1 610	1 478
14	1 203	1 159	45	1 623	1 488
15	1 219	1 170	46	1 637	1 499
16	1 233	1 181	47	1 650	1 508
17	1 245	1 192	48	1 663	1 519
18	1 258	1 202	49	1 678	1 529
19	1 270	1 213	50	1 690	1 540
20	1 285	1 225	51	1 705	1 550
21	1 300	1 236	52	1 719	1 560
22	1 315	1 247	53	1 730	1 570
23	1 329	1 258	54	1 745	1 580
24	1 341	1 269	55	1 760	1 591
25	1 355	1 279	56	1 770	1 601
26	1 369	1 290	57	1 785	1 611
27	1 381	1 300	58	1 800	1 622
28	1 395	1 310	59	1 815	1 633
29	1 410	1 321	60	1 830	1 643
30	1 422	1 332	70		1 748
31	1 438	1 343			

(Gerlach, Z anal 8 279, calculated from Schiff, A 107 300)

Sp gr of NaOH+Aq at 15°			
°C NaOH	Sp gr	% NaOH	Sp gr
0 61	1 0070	4 0	1 0435
0 9	1 0105	4 32	1 0473
1 0	1 0107	4 64	1 0511
1 2	1 0141	4 96	1 0549
1 6	1 0177	5 29	1 0588
2 0	1 0213	5 58	1 0627
2 36	1 0249	5 87	1 0667
2 71	1 0286	6 21	1 0706
3 0	1 0318	6 55	1 0746
3 35	1 0360	6 76	1 0787
3 67	1 0397	7 31	1 0827

Sp gr of NaOH+Aq at 15°—Continued			
% NaOH	Sp gr	% NaOH	Sp gr
7 66	1 0868	24 81	1 2748
8 0	1 0909	25 3	1 2800
8 34	1 0951	25 8	1 2857
8 68	1 0992	26 31	1 2905
9 0	1 1030	26 83	1 2973
9 42	1 1077	27 31	1 3032
9 74	1 1120	27 8	1 3091
10 0	1 1158	28 31	1 3151
10 5	1 1195	28 83	1 3211
10 97	1 1250	29 38	1 3272
11 42	1 1294	30 0	1 3339
11 84	1 1339	30 57	1 3395
12 24	1 1383	31 22	1 3458
12 64	1 1423	31 85	1 3521
13 0	1 1474	32 47	1 3585
13 55	1 1520	33 0	1 3642
13 86	1 1566	33 69	1 3714
14 5	1 1631	34 38	1 3780
14 75	1 1662	35 0	1 3858
15 0	1 1697	35 65	1 3913
15 5	1 1755	36 25	1 3981
15 91	1 1803	36 86	1 4049
16 38	1 1852	37 47	1 4118
16 77	1 1901	38 13	1 4187
17 22	1 1950	38 8	1 4267
17 67	1 2000	39 39	1 4328
17 12	1 2050	40 0	1 4410
18 58	1 2101	40 75	1 4472
19 0	1 2148	41 41	1 4545
19 58	1 2202	42 12	1 4619
20 0	1 2250	42 83	1 4694
20 59	1 2308	43 66	1 4769
21 0	1 2361	44 38	1 4845
21 42	1 2414	45 27	1 4922
22 0	1 2462	46 15	1 5000
22 64	1 2522	46 87	1 5079
23 15	1 2576	47 60	1 5158
23 67	1 2632	48 81	1 5238
24 24	1 2687	49 02	1 531

Hager, Comm 1883)

The sp gr increases or diminishes for each degree as follows

% NaOH	Corr
40-50	0 00045
30-39	0 0004
20-29	0 0003
10-19	0 0002

Hager, Comm 1883)

Sp gr of NaOH+Aq at 15°

% NaOH	Sp gr	% NaOH	Sp gr
2 5	1 0280	20	1 226
5	1 0568	25	1 282
10	1 1131	30	1 337
15	1 1790		

(Kohlrausch, W Ann 1879)

Sp gr of NaOH+Aq at 20° containing
2 mols NaOH to 100 mols H₂O = 1.04712
(Nicol, Phil Mag (5) 16 122)

Sp gr of NaOH+Aq at 15°

% Na O	Sp gr	% Na ₂ O	Sp gr
5	1.069	25	1.353
10	1.139	30	1.426
15	1.210	35	1.500
20	1.281		

(Hager, Adjumenta Varia, Leipsic, 1876)

Sp gr of NaOH+Aq at 15°

% NaOH	Sp gr	% NaOH	Sp gr	% NaOH	Sp gr
0	0.999180	17	1.188707	34	1.373453
1	1.010611	18	1.199783	35	1.383815
2	1.021920	19	1.210861	36	1.394092
3	1.033109	20	1.221933	37	1.404279
4	1.044317	21	1.233062	38	1.414363
5	1.055463	22	1.244119	39	1.424353
6	1.066602	23	1.255134	40	1.434299
7	1.077733	24	1.266092	41	1.444161
8	1.088856	25	1.277063	42	1.453929
9	1.099969	26	1.287990	43	1.463623
10	1.111069	27	1.298877	44	1.473249
11	1.122165	28	1.309708	45	1.482850
12	1.133250	29	1.320496	46	1.492406
13	1.144353	30	1.331213	47	1.501927
14	1.155450	31	1.341879	48	1.511412
15	1.166538	32	1.352472	49	1.520868
16	1.177619	33	1.362991	50	1.530282

(Pickering, Phil Mag 1894, (5) 37 373)

Sp gr of a N solution of NaOH+Aq at
18°/18° = 1.0418 (Ioomis, W Ann 1890, 60
550)

Sp gr of NaOH+Aq
%NaOH 8.73 3.67 3.82
Sp gr 20°/20° 1.0968 1.0416 1.0404
(Ie Blanc and Rohland, Z phys Ch 1896,
19 272)

Sp gr of NaOH+Aq at t H O at 4° = 1
The solutions contained a small amount
of Na₂CO₃

t	% NaOH	% Na CO ₃	Sp gr
60	22.57	0.61	1.2312
	20.04	0.48	1.2026
	17.04	0.35	1.1692
	14.16	0.38	1.1374
	10.92	0.36	1.1020
80	22.81	0.55	1.2207
	14.01	0.42	1.1232

(Wegscheider and Walter, M 1905, 26 691)

Sat NaOH+Aq boils at 215.5° (Griffiths)

Sat NaOH+Aq boils at 310° (Gerlach,
Z anal 26 427)

NaOH+Aq of 1.500 sp gr contains 36.8%
NaOH and boils at 130°

B-pt of NaOH+Aq containing pts NaOH
to 100 pts H₂O

B pt	Pts NaOH	B pt	Pts NaOH
105°	17	210°	425.5
110	30	215	475.5
115	41	220	526.3
120	51	225	583.3
125	60.1	230	645.2
130	70.1	235	714.3
135	81.1	240	800
140	93.5	245	888.8
145	106.5	250	1000
150	120.4	255	1142.8
155	134.5	260	1333.3
160	150.8	265	1534
165	168.8	270	1739.1
170	187	275	2000
175	208.3	280	2353
180	230	285	2857
185	254.5	290	3571.4
190	281.7	300	4651.1
195	312.3	305	6451.6
200	345	310	10526.3
205	380.9	314	22222.2

(Gerlach, Z anal 26 463)

Insol in liquid NH₃ (Franklin, Am Ch
J 1898, 20 829)

Sp gr of Na CO₃+NaOH+Aq at 11.5°
H O at 4° = 1

% Na CO ₃	% NaOH	Sp gr
3.84	14.10	1.196
3.171	13.63	1.182
2.204	12.51	1.164
1.642	10.17	1.136
0.2686	16.64	1.186

(Wegscheider and Walter, M 1905, 26 693)

Sp gr of Na₂CO₃+NaOH+Aq at t° H O
at 4° = 1

t	% Na CO ₃	% NaOH	Sp gr
60°	15.38	10.65	1.2621
	13.79	9.22	1.2302
	12.10	8.29	1.1922
	9.965	6.86	1.1594
	9.47	6.70	1.1521
	7.69	5.22	1.1158
80°	15.26	11.14	1.2510
	9.48	6.93	1.1417

(Wegscheider and Walter, M 1905, 26 692)

Solubility of $\text{NaOH} + \text{Na}_2\text{SbS}_4$ at 30°

$\% \text{ NaOH}$	$\% \text{ Na}_2\text{SbS}_4$	Solid phase
0	27.1	$\text{Na}_2\text{SbS}_4 \cdot 9\text{H}_2\text{O}$
9.9	13	"
24.8	5.9	"
32.9	10.5	"
42.6	16.4	"
47.2	17.7	" $+\text{NaOH}, \text{H}_2\text{O}$
49.5	9.1	$\text{NaOH}, \text{H}_2\text{O}$
54.3	0	"

(Donk, Chem Weekbl 1908, 5 529, 629, 767)

Easily sol in alcohol or wood spirit, sol in fusel-oil. Sol in an aqueous solution of mannite (Favre, A ch (3) 11 76)

Easily sol in glycerine

Sol to a certain extent in ether

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3602), benzonitrile (Naumann, B 1914, 47 1370)

$+\text{H}_2\text{O}$ 100 g solution in H_2O sat at 25° contain 42 g Na_2O (Schreinemakers, Arch Néer Sc 1910, (2) 15 81)

Mpt 64.3° (See above)

$+1\frac{1}{2}\text{H}_2\text{O}$ (Cripps, Pharm J Trans (3) 14 833)

 $+2\text{H}_2\text{O}$ See above

$+3\frac{1}{2}\text{H}_2\text{O}$ Deliquescent. Sol in H_2O with absorption of much heat. Melts at 6° (Hermes)

Mpt 15.5° (See above) $+4, 5$ and $7\text{H}_2\text{O}$ (See above)

The composition of the hydrates formed by NaOH at different dilutions is calculated from determinations of the lowering of the fr-pt produced by NaOH and of the conductivity and sp gr of $\text{NaOH} + \text{aq}$ (Jones, Am Ch J 1900, 34 336)

Sodium perhydroxide, NaO_2H

"Natrivhydroxide"

Decomp by H_2O . Sol in cold alcoholic acetic acid (Tafel, B 1894, 27 2300)

Sodium iodide, NaI , and $+2\text{H}_2\text{O}$

Solubility of NaI and of $\text{NaI} + 2\text{H}_2\text{O}$ in H_2O differ. Below 65° , $\text{NaI} + 2\text{H}_2\text{O}$ usually separates out and above that temp NaI separates

Solubility of NaI in 100 pts H_2O at t°

t°	Pts NaI	t	Pts NaI	t	Pts NaI
71.3	294.4	92.4	300.2	124.7	317.5
74.1	295.3	97.1	300.3	132.5	317.3
81.6	296.8	101.7	302.5	138.1	319.2
86.4	298.3	110.7	306.2		

Solubility is represented by a straight line of the formula $S = 264.19 + 0.3978t$

Solubility of $\text{NaI} + 2\text{H}_2\text{O}$ in 100 pts at t°

t°	Pts NaI	t°	Pts NaI	t°	Pts NaI
-17	149.4	15	173.7	45	215.6
-15	150.3	20	178.7	50	227.8
-5	155.4	25	184.2	55	241.2
0	158.7	30	190.3	60	256.8
5	163.6	35	197.0	65	278.4
10	168.6	40	205.1		

(Coppet, A ch (5) 50 424)

If solubility $S = \text{pts NaI in 100 pts solution}$, $S = 61.3 + 0.1712t$ from 0° to 80° , $S = 75 + 0.0258t$ from 80° to 160° (Etard, C R 98 1432)

$\text{NaI} + 2\text{H}_2\text{O}$ is sol in 0.55 pt H_2O at 15° (Eder, Dingl 221 89)

100 pts $\text{NaI} + \text{Aq}$ at $18-19^\circ$ contain 62.9 pts NaI (v Hauer, J pr 98 137)

100 pts H_2O dissolve at

0°	20°	40°	60°
158.7	178.6	208.4	256.4 pts NaI

80°	100°	120°	140°
303	312.5	322.5	333.3 pts NaI

(Kremers, Pogg 97 14)

Transition pt for $\text{NaI} + 2\text{H}_2\text{O}$ to NaI 1 64.3° , and sat solution containing 74.4% NaI (Panfiloff, J Russ Phys Chem Soc 1893, 25 162)

100 g H_2O dissolve 172.4 g NaI at 15° , and sp gr of sat solution = 1.893. (Greenish, Pharm J 1900, 65 190)

100 g solution of $\text{NaI} + 2\text{H}_2\text{O}$ sat at 30° contains 65.5 g anhyd NaI (Cochere Dissert 1910)

Sp gr of $\text{NaI} + \text{Aq}$ at 19.5° containing

5	10	15	20	25	30 % NaI
1.040	1.082	1.128	1.179	1.234	1.294

35	40	45	50	55	60 % NaI
1.360	1.432	1.510	1.60	1.70	1.81

(Gerlach, Z anal 8 285)

Sat solution boils at 141°

Sol in liquid SO_2 (Walden, B 1899, 32 2864), POCl_3 (Walden, Z anal 1900, 2 212)

Very easily sol in liquid NH_3 (Franklin Am Ch J 1898, 20 829)

Sol in 12.0 pts absolute alcohol, in 3t pts ether (Eder, Dingl 221 89)

Sol in 3 pts 90% alcohol (Hager)

100 pts absolute methyl alcohol dissolv 77.7 pts NaI at 22.5° , ethyl alcohol, 43.1 pt (de Bruyn, Z phys Ch 10 783)

Very sol in abs methyl alcohol and is n pptd therefrom on the addition of a lar volume of abs ether, while wet ether produc immediate separation (Loeb, J Am Chem Soc 1905, 27 1020)

Solubility of NaI in ethyl alcohol
(g NaI in 100 g alcohol)

t°	NaI	t	NaI
10	43 77	200	42 3
30	44 25	220	38 5
50	44 50	230	36 2
80	45 0	240	32 7
100	45 1	250	26 2
120	45 2	255	21 0
160	45 0	260	10 8
180	44 3	261 5*	8 6

*Critical temp of solution

(Tyrer, Chem Soc 1910, 97 626)

100 g sat solution of NaI in ethyl alcohol at 30° contains 30.9 g (Cocheret, Dissert, 1910)

Solubility in ethyl alcohol + Aq at 30°

% NaI	% alcohol	Solid phase
65 52	0	NaI, 2H ₂ O
64	3 40	"
54 2	18 5	"
54	18 8	"
48 8	28 5	"
42 35	41 7	"
38 5	53 2	"
37 91	54 7	"
37 49	55 37	NaI, 2H ₂ O + NaI
35 65	59 24	NaI
33 24	61 78	"
30 90	68 70	"

(Cocheret, Dissert 1911)

At room temp 1 pt by weight is sol in

1 2 pts methyl alcohol D¹⁵ 0 7990
1 7 " ethyl " D¹⁵ 0 8100
3 8 " propyl " D¹⁵ 0 8160

(Rohland, Z anorg 1898, 18 325)

100 g methyl alcohol dissolve 90.35 g NaI at 25°

100 g ethyl alcohol dissolve 46.02 g NaI at 25°

100 g propyl alcohol dissolve 28.22 g NaI at 25°

100 g isoamyl alcohol dissolve 16.30 g NaI at 25°

(Turner and Bissett, Chem Soc 1913, 103 1909)

Solubility in methyl alcohol + ethyl alcohol at 25°

P = % methyl alcohol in the solvent
G = g NaI in 10 ccm of the solution
S = Sp gr of the sat solution at 25°

P	G	S 25°/4°
0 00	3 515	1 0806
4 37	3 768	1 1029
10 40	3 971	1 1123
41 02	4 598	1 1742
80 69	5 744	1 2741
84 77	5 892	1 2886
91 25	6 110	1 3056
100 00	6 322	1 3250

(Herz and Kuhn, Z anorg 1908, 60 154)

Solubility in mixtures of methyl and propyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NaI in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	6 322	1 3250
11 11	5 845	1 2853
23 8	5 464	1 2528
65 2	4 071	1 138
91 8	2 914	1 0420
93 75	2 649	1 0178
100 00	2 411	0 9968

(Herz and Kuhn, Z anorg 1908, 60 156)

Solubility in mixtures of propyl and ethyl alcohol at 25°

P = % propyl alcohol in the solvent
G = g NaI in 10 ccm of the solution
S = Sp gr of the sat solution

P	G	S 25°/4°
0	3 515	1 0806
8 1	3 460	1 0732
17 85	3 405	1 0720
56 6	2 841	1 0276
88 6	2 613	1 0130
91 2	2 588	1 0104
95 2	2 474	1 0020
100	2 411	0 9968

(Herz and Kuhn, Z anorg 1908, 60 159)

Sol in normal propyl alcohol (Loeb, J Am Chem Soc 1905, 27 1020)

28.74 g are sol in 100 g propyl alcohol (Schlamp, Z phys Ch 1894, 14 276)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

Sol in ethyl acetate (Casasaca, C R 30 821)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Solubility in organic solvents at t°

C=pts by wt of NaI in 100 cem of the sat solution

L=no of liters which at the saturation temp hold in solution 1 mol NaI

Solvent	t°	C	L
Furfural	25	25 10	0 597
Acetonitrile	25	18 43	0 813
"	0	22 09	0 679
Propionitrile	25	6 230	2 406
"	0	9 091	1 649
Nitromethane	25	0 478	31 36
"	0	0 339	44 27

(Walden, Z phys Ch 1906, 55 718)

Very sol in acetone (Walden)
 $+5H_2O$ Transition point of $NaI+5H_2O$ to $NaI+2H_2O$ is -13.5° , and sat solution contains 60.2% NaI (Panfiloff, J Russ Phys Chem Soc 1893, 25 162)

Sodium tin (stannous) iodide, NaI, SnI_2

Very sol in H_2O When treated with little H_2O , NaI is dissolved out, but a larger amt of H_2O dissolves it completely (Boullay, A ch (2) 34 375)

Sodium zinc iodide, $2NaI, ZnI_2+3H_2O$

Deliquescent
 $NaZnI_3+2H_2O$ Very hygroscopic (Ephraim, Z anorg 1910, 67 383)

Sodium nitride,

Decomp by heat (Franz Fisher, B 1910, 43 1468)

Sodium suboxide, Na_2O

Decomp by H_2O (de Forciand, C R 1898, 127 365)

Sodium oxide, Na_2O

Very deliquescent, and sol in H_2O with evolution of heat

See Sodium hydroxide

Sodium peroxide, Na_2O_2

Deliquescent, and very sol in H_2O with partial decomp

Solution decomp on boiling
 Cryst with $2H_2O$, and $8H_2O$ (Fairley, Chem Soc 1877 125)

Forms hydrate $Na_2O_2(OH)_4+4H_2O$
 Easily sol in H_2O or dil acids without decomp (Schone, A 193 241)

Sodium peroxide carbonate, Na_2CO_3

Easily decomp (Woffenstein, B 1908 41 285)

Sodium peroxide dicarbonate, $Na_2C_2O_6$

Easily decomp (Woffenstein, B 1908 41 287)

Sodium trioxide, NaO_3

Sol in H_2O forming a solution of Na_2O (Joannis, C R 1893, 116 1371)

Sodium trioxide carbonate, Na_2CO_3

(Woffenstein, B 1908, 41 296)

Sodium trioxide dicarbonate, $NaHCO_3$

Two isomeric modifications (Woffenstein, B 1908, 41 390)

Sodium trioxide hydrate, $NaO OH$

See Sodium perhydroxide

Isomeric with Tafel's sodyl hydroxid $O Na OH$ (B 27, 2297)

Insol in alcohol

Very unstable (Woffenstein, B 1908 41 290)

Sodium phosphide, NaP_3

Easily decomp by H_2O (Hugot, C R 1895, 121 208)

Sodium hydrogen phosphide, NaH_2P

Decomp by H_2O (Joannis, C R 1891 119 558)

$Na_3H_3P_2$ Decomp by acids and H_2O (Hugot, C R 1898, 126 1721)

Sodium selenide, Na_2Se

Very deliquescent. Decomp by H_2O (Uelsmann, A 116 127)

Insol in liquid NH_3 , sol in an free H_2 to a colorless liquid (Hugot, C R 1891 129 299)

Cryst with $16H_2O$, $9H_2O$, and $9/2 H_2O$ (Fabre, C R 102 613)

$+10H_2O$ Very sol in H_2O , very unstable in the air (Cleva, Z anorg 1895, 10 14)

Sodium diselenide, Na_2Se_2

(Jackson, B 7 1277)

Sodium triselenide, Na_2Se_3

Sol in H_2O (Mathewson, J Am Chem Soc 1907, 29 873)

Sodium hexaselenide, Na_2Se_6

Sol in H_2O (Mathewson, J Am Chem Soc 1907, 29 873)

Sodium monosulphide, Na_2S

Sol in H_2O Much less sol in alcohol than in H_2O Insol in ether (Roussin)

+5H₂O Tr pt from Na₂S+5½H₂O, 94°

+5½H₂O

The sat solution contains —

28	48%	anhydrous salt at	50°
29	27	"	" 55°
29	92	"	" 60°
31	38	"	" 70°
33	95	"	" 80°
37	20	"	" 90°

Labile from 48.9–91.5°, stable from 91.5–96°

(Parravano and Fornaini, C C 1908, I 5)

+6H₂O Less efflorescent than with 9H₂O
Sol in H₂O and alcohol

The sat solution contains —

26	7%	anhydrous salt at	50°
28	1	"	" 60°
30	22	"	" 70°
32	95	"	" 80°
36	42	"	" 90°

Tr pt to Na₂S+5½H₂O, 91.5°

(Parravano and Fornaini)

+9H₂O Efflorescent Much less sol in
alcohol than H₂O When dissolved in H₂O,
temp sinks from +22 to –6.1° (Finger,
Pogg 128 635)

The sat solution contains —

9	34%	anhydrous Na ₂ S at	–10°
13	36	"	" +10°
14	36	"	" 15°
15	30	"	" 18°
16	2	"	" 22°
17	73	"	" 28°
19	09	"	" 32°
20	98	"	" 37°
24	19	"	" 45°

Tr pt to Na₂S+5½H₂O, 48.9°

(Parravano and Fornaini)

Sodium disulphide, Na₂S

Sol in H₂O and alcohol

+5H₂O Not efflorescent

Sodium trisulphide, Na₂S₃

Sol in H₂O with decomp

Cryst with 3H₂O from in alcoholic solution (Bottger, A 223 355)

Sodium tetrasulphide, Na₂S₄+6H₂O

Very deliquescent, and sol in H₂O Difficultly sol in absolute alcohol Insol in ether (Schone)

+8H₂O Efflorescent (Bottger)

Sodium pentasulphide, Na₂S₅+6H₂O

Sol in H₂O (Schone)

Sol in alcohol

+8H₂O (Bottger)

Solution is easily decomp by warming (Jones, Chem Soc 37 461)

Sodium tellurium sulphide

See Sulphotellurate, sodium

Sodium stannic sulphide

See Sulphostannate, sodium

Sodium yttrium sulphide, Na₂S, Y₂S₃

Decomp by dil acids, even by HC₂H₃O₂+Aq (Dubois, C R 107 243)

Sodium zinc sulphide, Na₂S, 3ZnS

Not so stable as the corresponding K salt (Schneider, J pr (2) 8 29)

Sodium sulphoselenide, Na₂SSe₂+5H₂O

Hydrosopic, and decomp in the air (Meesinger, B 1897, 30 806)

Sodium telluride, Na₂Te

Sol in H₂O (Demarçay, Bull Soc (2) 40 99)

Sodium tritelluride, Na₂Te₃

Sol in H₂O

Sol in liq NH₃ (Hugot, C C 1899, II 580)

Stannic acid, H₂SnO₃

Insol in H₂O Sol in HCl, and H₂SO₄+Aq, even when dil (Fremy) Easily sol in acids, from which solution it may be pptd by dilution or boiling While moist it is sol in HNO₃+Aq, but gradually separates on standing, and coagulates at once when heated to 50° If NH₄NO₃ be added to the solution, it remains clear at ord temp (Berzelius)

Easily sol in HNO₃+Aq, when previously treated with NH₄OH+Aq (Thénard)

Easily sol in KOH+Aq, but addition of large excess ppts K₂SnO₃, insol in KOH+Aq

Easily sol in NaOH+Aq, and not pptd by an excess of that reagent (Barfoed, J B 1867 267)

Sl sol in NH₄OH+Aq or (NH₄) CO₃+Aq Completely sol in K₂CO₃+Aq, but not in Na₂CO₃+Aq

Insol in alkali hydrogen carbonates or NH₄Cl+Aq

Sol in alkali sulphides+Aq (Berzelius)

Sol in triethyltoluene ammonium hydrate+Aq

Not pptd by NH₄OH+Aq in presence of Na citrate+Aq

SnO₂ 2H₂O (Weber, Pogg 122 358)

"*Orthostannic acid*" Easily sol in HCl+Aq (Neumann, M 12 515)

H₁₀Sn₅O₁₅ (?)

Metastannic acid Insol in H₂O, HNO₃, or H₂SO₄+Aq Insol in HCl+Aq, but converted thereby into metastannic chloride, which dissolves after excess of HCl has been removed (Fresenius) Insol in HCl+Aq of sp gr 1.1 (Barfoed) Sol in large amount

of conc HCl + Aq (Allen, Chem Soc (2) 10 274)

In contact with HCl + Aq, metastannic acid is converted into stannic acid (Barfoed)

Insol in HNO_3 + Aq even after treatment with NH_4OH + Aq

Insol in NH_4OH + Aq

Sol in KOH or NaOH + Aq with formation of metastannates, which are insol in dil NaOH + Aq, but sol in H₂O or KOH + Aq, therefore KOH + Aq dissolves metastannic acid, while NaOH + Aq does not, but if the clear solution in KOH + Aq is treated with a large excess of that reagent, a further pptn occurs (Barfoed, J pr 101 368)

Insol in K_2CO_3 + Aq (Rose), alkali carbonates + Aq (Fremy)

Insol in NH_4Cl + Aq even after long boiling

Sol in $\text{Fe}(\text{NO}_3)_3$ + Aq containing HNO_3 (Lepéz and Storch, W A B 98, 2b 270)

Also in $\text{Cr}(\text{NO}_3)_3$ + Aq, but not in $\text{Ce}(\text{NO}_3)_3$, $\text{Al}(\text{NO}_3)_3$, $\text{Co}(\text{NO}_3)_2$ + Aq, etc (L and S)

A colloidal metastannic acid sol in H_2O can be obtained (Lepéz and Storch)

According to Weber (Pogg 122 358), stannic and metastannic acids are only different hydrates of same oxide, and it is not a case of allotropic modification

Colloidal H SnO_3 in colloidal state can be obtained in aqueous solution containing 5.164 g SnO in a litre. This solution is coagulated by HNO_3 + Aq only when in great excess, easily by dil H_2SO_4 + Aq, but not by conc HCl + Aq. NH_4OH + Aq in large excess causes coagulation, also NH_4Cl , NaOH, NaCl, Na₂SO₄, etc (Schneider, Z anorg 5 83)

Parastannic acid, $\text{H Sn}_2\text{O}_{11} + 3\text{H}_2\text{O}$

(Engel, C R 1897, 125 711)

Stannates

Stannates of alkali metals are sol in H_2O , others are insol. All metastannates, excepting Na, K, and NH_4 salts, are insol in H_2O (Fremy, A ch (3) 12 474)

Ammonium stannate, $(\text{NH}_4)_2\text{O}$, 2SnO_2

Sol in H₂O Insol in dil NH_4OH + Aq (Berzelius)

+ xH₂O (Moberg, 1838)

Ammonium cupric stannate, $(\text{NH}_4)_2\text{O}$, $\text{CuSnO} + 2\text{H}_2\text{O}$

Insol in H₂O Sol in acids (Ditte, C R 96 701)

Barium stannate, $\text{BaSnO}_3 + 6\text{H}_2\text{O}$

Ppt Sol in HCl + Aq (Moberg)

$\text{Ba SnO}_4 + 10\text{H}_2\text{O}$ Insol in H_2O Sol in acids (Ditte, C R 95 641)

Calcium stannate, $\text{CaSnO}_3 + 4\text{H}_2\text{O}$

Ppt (Moberg)

+ $5\text{H}_2\text{O}$ Insol in H_2O Sol in acids (Ditte, C R 96 701)

2CaO , SnO_2 (Zulkowski, Chem Ind 1901, 24 422)

Cobaltous stannate, $\text{CoSnO}_3 + 6\text{H}_2\text{O}$

Insol in H_2O Sol in acids (Ditte)

Cupric stannate, $\text{CuSnO}_3 + 3\text{H}_2\text{O}$

(Moberg)

+ $4\text{H}_2\text{O}$ Insol in H_2O (Ditte)

Cuprous stannous stannate, Cu_2O , 3SnO , $\text{SnO}_2 + 5\text{H}_2\text{O}$

Slowly decomp by dil acids, and NH_4OH + Aq, completely decomp by conc acids (Lenssen, J pr 79 90)

Gold (aurous) stannate

See Gold purple

Lead stannate, $\text{RbSn}(\text{OH})_6$

Ppt (Bellucci, Chem Soc 1905, 98 (2) 40)

Lithium stannate hexatungstate, $2\text{Li}_2\text{O}$, SnO_2 , $6\text{WO}_3 = \text{Li}_2\text{SnO}_3$, $\text{Li}_2\text{W}_6\text{O}_{18}$

Insol in H_2O (Knorre, J pr (2) 27 49)

Magnesium stannate

Ppt (Moberg)

Manganous stannate

Ppt (Moberg)

Mercurous stannate, $\text{Hg}_2\text{SnO}_3 + 5\text{H}_2\text{O}$

Ppt

Mercuric stannate, $\text{HgSnO}_3 + 6\text{H}_2\text{O}$

Ppt (Moberg, J pr 28 231)

Nickel stannate, $\text{NiSnO}_3 + 5\text{H}_2\text{O}$

Insol in H₂O Sol in acids (Ditte, C R 96 701)

Platinous sodium stannous stannate, 2PtO , Na_2O , SnO , SnO_2 (?)

(Schneider, Pogg 136 105)

Platinous stannous stannate, PtO , 2SnO , SnO_2

Decomp by conc alkalies (Schneider, Pogg 136 105)

Potassium stannate, $\text{K}_2\text{SnO}_3 + 3\text{H}_2\text{O}$

100 pts H_2O dissolve 106.6 pts at 10°, solution has sp gr = 1.618, 100 pts dissolve 110.5 pts at 20°, solution has sp gr = 1.627 (Ordway, Sill Am J (2) 40 173)

Very sl sol in conc KOH + Aq
 Insol in KCl + Aq (Freymy)
 Insol in alcohol
 Pptd from aqueous solution by the addition of any soluble salt, especially those of K, Na, and NH_4 (Freymy), by NH_4Cl , but not by KCl or NaCl (Ordway)
 Insol in acetone (Naumann, B 1904, 37 329)

Potassium metastannate, $\text{K}_2\text{O}, 10\text{SnO}_2$

$\text{K}_2\text{O}, 7\text{SnO}_2 + 3\text{H}_2\text{O}$ Sol in H_2O Solution gelatinises on heating (Rose)
 $\text{K}_2\text{O}, 6\text{SnO}_2 + 5\text{H}_2\text{O}$ Sol in H_2O , but loses its solubility by drying (Freymy, A ch (3) 12 475)

$\text{K}_2\text{O}, 5\text{SnO}_2 + 4\text{H}_2\text{O}$ Completely sol in H_2O Insol in alcohol (Freymy, A ch (3) 23 396)

$\text{K}_2\text{O}, 3\text{SnO}_2 + 3\text{H}_2\text{O}$ Deliquescent (Freymy)

Silver stannate, Ag_2SnO_3

Insol in H_2O Unacted upon by NH_4OH or HCl + Aq (Ditte)

Silver (argentous) stannous stannate (?), $\text{Ag}_2\text{O}, \text{SnO}, 3\text{SnO}_2 + 3\text{H}_2\text{O}$ (?)

Cold dil HNO_3 + Aq slowly dissolves all Ag, hot HNO_3 + Aq rapidly
 Easily sol in boiling conc H_2SO_4 (Schulze, J B 1857 257)

Sodium stannate, $\text{Na}_2\text{SnO}_3 + 3\text{H}_2\text{O}$

More easily sol in cold than in hot H_2O (Freymy)

Sol in 2 pts H_2O at 20° and 100° (Magnac)

100 pts H_2O dissolve 67.4 pts at 0° , 61.3 pts at 20° , and solutions have sp gr = 1.472 and 1.438 at 15.5° (Ordway, Sil Am J (2) 40 173)

Pptd from Na_2SnO_3 + Aq by salts of K, Na, and NH_4

Insol in acetone (Naumann, B 1904, 37 4329)

+ $4\text{H}_2\text{O}$ (Prandtl, B 1907, 40 2129)
 + $8\text{H}_2\text{O}$ (Haefely, J B 1857 650)
 + $9\text{H}_2\text{O}$ (Jones, C C 1865 607)
 + $10\text{H}_2\text{O}$ Very efflorescent (Schuren-Kestner, Bull Soc (2) 8 389)

Sodium metastannate, $\text{Na}_2\text{O}, 9\text{SnO}_2 + 8\text{H}_2\text{O}$

Sol in H_2O Insol in NaOH + Aq or alcohol (Barfoed, J B 1867 267)

$\text{Na}_2\text{O}, 5\text{SnO}_2$ Very difficultly sol in H_2O (Freymy, A ch (3) 23 399)

Insol in KOH + Aq
 + $8\text{H}_2\text{O}$ (Haefely, Chem Gaz 1855 59)

Sodium stannate vanadate,

$\text{Na}_2\text{SnO}_3, 3\text{Na}_2\text{VO}_4 + 32\text{H}_2\text{O}$
 $\text{Na}_2\text{SnO}_3, 4\text{Na}_2\text{VO}_4 + 48\text{H}_2\text{O}$
 $\text{Na}_2\text{SnO}_3, 5\text{Na}_2\text{VO}_4 + 64\text{H}_2\text{O}$
 $\text{Na}_2\text{SnO}_3, 6\text{Na}_2\text{VO}_4 + 80\text{H}_2\text{O}$ (Prandtl, B 1907, 40 2128)

Strontium stannate, $3\text{SrO}, 2\text{SnO}_2 + 10\text{H}_2\text{O}$

Ppt Insol in H_2O Sol in acids (Ditte, C R 95 641)

$\text{SrSn}(\text{OH})_6$ (Bellucci, Chem Soc 1905, 88 (2) 40)

Tin (stannous) stannate, $\text{SnO}, 6\text{SnO}_2 + 5\text{H}_2\text{O}$

Insol in H_2O Decomp by HNO_3 + Aq into metastannic acid (Schiff, A 120 53)

Sol in HCl + Aq, and in KOH + Aq

Tin (stannous) metastannate, $\text{SnO}, 7\text{SnO}_2$

$\text{SnO}, 6\text{SnO}_2 + 9\text{H}_2\text{O}$ Sol in KOH + Aq or in HCl + Aq (Freymy)
 + $4\text{H}_2\text{O}$ (Schiff)

Zinc stannate, $\text{ZnSnO}_3 + 2\text{H}_2\text{O}$

Ppt (Moberg, 1838)

$3\text{ZnO}, 2\text{SnO}_2 + 10\text{H}_2\text{O}$ Insol in H_2O Sol in acids (Ditte)

Perstannic acid, $\text{H}_2\text{Sn}_2\text{O}_7$

See Perstannic acid

Stannophosphomolybdic acid

Ammonium stannophosphomolybdate,

$3(\text{NH}_4)_2\text{O}, 4\text{SnO}_2, 3\text{P}_2\text{O}_5, 16\text{MoO}_3 + 28\text{H}_2\text{O}$

Quite insol even in boiling H_2O (Gibbs, Am Ch J 7 392)

Stannophosphotungstic acid

Ammonium stannophosphotungstate,

$2(\text{NH}_4)_2\text{O}, 2\text{SnO}_2, \text{P}_2\text{O}_5, 22\text{WO}_3 + 15\text{H}_2\text{O}$

Precipitate Sl sol in boiling H_2O (Gibbs, Am Ch J 7 319)

Stannosulphuric acid

See Sulphate, stannic

Stibine

See Hydrogen antimonide

Strontium, Sr

Decomp by H_2O with violence Dil H_2SO_4 , and HCl + Aq decomp and dissolve, cold H_2SO_4 attacks slowly Fuming HNO_3 has scarcely any action even when boiling (Franz, J pr 107 253)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Sol in excess of liquid NH_3 at -60° forming $\text{Sr}(\text{NH}_3)_6$ (Roederer, C R 1905, 140 1252)

Strontium amalgam, $\text{SrHg}_{1.0}$

Stable below 30° Above 30° the composition of the amalgam varies Can be cryst from Hg at any temp below 30° (Kerp, Z anorg 1900, 25 68)

Strontium amide, $\text{Sr}(\text{NH}_2)_2$

(Roederer, Bull Soc 1906, (3) 35 715)

100 pts H₂O dissolve 52.4 pts SrCl₂ at 18° (Gerardin)

Sat SrCl + Aq contains % SrCl at t°

t°	% SrCl	t°	% SrCl ₂
-17	26.5	75	46.5
-11	28.6	80	47.1
-5	29.3	92	47.5
-1	30.8	98	49.6
+2	31.3	104	50.7
7	31.7	105	50.7
18	33.7	118	52.0
21.5	34.7	132	52.5
35	37.8	144	54.7
44.5	39.8	153	55.7
54	42.8	175	60.5
55	43.8	215	64.1
59	47.7	222	65.4
64	46.4	250	67.3
70	46.1		

(Étard, A ch 1894, (7) 2 535)

SrCl₂ + Aq sat at 8° has sp gr = 1.379 (Anthon A 24 211)

Sp gr of SrCl₂ + Aq

Pts SrCl ₂ to 100 pts H ₂ O	Sp gr	Pts SrCl ₂ to 100 pts H ₂ O	Sp gr
9.81	1.0823	41.04	1.3114
20.12	1.1632	51.69	1.3516
30.57	1.2401		

(Kremers, Pogg 99 444)

Sp gr of SrCl₂ + Aq at 15°

% SrCl ₂	Sp gr	% SrCl	Sp gr
5	1.0453	25	1.2580
10	1.0929	30	1.3220
15	1.1439	33	1.3633
20	1.1989		

(Gerlach, Z anal 8 283)

Sp gr of SrCl + Aq at 24.7° a=no of molecules in grms dissolved in 1,000 g

H₂O, b=sp gr when a=SrCl₂+6H₂O, 1/2 mol SrCl₂+6H₂O=133.5 g, c=sp gr when a=SrCl₂, 1/2 mol =79.5 g

a	b	c	a	b	c
1	1.063	1.067	7	1.304	1.401
2	1.118	1.130	8	1.330	
3	1.166	1.190	9	1.354	
4	1.207	1.247	10	1.376	
5	1.243	1.301	11	1.396	
6	1.275	1.352			

(Favre and Valsen, C R 79 968)

Sp gr of SrCl₂ + Aq at 18°

% SrCl	Sp gr	% SrCl	Sp gr
5	1.0443	20	1.2023
10	1.0932	22	1.2259
15	1.1456		

(Kohlrausch, W Ann 1879 1)

Sp gr of SrCl₂ + Aq at 0° S=pts SrCl₂ in 100 pts solution

S	Sp gr	S	Sp gr
31.8193	1.3609	18.2629	1.1915
27.7170	1.3086	12.9997	1.1284
23.2300	1.2515	6.7243	1.0637

(Charpy, A ch (6) 29 24)

Sat SrCl₂ + Aq boils at 114° (Kremers), 118.8° (Mulder), 117.45°, and contains 117.5 pts SrCl₂ to 100 pts H₂O (Legrand), forms a crust at 115.5°, and contains 120.7 pts SrCl₂ to 100 pts H₂O, highest temp observed, 119° (Gerlach, Z anal 26 436)

B-pt of SrCl₂ + Aq containing pts SrCl₂ to 100 pts H₂O G=according to Gerlach (Z anal 26 442), L=according to Legrand (A ch (2) 59 436)

B pt	G	I	B pt	G	L
101°	11	16.7	110°	71.4	68.9
102	20.5	25.2	111	76.5	74.1
103	28.9	52.1	112	81.6	79.6
104	36.2	37.9	113	87	85.3
105	43.2	43.4	114	93.1	91.2
106	49.6	48.8	115	99.5	97.5
107	55.4	54.0	116	105.9	104.0
108	60.8	59.0	117	112.3	110.9
109	66.2	63.9	117.5		

Melts in its crystal H₂O at 112° (Tilden, Chem Soc 45 409)

Sp gr of SrCl + Aq at 25°

Concentration of SrCl + A ₁	Sp gr
1-normal	1.0676
1/2- "	1.0336
1/4- "	1.0171
1/8- "	1.0084

(Wagner, Z phys Ch 1890, 5 40)

SrCl₂ + Aq containing 3.24% SrCl₂ has sp gr 20°/20°=1.0284

SrCl₂ + Aq containing 7.08% SrCl₂ has sp gr 20°/20°=1.0638

(Le Blanc and Rohland, Z phys Ch 1896, 19 279)

Sp gr of $\text{SrCl}_2 + \text{Aq}$ at 20°	
g mols SrCl_2 per l	Sp gr
0 01	1 0012284
0 02937	1 0038396
0 03987	1 0053832
0 05017	1 0070228
0 07077	1 009560
0 10	1 013205
0 25	1 034433
0 50	1 068379
0 75	1 101760
1 00	1 135423

(Jones and Pearce, Am Ch J 1907, 38 697)

Conc $\text{HCl} + \text{Aq}$ ppts part of the SrCl_2 from $\text{SrCl}_2 + \text{Aq}$ (Hope)

Solubility of SrCl_2 in $\text{HCl} + \text{Aq}$ at 0° $\text{SrCl}_2 = \frac{1}{2}$ mols SrCl_2 (in milligrammes) dissolved in 10 ccm of liquid, $\text{HCl} =$ mols HCl (in milligrammes) dissolved in 10 ccm of liquid

SrCl_2	HCl	Sum of mols	Sp gr
55	0	55 0	1 334
48 2	6 1	54 3	1 3045
41 25	12 75	54 00	1 2695
30 6	23 3	53 9	1 220

(Engel, Bull Soc (2) 45 655)

Solubility of SrCl_2 in $\text{HCl} + \text{Aq}$ at 0°

Mg mols per 10 cc solution		Sp gr of solution	G per 100 cc solution	
$\frac{\text{SrCl}_2}{2}$	HCl		SrCl_2	HCl
51 6	0	1 334	40 9	0 0
44 8	6 1	1 304	35 5	2 22
37 85	12 75	1 269	30 0	4 65
27 2	23 3	1 220	21 56	8 49
22 0	28 38	1 201	17 44	10 35
14 0	37 25	1 167	11 09	13 58
4 25	52 75	1 133	3 37	19 23

(Engel A ch 188b, (6) 13 376)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Sol in 6 pts alcohol of 0.83 sp gr at 1) (Vauquelin)

Sol in 24 pt absolute alcohol at 1) and in 19 pts at boiling (Bucholz) Sol in 20 pts of boiling alcohol

Anhydrous SrCl_2 is sol in 111.6–116.4 pts alcohol of 99.3% at 14.5° , and in 26.2 pts of the same alcohol at boiling (Fresenius, A 59 127)

100 pts alcohol of given sp gr at 0° dissolve pts SrCl_2 at 18°

0 990	0 985	0 973	0 966	0 953 sp gr
49 81	47 0	39 6	35 9	30 4 pts SrCl_2
0 939	0 909	0 846	0 832 sp gr	
26 8	19 2	4 9	3 2 pts SrCl_2	

Insol in absolute alcohol (Gerardin, A ch (4) 5 156)

100 pts absolute methyl alcohol dissolve 63.3 pts $\text{SrCl}_2 + 6\text{H}_2\text{O}$ at 6° , ethyl alcohol, 3.8 pts (de Bruyn, Z phys Ch 10 787)

Sl sol in boiling amyl alcohol (Browning, Sill Am J 144 459)

100 g 95% formic acid dissolve 23.8 g SrCl_2 at room temp (Aschan, Ch Ztg 1913, 37 1117)

Absolutely insol in acetic ether (Cann, C R 102 363)

Very sl sol in acetone (Krug and M'Elroy)

Sol in acetone (Eidmann, C C 1899, II 1014)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Sl sol in anhydrous pyridine Sol in 97%, 95% and 93% pyridine + Aq (Kahlenberg, J Am Chem Soc 1908, 30 1107)

+ $2\text{H}_2\text{O}$ Tr pt from + $6\text{H}_2\text{O}$ is 61.5° (Richards and Churchill, Z phys Ch 1899, 28 313)

+ $6\text{H}_2\text{O}$ See above

Strontium thallic chloride, $\text{SrCl}_2, 2\text{TlCl}_3 + 6\text{H}_2\text{O}$

(Gewecke, A 1909, 366 223)

Strontium tin (stannous) chloride, $\text{SrCl}_2, \text{SnCl}_2 + 4\text{H}_2\text{O}$

Sol in H_2O (Poggiale, C R 20 1183)

Strontium tin (stannic) chloride

See Chlorostannate, strontium

Strontium uranium chloride, $\text{SrCl}_2, \text{UCl}_4$

Decomp by H_2O (Aloy, Bull Soc 1899, (3) 21 265)

Strontium zinc chloride, $\text{SrZnCl}_4 + 4\text{H}_2\text{O}$

Very sol in H_2O (Ephram, Z anorg 1910, 67 380)

Strontium chloride ammonia, $\text{SrCl}_2, 8\text{NH}_3$

Decomp by H_2O (Rose, Pogg 20 155)

Strontium chloride hydrazine, $\text{SrCl}_2, 2\text{N}_2\text{H}_4 + \text{H}_2\text{O}$

Hydroscopic (Franzen, Z anorg 1908, 60 289)

Strontium chloride hydroxylamine, $2\text{SrCl}_2, 5\text{NH}_2\text{OH} + 2\text{H}_2\text{O}$

As Ca comp (Antonow, J Russ Phys Chem Soc 1905, 37 482)

Strontium hydrogen chloride hydroxylamine, $2\text{SrCl}_2, 3\text{HCl}, 9\text{NH}_2\text{OH} + \text{H}_2\text{O}$

(Antonow, J Russ Phys Chem Soc 1905, 37 482)

Strontium chlorofluoride, $\text{SrF}_2, \text{SrCl}_2$

Decomp by H_2O , by very dil HCl , HNO_3 or acetic acid, by hot dil or conc H_2SO_4

Sol in conc HCl or HNO₃ Insol in, and not decomp by cold or boiling alcohol (Defacqz, A ch 1904, (8) 1 355)

Strontium fluoride, SrF₂

Somewhat sol in H₂O (Fr Roder)
1 l H₂O dissolves 113.5 mg SrF₂ at 0 26°,
117.3 mg at 17 4°, 119.3 mg at 27 4°,
(Kohlrausch, Z phys Ch 1908, 64 168)
Insol in HF+Aq (Berzelius)
Boiling HCl+Aq dissolves, sl attacked by
boiling HNO₃+Aq, decomp by hot H₂SO₄
(Poulenc, C R 116 987)

Strontium stannic fluoride

See Fluostannate, strontium

Strontium titanium fluoride

See Fluotitanate, strontium

Strontium fluoriodide, SrF, SrI₂

Decomp by cold H₂O, more rapidly by hot
H₂O Decomp by dil HCl, dil HNO₃, dil
H₂SO₄ or conc H₂SO₄, also by alcohol and by
ether, if not absolute (Defacqz, A ch 1904,
(8) 1 358)

Strontium hydride, SrH

Decomp by H₂O or HCl+Aq (Winkler,
B 24 1976)

SrH₂ Decomp by H₂O (Gautier, C R
1902, 134 100)

Strontium hydroselenide

Sol in H₂O

Strontium hydrosulphide, SrS₂H₂

Sol in H₂O, decomp by boiling

Strontium hydroxide, SrO₂H₂, and +8H₂O

Deliquescent

Sol in 50 pts cold and 2.4 pts boiling H₂O (Bu
cholz) in 50 pts H₂O at 15 56° (Dalton) in 51.4 pts
H₂O at 15 56° and 2 pts at 17 5°
at 15° and 2.4 pts at 100°
at 18 70° (Abl)
100 pts H₂O at 20° dissolve 1.49 pts SrO (Bineau
C R 41 509)

100 pts aqueous solution of SrO₂H₂ contain
pts SrO and pts SrO₂H₂+8H₂O at t°

t°	Pts SrO	Pts SrO ₂ H ₂ +8H ₂ O	t°	Pts SrO	Pts SrO ₂ H ₂ +8H ₂ O
0	0 35	0 90	55	2 54	6 52
5	0 41	1 05	60	3 03	7 77
10	0 48	1 23	65	3 62	9 29
15	0 57	1 46	70	4 35	11 16
20	0 68	1 74	75	5 30	13 60
25	0 82	2 10	80	6 56	16 83
30	1 00	2 57	85	9 00	23 09
35	1 22	3 13	90	12 00	30 78
40	1 48	3 80	95	15 15	38 86
45	1 78	4 57	100	18 60	47 71
50	2 13	5 46			

(Scheibler, J pharm Chim 1883, (5) 8 540)

Sol in cold NH₄Cl+Aq (Rose)

Solubility in Sr(NO₃)₂+Aq at 25°

Sp gr 25°/25°	G SrO as Sr(OH) in 100 g H ₂ O	G Sr(NO ₃) ₂ in 100 g H ₂ O
1 481	0 0	79 27
*1 506	1 76	81 06
1 490	1 71	74 27
1 450	1 55	66 88
1 419	1 51	63 71
1 403	1 47	60 37
1 381	1 41	56 30
1 359	1 34	52 90
1 327	1 27	46 97
1 317	1 20	44 03
1 291	1 14	40 83
1 267	1 11	37 81
1 239	1 03	32 41
1 217	1 01	28 80
1 206	0 96	26 58
1 178	0 95	23 83
1 148	0 91	17 96
1 126	0 87	16 21
1 108	0 84	12 78
1 079	0 81	8 96
1 059	0 79	6 29
1 033	0 78	4 45

*Solution is sat with respect to both sub-
stances

(Parsons and Perkins, J Am Chem Soc
1910, 32 1388)

Sol in methyl alcohol At room temp 1
l contains 31.5 g SrO (Neuberg and Re-
wald, Biochem Z 1908, 9 540)

Insol in acetone (Eidmann, C C 1899,
II 1014)

Sol in an aqueous solution of cane sugar
(Hunton, Phil Mag (3) 11 156)

Solubility in H₂O containing 10 g sugar at t°

t°	g SrO H +8H ₂ O	t	g SrO ₂ H ₂ +8H ₂ O
3	3 10	24	4 79
15	3 79	40	9 70

(Sidersky C C 1886 57)

+8H₂O 0.0835 mol is sol in 1 l H₂O at
25° (Rothmund, Z phys Ch 1909, 69 539)

Solubility in organic compds +Aq at 25°

Solvent	Mol SrO H +8H ₂ O sol in litre
water	0 0835
0.5-N methyl alcohol	0 0820
" ethyl alcohol	0 0744
" propyl alcohol	0 0708
" tert amyl alcohol	0 0630
" acetone	0 0692
" ether	0 0645

Solubility in organic compds +Aq at 25° —
Continued

Solvent	Mol $\text{SrO}_2\text{H}_2 + 8\text{H}_2\text{O}$ sol id 1 litre
0 5-N glycol	0 0922
" glycerine	0 1094
" mannitol	0 1996
" urea	0 0820
" ammonia	0 0785
" diethyl amine	0 0586
" pyridine	0 0694

(Rothmund, Z phys Ch 1909, 69 539)

Insol in acetone (Naumann, B 1904, 37 4329)

*See also Strontium oxide***Strontium iodide, SrI_2 , and +6, or $7\text{H}_2\text{O}$** 100 pts H_2O dissolve at

0° 20° 40° 70° 100°

164 179 196 250 370 pts SrI_2

(Kremers, Pogg 103 65)

Sat aq solution contains at

-20° -10° -3° +7° 11° 18° 38°

60 0 60 3 62 2 63 0 63 4 63 5 64 8% SrI_2 ,

52° 63° 77° 81° 97° 105° 120 175°

66 0 68 5 70 5 74 0 79 2 79 4 80 8 85 6% SrI_2

(Étard, A ch 1894, (7) 2 543)

Sp gr of $\text{SrI}_2 + \text{Aq}$ at 19.5° containing5 10 20 30 % SrI_2 ,

1 045 1 091 1 200 1 330

40 50 60 65 % SrI_2

1 491 1 695 1 955 2 150

(Kremers, Pogg 103 67, calculated by
Gerlach, Z anal 8 285)Sat solution in abs ethyl alcohol contains
at

-20° +4° 39° 82°

2 6 3 1 4 3 4 7% SrI_2

(Étard, A ch 1894, (7) 2 565)

Strontium periodide, $\text{SrI}_3 + 15\text{H}_2\text{O}$

(Mosnier, A ch 1897, (7) 12 399)

 SrI_4 (Herz and Bulla, Z anorg 1911, 71 255)**Strontium stannous iodide**Very sol in H_2O (Boullay)**Strontium zinc iodide, $\text{SrZnI}_4 + 9\text{H}_2\text{O}$**

Hydroscopic (Ephraim, Z anorg 1910, 67 385)

Strontium nitride, Sr_3N_2 Decomp H_2O violently, but not alcohol
(Maquenne, A ch (6) 29 225)**Strontium oxide, SrO** Decomp by H_2O to SrO_2H_2 , which seeSol in 160 pts H_2O at 15.56° (Dalton) in 50 pts at 100° (Dalton) in 130 pts at 20° (Bineau) in 40 pts cold and 20 pts hot H_2O (Dumas)

Very sl sol in alcohol Insol in ether

1 l methyl alcohol dissolves 11.2 g SrO
(Neuberg and Rewald, Biochem Z 1908, 9 540)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Sol in cane sugar +Aq

Solubility in H_2O containing 10 g sugar at t°

t°	g SrO	t°	g SrO
8	1 21	24	1 87
15	1 48	40	3 55

(Sidersky, C C 1886 57)

*See also Strontium hydroxide***Strontium peroxide, SrO_2** Sl sol in H_2O Easily sol in acids and $\text{NH}_4\text{Cl} + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Conroy, Chem Soc (2) 11 812)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Strontium oxybromide, $\text{SrBr}_2, \text{SrO} + 9\text{H}_2\text{O}$ Not hygroscopic, sol in H_2O (Tassilly C R 1895, 120 1339)**Strontium oxychloride, $\text{SrCl}_2, \text{SrO} + 9\text{H}_2\text{O}$** Very easily decomp by H_2O and alcohol (André, A ch (6) 3 76)**Strontium oxyiodide, $2\text{SrI}_2, 5\text{SrO} + 30\text{H}_2\text{O}$** Not hygroscopic, sol in H_2O (Tassilly, C R 1895, 120 1339)**Strontium oxysulphide, $\text{Sr}_2\text{OS}_4 + 12\text{H}_2\text{O}$** Decomp by H_2O Insol in alcohol, ether, and CS_2 (Schöne Mixture of SrS O_3 and SrS , (Geuther, A 224 178)**Strontium phosphide, Sr_3P_2** *Crystallized* Sol in dil acids, insol in conc acids, decomp by H_2O Insol in organic solvents at ord temp (Jaboin, C R 1899, 129 764)**Strontium selenide, SrSe** Sl sol in H_2O (Fabre, C R 102 1469)**Strontium silicide, SrSi_2** Decomp by H_2O (Bradley, C N 1900, 82 150)

Strontium sulphide, SrS

Sol in H_2O with decomp into SrO_2H_2 and SrS_2H_2
 Insol in acetone (Eldmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)
 Insol in methyl acetate (Naumann, B 1909, 42 3790)

Strontium tetrasulphide, SrS_4

Very deliquescent, and sol in H_2O and alcohol Aqueous solution decomp on air
 Cryst with 2, or $6H_2O$ (Schone, Pogg 117 58)

Strontium pentasulphide, SrS_5

Known only in solution

Strontium stannic sulphide

See Sulphostannate, strontium

Sulphalummic acid**Silver sulphaluminate, $4Ag_2S, 5Al_2S$**

(Camb, Real Ac Linc 1912, (5) 21, II 837)

Sulphamic acid, $HOSO_2NH_2$

See Amidosulphonic acid

Ammonium sulphamate, $2NH_3, SO_3$

(Woronin)
 Is ammonium imidosulphonate, which see (Berglund)

Ammonium sulphamate, acid, $3NH_3, 2SO_3$

(Woronin)
 Is basic ammonium imidosulphonate, which see (Berglund)

Barium sulphamate, basic, $2BaO, 3SO_3, 2NH_3$

Somewhat sol in H_2O easily in $HCl + Aq$ (Jacquelin, Arch (3) 8 304)
 $BaSO_6(NH_3)_2$ Sl sol in H_2O Decomp by heating with H_2O (Woronin, J B 1860 50)
 Is barium imidosulphonate (Berglund)

Sulphamide, $SO(NH_2)_2$

Very sol in H_2O (Regnault, Arch 69 170, Mente, A 248 267)
 Insol in alcohol, ether, etc (Traube, B 26 607)
 Very sol in H_2O
 Sl sol in abs alcohol
 Sl sol in dry ether (Divers and Ogawa, Chem Soc 1902, 81 504)
 Very sol in liquid NH_3 (Franklin and Stafford, Am Ch J 1902, 28 95)
 Sol in alcohol, very sol in H_2O (Hantzsch, B 1901, 34 3436)

Silver sulphamide, $SO_2(NHAg)_2$

Sl sol in cold H_2O Sol in HNO_3 , and $(NH_4)_2CO_3 + Aq$ (Traube, B 26 607)
 $3NH_3, 2SO_3$ (Jacquelin)
 Is basic ammonium imidosulphonate, which see (Berglund)

Sulphamidic acid

(Fremy)

See Imidosulphonic acid

Sulphaminoplatinous acid**Ammonium tetrasulphaminoplatinite,**

$[Pt(SO_3NH_2)_4](NH_4)_2 + 6H_2O$
 Sl sol in cold H_2O (Ramberg, B 1912, 45 1512)

Potassium —, $[Pt(SO_3NH_2)_4]K_2 + 2H_2O$

Very sl sol in cold H_2O (Ramberg)

Sodium —

Easily sol in cold H_2O (Ramberg)

Sulphammonic, and Metasulphammonic acids

(Fremy)

See Nitrosulphonic acid

Monosulphammonic acid

(Claus)

See Amidosulphonic acid

Disulphammonic acid

(Claus)

See Imidosulphonic acid

Trisulphammonic acid

(Claus)

See Nitrosulphonic acid

Tetrasulphammonic acid

(Claus)

Does not exist See Nitrosulphonic acid

Sulphammonium, $S(NH_3)_2, 2NH_3$

Sol in liquid NH_3
 Sol in abs alcohol and anhydrous ether (Moissan, C R 1901, 132 517)

Sulphantimonic acid**Sulphantimonates**

The alkali sulphantimonates are sol in H_2O , but the solutions decomp on the air, most of the other sulphantimonates are insol in H_2O , all sulphantimonates are insol in alcohol (Rammelsberg)

Ammonium sulphantimonate, $(\text{NH}_4)_3\text{SbS}_4$

Sol in H_2O
Sol in dil acids with decomp (Stanek,
Z anorg 1898, 17 122)
+4 H_2O (Stanek)

Solubility of $(\text{NH}_4)_3\text{SbS}_4 + 4\text{H}_2\text{O}$ in H_2O at t°

t°	% $(\text{NH}_4)_3\text{SbS}_4$	Solid phase
-19	99	Ice
-5	200	"
-8	302	"
-13.5	416	Ice + $(\text{NH}_4)_3\text{SbS}_4, 4\text{H}_2\text{O}$
0	416	$(\text{NH}_4)_3\text{SbS}_4, 4\text{H}_2\text{O}$
+20	477	"
30	545	"

(Donk, Chem Weekbl, 1908, 5 529)

Solubility of $(\text{NH}_4)_3\text{SbS}_4$ in alcohol at 10°
Solid phase, $(\text{NH}_4)_3\text{SbS}_4 + 4\text{H}_2\text{O}$

C H_4OH	% $(\text{NH}_4)_3\text{SbS}_4$	C H_4OH	% $(\text{NH}_4)_3\text{SbS}_4$
0	432	431	87
51	359	531	41
191	231	933	0

(Donk, l c)

Antimonyl sulphantimonate, $(\text{SbO})_3\text{SbS}_4$

Sol in HCl (Rammelsberg, Pogg 1841,
52 236)

Barium sulphantimonate, $\text{Ba}_3(\text{SbS}_4) + 3\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol

Barium potassium sulphantimonate,

$\text{KBaSbS}_4 + 6\text{H}_2\text{O}$

Easily sol in H_2O
Decomp by acids (Glatzel, Z anorg
1911, 72 100)

Bismuth sulphantimonate

Ppt

Cadmium sulphantimonate

Ppt (Rammelsberg, Pogg 52 236)

Calcium sulphantimonate, $\text{Ca}_3(\text{SbS}_4)_2$

Partially sol in H_2O Insol in alcohol

Cobaltous sulphantimonate, $\text{Co}_3(\text{SbS}_4)_2$

Ppt Decomp by $\text{HCl} + \text{Aq}$ (Rammels-
berg, Pogg 52 236)

Cupric sulphantimonate, $\text{Cu}_3(\text{SbS}_4)_2$

Ppt (Rammelsberg, Pogg 52 226)

Iron (ferrous) sulphantimonate

Ppt

Iron (ferric) sulphantimonate, $\text{Fe}_2(\text{SbS}_4)_3$

(Rammelsberg, Pogg 52 234)

Lead sulphantimonate, $\text{Pb}_3(\text{SbS}_4)_2$

Ppt Decomp by $\text{KOH} + \text{Aq}$ (Rammels-
berg, Pogg 52 223)

Lithium sulphantimonate, $\text{Li}_3\text{SbS}_4 + 8\frac{1}{2}\text{H}_2\text{O}$

100 g sat solution in H_2O contain 50.8,
anhyd Li_3SbS_4

Solubility in alcohol at 30°

% alcohol	% Li_3SbS_4	Solid phase
0	50.8	$\text{Li}_3\text{SbS}_4, 8\frac{1}{2}\text{H}_2\text{O}$
13.3	46.3	"
51.9	30.7	"
54.8	29.9	"
58.4	30.8	$\text{Li}_3\text{SbS}_4, 8\frac{1}{2}\text{H}_2\text{O} + \text{Li}_2\text{Sb}_2\text{O}_7$
58.6	32.3	"
65.26	29.31	$\text{Li}_2\text{Sb}_2\text{O}_7$
74.3	24.1	"
79.5	20.5	"

(Schreinemakers and Jacobs, Ch Weekl
1910, 72 213)

+9 H_2O Very sol in H_2O (Brinkman
Dissert 1891)

+10 H_2O Solubility of $\text{Li}_3\text{SbS}_4 + 10\text{H}_2\text{O}$
 H_2O at t°

t°	% Li_3SbS_4	Solid phase
-17	71	Ice
-32	12.8	"
-51	17.5	"
-108	23.2	"
-159	28.5	"
-262	35.3	"
-42	40.4	Ice + $\text{Li}_3\text{SbS}_4, 10\text{H}_2\text{O}$
0	45.5	$\text{Li}_3\text{SbS}_4, 10\text{H}_2\text{O}$
+10	46.9	"
30	50.1	"
50	51.3	"

(Donk, Chem Weekbl 1908, 5 629)

At 10° , 100 g sat $\text{Li}_3\text{SbS}_4 + 10\text{H}_2\text{O}$ in 11
% alcohol contain 41.8 g Li_3SbS_4 , 26.2
alcohol, 36.5 g Li_3SbS_4 (Donk, l c)

Magnesium sulphantimonate, $\text{Mg}_3(\text{SbO})_2$

Deliquescent Sol in H_2O Decomp
alcohol

Mercurous sulphantimonate, $(\text{Hg}_2)_3(\text{SbS}_4)_2$

Ppt

Mercuric sulphantimonate, $\text{Hg}_2(\text{SbS}_4)_2$

Ppt (Rammelsberg, Pogg 52 229)

Mercuric sulphantimonate chloride,
 $\text{Hg}_3(\text{SbS}_4)_2, 3\text{HgCl}_2, 3\text{HgO}$

Insol in acids, except aqua regia (Rammelsberg)

Nickel sulphantimonate, $\text{Ni}_3(\text{SbS}_4)_2$

Ppt Decomp by hot $\text{HCl} + \text{Aq}$ (Rammelsberg, Pogg 52 226)

Potassium sulphantimonate, K_3SbS_4

Sol in H_2O

Solubility of K_3SbS_4 in H_2O at t°

t°	% K_3SbS_4	Solid phase
- 1 3	9 5	Ice
- 2 6	17 1	
- 4	24 2	
- 7 2	35 4	"
- 10 6	42 9	
- 13 5	48 8	
- 18 5	52 6	"
- 28 8	59 6	
- 34	62	
- 10	65 5	Ice + $\text{K}_3\text{SbS}_4, 6\text{H}_2\text{O}$ $\text{K}_3\text{SbS}_4, 6\text{H}_2\text{O}$
- 4 5	69 1	
0	75 4	$\text{K}_3\text{SbS}_4, 5\text{H}_2\text{O}$
+ 10	76 2	
30	77 1	"
50	77 7	
80	79 2	

(Donk, Chem Weekbl 1908, 5 529, 629, 767)

Solubility of K_3SbS_4 in $\text{KOH} + \text{Aq}$ at 25°

% K_3SbS_4	% KOH	Solid phase
75	0	$\text{K}_3\text{SbS}_4, 5\text{H}_2\text{O}$ $\text{K}_3\text{SbS}_4, 3\text{H}_2\text{O}$
68 4	3 4	
56 8	11 0	K_3SbS_4
50 9	16 1	
37 7	25 5	"
19 8	40 5	
11 5	46 9	$\text{K}_3\text{SbS}_4 + \text{KOH}, 2\text{H}_2\text{O}$ $\text{KOH}, 2\text{H}_2\text{O}$
9 4	49 9	
00 0	56 3	"

(Donk)

Solubility of K_3SbS_4 in alcohol + Aq at 10°

% $\text{C}_2\text{H}_5\text{OH}$	% K_3SbS_4	Solid phase
94	0	$\text{K}_3\text{SbS}_4, 5\text{H}_2\text{O}$
90 5	0	
0 8	69 2	"
0	76 1	

* Two liquid layers are formed

Composition of the liquid layers

Alcohol layer		H_2O layer	
% $\text{C}_2\text{H}_5\text{OH}$	% K_3SbS_4	% alcohol	% K_3SbS_4
85	0	1 1	67 4
54 7	2 2	3 4	49 0
46 9	4 2	3 8	45 6
16	27 4		
		31 1	12 7

(Donk, l c)

+ $4\frac{1}{2}\text{H}_2\text{O}$ Deliquescent Sol in H_2O , more sol than the Na salt

+ 3, 5, and $6\text{H}_2\text{O}$ See Donk above
 $2\text{K}_2\text{S}, \text{Sb}_2\text{S}_3$ Decomp by cold H_2O
 (Ditte, C R 102 168)

$\text{K}_2\text{S}, 2\text{Sb}_2\text{S}_3 + 3\text{H}_2\text{O}$ Sl sol in H_2O
 (Ditte)

$\text{K}_2\text{S}, \text{Sb}_2\text{S}_3$ Decomp by H_2O (Ditte)
 $\text{K}_2\text{S}, 2\text{Sb}_2\text{S}_3$ (Ditte)

Silver sulphantimonate, Ag_3SbS_4

Insol in H_2O or acids Decomp by $\text{KOH} + \text{Aq}$ (Rammelsberg, Pogg 52 218)

Sodium sulphantimonate, $\text{Na}_3\text{SbS}_4 + 9\text{H}_2\text{O}$

(Schuppe's salt) Sol in 29 pts H_2O at 15° Aqueous solution is precipitated by alcohol (Rammelsberg)

Sol in 3 pts cold H_2O (van den Corput)

Sol in 4 pts cold H_2O (Duflos)

Sol in 1 pt boiling H_2O (Duflos)

Solubility of $\text{Na}_3\text{SbS}_4 + 9\text{H}_2\text{O}$ in H_2O at t°

t	% Na_3SbS_4	Solid phase
- 0 1	0 5	Ice
- 0 65	4	
- 0 9	5 7	
- 1 26	7 8	"
- 1 45	9 2	
- 1 75	11 2	
0	11 3	$\text{Na}_3\text{SbS}_4, 9\text{H}_2\text{O}$
15	19 3	
30	27 1	
38	32	"
49 6	38 9	
59 6	45	
69 6	50 7	"
79 5	57 1	

(Donk, Chem Weekbl 1908, 5 529, 629, 767)

Solubility of $\text{Na}_3\text{SbS}_4 + \text{Na}_2\text{S}_2\text{O}_3$ in H_2O		
$\% \text{Na}_3\text{SbS}_4$	$\% \text{Na}_2\text{S}_2\text{O}_3$	Solid phase
$t^\circ = 10^\circ$		
11 8	0	$\text{Na}_3\text{SbS}_4 \cdot 9\text{H}_2\text{O}$
4 4	4 9	"
0 8	14 6	"
0 1	27 3	"
0 0	33 6	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
$t^\circ = 30^\circ$		
19 9	7 7	$\text{Na}_3\text{SbS}_4 \cdot 9\text{H}_2\text{O}$
12 5	16 4	"
4 2	37 7	"
1	43 8	"
1	47	"
1	47 8	$\text{Na}_3\text{SbS}_4 + \text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
0	45 8	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

(Donk, l c)

Solubility of Na_3SbS_4 in alcohol + Aq at t°
Solid phase, $\text{Na}_3\text{SbS}_4 + 9\text{H}_2\text{O}$

$t = 0$		$t = 30^\circ$		$t = 65$	
$\% \text{C}_2\text{H}_5\text{OH}$	$\% \text{Na}_3\text{SbS}_4$	$\% \text{C}_2\text{H}_5\text{OH}$	$\% \text{Na}_3\text{SbS}_4$	$\% \text{C}_2\text{H}_5\text{OH}$	$\% \text{Na}_3\text{SbS}_4$
0	11 8	5	19 3	0	47 9
3 7	8 2	10 3	14 6	4 7	39 3
12 7	3 2	24 8	6 4	8	36 5
29	0 9	46	1 2	* 54 1	4 1
60 8	0	76 2	0	81	0

* Two layers are formed

Composition of above layers

Alcohol layer		H ₂ O layer	
$\% \text{alcohol}$	$\% \text{Na}_3\text{SbS}_4$	$\% \text{alcohol}$	$\% \text{Na}_3\text{SbS}_4$
54 1	4 1	8 0	36 5
40 4	10 2	14 3	27 8
33 5	14 1	18 8	24 1
		27 2	18 0

(Donk, l c)

Solubility of Na_3SbS_4 in methyl alcohol at t°
Solid phase, $\text{Na}_3\text{SbS}_4 + 9\text{H}_2\text{O}$

$t = 0^\circ$		$t = 30^\circ$	
$\% \text{CH}_3\text{OH}$	$\% \text{Na}_3\text{SbS}_4$	$\% \text{CH}_3\text{OH}$	$\% \text{Na}_3\text{SbS}_4$
3 4	8 6	0	27 1
15 5	2 8	18 1	12 8
23 1	2 1	33 1	5 8
50 3	0 3	65 7	0 1
57	0 1	84 2	0 1
81 7	0 05	91 2	1 2
92	0 2	94	3 9
95 9	2 0		

(Donk, l c)

Sodium sulphantimonate thiosulphate,
 $\text{Na}_3\text{SbS}_4 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 + 20\text{H}_2\text{O}$

Efflorescent, and decomp by H_2O (Unger, Arch Pharm (2) 147 193)

No double salt exists See Donk, $\text{Na}_3\text{SbS}_4 + \text{Na}_2\text{S}_2\text{O}_3$ under Na_3SbS_4

Strontium sulphantimonate

Sol in H_2O , pptd by alcohol

Uranium sulphantimonate

Ppt

Zinc sulphantimonate, $\text{Zn}_3(\text{SbS}_4)_2$

Ppt Sol in hot $\text{Na}_3\text{SbS}_4 + \text{Aq}$, insol in $\text{ZnSO}_4 + \text{Aq}$ Partially sol in $\text{KOH} + \text{Aq}$ sol in hot $\text{HCl} + \text{Aq}$ (Rammelsberg, Pogg 52 233)

Sulphantimonous acid

Ammonium metasulphantimonite, NH_4SbS_2
Insol in H_2O (Rouget, C R 1898, 12 1145)

+ $2\text{H}_2\text{O}$ Insol in H_2O and alcohol
Decomp in the air (Stanck, Z anor 1898, 17 119)

Ammonium orthosulphantimonite,
 $(\text{NH}_4)_3\text{SbS}_3$

Easily decomp Stable only in presence of $(\text{NH}_4)_2\text{S}$ Sol in H_2O Insol in alcohol by which it is pptd from aqueous solution (Pouget, A ch 1899, (7) 18 536)

Ammonium parasulphantimonite,
 $(\text{NH}_4)_2\text{Sb}_2\text{S}_7$

Stable in the air
Insol in H_2O

Decomp by acids (Stanek, Z anor 1898, 17 120)

Stable, cryst from hot solutions (Pouget, C R 1898, 126 1145)

Ammonium silver orthosulphantimonite,
 $\text{NH}_4\text{Ag}_2\text{SbS}_3$ Decomp by H_2O (Pouget, A ch 1899, (7) 18 551)**Barium metasulphantimonite,** BaSb_2S_4
 $+4\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O (Pouget, A ch 1899, (7) 18 541)**Barium orthosulphantimonite,** $\text{Ba}_3\text{Sb}_2\text{S}_6$
 $+8\text{H}_2\text{O}$ Decomp in the air and by H_2O Somewhat sol in $\text{BaS}+\text{Aq}$ (Pouget, C R 1898, 126 1792)**Barium pyrosulphantimonite,** $\text{Ba}_2\text{Sb}_2\text{S}_5$
 $+8\text{H}_2\text{O}$ Decomp by H_2O Nearly insol in $\text{BaS}+\text{Aq}$ (Rouget)**Barium sulphantimonite,** $\text{Ba}_3\text{Sb}_4\text{S}_9+10\text{H}_2\text{O}$

Pptd from aq solution of ortho and pyrobarium salts (Pouget)

 $\text{Ba}_3\text{Sb}_4\text{S}_{11}+16\text{H}_2\text{O}$ (Pouget, A ch 1899, (7) 18 538)**Calcium sulphantimonite basic,** $\text{Ca}(\text{OH})\text{SbS}_2$ Insol in H_2O Sol in conc HCl (Pouget, A ch 1899, (7) 18 544)**Calcium pyrosulphoantimonite,** $\text{Ca}_2\text{Sb}_2\text{S}_5$
 $+15\text{H}_2\text{O}$ Sol in H_2O without decomp (Pouget, C R 1898, 126 1793)**Cobaltous orthosulphantimonite,** $\text{Co}_3\text{Sb}_2\text{S}_6$

Ppt (Pouget, A ch 1899, (7) 18 554)

Cuprous metasulphantimonite, CuSbS_2 Sol in mixture of HNO_3 and tartaric acid with separation of SInsol in $\text{NH}_4\text{OH}+\text{Aq}$ Decomp by hot KOH and alkali sulphides $+\text{Aq}$ (Sommerlad, Z anorg 1898, 18 430)Min *Wolfberite* Sol in HNO_3+Aq with separation of S and Sb O_3 **Cuprous orthosulphantimonite,** Cu_3SbS_3

(Sommerlad, Z anorg 1898, 18 432)

Ppt Insol in H_2O Decomp by H_2O (Pouget, A ch 1899, (7) 18 556)**Cuprous sulphantimonite,** $\text{Cu}_2\text{Sb}_4\text{S}_7$ Min *Guejarite***Cupric orthosulphantimonite,** $\text{Cu}_3\text{Sb}_2\text{S}_6$

Ppt (Pouget, A ch 1899, (7) 18 557)

Cuprous lead sulphantimonite, Cu_3SbS_3 ,
 $2\text{Pb}_3\text{SbS}_3$ Min *Boironite* Decomp by HNO_3+Aq , and aqua regia**Cuprous potassium orthosulphantimonite,**
 Cu_2KSbS_3 Ppt, easily decomp by H_2O (Pouget, C R 1899, 129 104) $+3\text{H}_2\text{O}$ Ppt decomp by H_2O (Pouget, A ch 1899, (7) 18 556)**Iron (ferrous) orthosulphantimonite,**
 $\text{Fe}_3(\text{Sb}_2\text{S}_6)_2$

Ppt (Pouget, A ch 1899, (7) 18 554)

Min *Berthierite* Sl sol in $\text{HCl}+\text{Aq}$, easily sol in aqua regia**Lead orthosulphantimonite,** $\text{Pb}_3(\text{SbS}_2)_2$ Ppt Very sl sol in H_2O Decomp by H_2O (Pouget, A ch 1899, (7) 18 553)Min *Boulangerite* Completely sol in hot $\text{HCl}+\text{Aq}$, decomp by HNO_3+Aq **Lead sulphantimonite**Sol in boiling conc HNO_3+Aq (Fournet) $\text{Pb}(\text{SbS}_2)_2$ Min *Zinkenite* Decomp by hot $\text{HCl}+\text{Aq}$ 4PbS , Sb_2S_3 Min *Plagionite* 2PbS , Sb_2S_3 Min *Jamesonite* Decomp by hot $\text{HCl}+\text{Aq}$ 4PbS , Sb_2S_3 Min *Meneghinite* 5PbS , Sb_2S_3 Min *Geokronite* 6PbS , Sb_2S_3 Min *Kibirilenite* (?)**Lead potassium orthosulphantimonite,** PbKSbS_3 Very sl sol in H_2O Decomp by H_2O (Pouget, A ch 1899, (7) 18 554)**Lead silver sulphantimonite,** $(\text{Ag}_2, \text{Pb})_3\text{Sb}_4\text{S}_{11}$ Min *Freieslebenite***Lithium orthosulphantimonite,** Li_3SbS_3 $+3\text{H}_2\text{O}$

Very deliquescent

Very sl in H_2O (Pouget, A ch 1899, (7) 18 530)**Lithium parasulphantimonite,** $\text{Li Sb}_4\text{S}_7+3\text{H}_2\text{O}$

Ppt (Pouget, A ch 1899, (7) 18 531)

Lithium silver orthosulphantimonite, $\text{LiAg}_2\text{SbS}_3$ Decomp by H_2O (Pouget, A ch 1899, (7) 18 551)**Manganous orthosulphantimonite,** $\text{Mn}_3\text{Sb}_2\text{S}_6$ Ppt Sl sol in H_2O (Pouget, A ch 1899, (7) 18 553)**Manganous potassium orthosulphantimonite,**
 MnKSbS_3 Sl sol in H_2O Decomp by H_2O (Pouget, A ch 1899, (7) 18 553)

Nickel orthosulphantimonite, $\text{Ni}_3\text{Sb}_2\text{S}_6$

Ppt (Pouget, A ch 1899, (7) 18 554)

Potassium metasulphantimonite, KSbS_2

Insol in cold H_2O Decomp by hot H_2O
(Pouget, A ch 1899, (7) 18 513)

+ $1\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O , but decomp quickly

Sol in H_2O (Stanek, Z anorg 1898, 17 119)

Potassium orthosulphantimonite, K_3SbS_3

Very deliquescent

Very sol in H_2O

Decomp by acids (Pouget, A ch 1899, (7) 18 518)

Potassium sulphantimonite, $\text{K}_2\text{Sb}_4\text{S}_7 + 3\text{H}_2\text{O}$

Sl sol in H_2O and not decomp thereby
(Pouget, A ch 1899, (7) 18 522)

Decomp in the air

Sol in $\text{K}_2\text{S} + \text{Aq}$ (Stanek, Z anorg 1898, 17 120)

$2\text{K}_2\text{S}$, Sb_2S_3 Sol in H_2O (Ditte, C R 102 68)

$x\text{K}_2\text{S}$, $y\text{Sb}_2\text{S}_3$ Deliquescent When K_2S is in excess, sol in H_2O , when Sb_2S_3 is in excess, partially sol Aqueous solution is decomp by all acids, even CO_2 , and by K_2CO_3 , Na_2CO_3 , NaHCO_3 , KHCO_3 , $\text{NH}_4\text{HCO}_3 + \text{Aq}$ Insol in absolute alcohol (Kohl)

Potassium hydrogen sulphantimonite,

KHSb_4S_7

(Pouget, A ch 1899, (7) 18 522)

Potassium silver orthosulphantimonite,

Ag KSbS_3

Decomp by boiling H_2O (Pouget, C R 1897, 124 1519)

Potassium zinc orthosulphantimonite,

KZnSbS_3

Decomp by H_2O (Pouget, A ch 1899, (7) 18 552)

Silver orthosulphantimonite, Ag_3SbS_3

Ppt Sl sol in H_2O (Pouget, A ch 1899 (7) 18 547)

Min *Pyrrargyrite* Sol in $\text{HNO}_3 + \text{Aq}$ with residue of S and Sb_2O_3 $\text{KOH} + \text{Aq}$ dissolves out Sb S_3

Silver sulphantimonite

AgSbS Min *Margyrite*

5Ag S , Sb S_3 Min *Stephanite* Easily decomp by warm $\text{HNO}_3 + \text{Aq}$

12Ag S , Sb S_3 Min *Polyargyrite*

Silver sodium orthosulphantimonite,

Ag NaSbS_3

Decomp by H O Pouget, A ch 1899, (7) 18 551)

Sodium metasulphantimonite, NaSbS_2

Deliquescent Decomp by hot H_2O When Na_2S is in excess, sol in H_2O , but partially sol if Sb_2S_3 is in excess (Unger Arch Pharm (2) 148 1)

Ppt Insol in H_2O (Pouget, C R 1898 126 1145)

Sodium orthosulphantimonite, Na_3SbS_3

+ $9\text{H}_2\text{O}$

Decomp in solution in H_2O (Pouget C R 1898, 126 1144)

Sodium sulphantimonite, $\text{Na}_2\text{Sb}_4\text{S}_7 + 2\text{H}_2\text{O}$

Sol in H_2O (Pouget, C R 1898, 126 1145)

$\text{Na}_2\text{Sb}_4\text{S}_7$ (Pouget, C R 1898, 126 1144) $4\text{Na}_2\text{S}$, $3\text{Sb}_2\text{S}_3 + 3\text{H}_2\text{O}$ Permanent, so in H_2O Insol in alcohol and ether (Kohl)

Strontium orthosulphantimonite, $\text{Sr}_3\text{Sb}_2\text{S}_3$

+ $10\text{H}_2\text{O}$

Sol in H_2O (Pouget, C R 1898, 126 1793)

Strontium pyrosulphantimonite, $\text{Sr}_2\text{Sb}_2\text{S}_5$

+ $15\text{H}_2\text{O}$

Sol in H_2O without essential decomp (Pouget, C R 1898, 126 1793)

Zinc orthosulphantimonite, $\text{Zn}_3\text{Sb}_2\text{S}_3$

Ppt (Pouget, A ch 1899, (7) 18 552)

Orthosulpharsenic acid, H_3AsS_4

Ppt Loses H_2S by prolonged boiling wth H_2O (Nilson, J pr (2) 14 145)

See also Sulphoxyarsenic acid

Ammonium sulpharsenate, $(\text{NH}_4)_4\text{As}_2\text{S}_7$

Known only in solution in H_2O Decomp on boiling into—

NH_4AsS_3 Sol in alcohol

$(\text{NH}_4)_3\text{AsS}_4$ Sol in H_2O Precipitate

by alcohol

$(\text{NH}_4)_2\text{S}$, $12\text{As}_2\text{S}_5$ Ppt Insol in H_2O

Ammonium magnesium sulpharsenate,

$(\text{NH}_4)_2\text{S}$, MgS , As_2S_5

Ammonium sodium sulpharsenate,

$(\text{NH}_4)_3\text{AsS}_4$, Na_3AsS_4

Much more sol in H_2O than Na_3AsS_4 , sol in cold, more sol in hot alcohol (Bezelius)

Barium sulpharsenate, $\text{Ba}(\text{AsS}_3)_2$

Sol in H_2O and alcohol Decomp by evaporation

$\text{Ba}_2\text{As}_2\text{S}_7$ Sol in H_2O in all proportions with decomp Decomp by alcohol

$\text{Ba}_3(\text{AsS}_4)_2$ Sol in H_2O Insol in alcohol

BaS , $3\text{As}_2\text{S}_5$ Ppt Insol in H_2O

Barium potassium sulpharsenate,
 $\text{KBaAsS}_4 + 6\text{H}_2\text{O}$

Easily sol in H_2O
Decomp by acids with separation of As_2S_5
(Glatzel, Z anorg 1911, 71 209)

Barium sulpharsenate sulpharsenite,
 $\text{Ba}_2(\text{AsS}_4)_2, \text{Ba}_2\text{As}_2\text{S}_5 + 4\text{H}_2\text{O}$

Sl sol in cold, more easily in hot H_2O
(Nilson)

Bismuth sulpharsenate, $2\text{Bi}_2\text{S}_3, 3\text{As}_2\text{S}_5$

Sol in $\text{Na}_2\text{AsS}_4 + \text{Aq}$
 $\text{Bi}_2\text{S}_3, 3\text{As}_2\text{S}_5$ As above (Berzelius)

Cadmium sulpharsenate

Ppt (Berzelius, Pogg 7 88)

Calcium sulpharsenate, $\text{Ca}_2\text{As}_2\text{S}_7$

Sol in H_2O and alcohol
 $\text{Ca}_3(\text{AsS}_4)_2$ Easily sol in H_2O Insol in
alcohol
+ $10\text{H}_2\text{O}$ Easily sol in H_2O (Nilson, J
pr (2) 14 169)
 $5\text{CaS}, 2\text{As}_2\text{S}_5 + 6\text{H}_2\text{O}$ Easily sol in H_2O
(Nilson, J pr (2) 14 163)

Cerous sulpharsenate, $\text{Ce}_2\text{As}_2\text{S}_7$

Ppt
 $\text{Ce}_3(\text{AsS}_4)_2$ Ppt
 $\text{Ce}_4(\text{As}_2\text{S}_7)_3$ Ppt

Cobaltous sulpharsenate, $\text{Co}_2\text{As}_2\text{S}_7$

Ppt Sol in excess of sodium sulpharsen-
ate + Aq

Cuprous sulpharsenate, Cu_3AsS_4

Ppt (Preis, A 257 201)
Min *Enargite Clarite* Not wholly de-
comp by $\text{HCl} + \text{Aq}$ Sol in $\text{HCl} + \text{Aq}$ with
residue of As_2O_3 Not attacked by $\text{KOH} + \text{Aq}$

Cupric sulpharsenate, $\text{Cu}_2\text{As}_2\text{S}_7$

Ppt Sol in $(\text{NH}_4)_2\text{S} + \text{Aq}$ Decomp by
 $\text{NH}_4\text{OH} + \text{Aq}$ (Berzelius)
 $\text{Cu}_3(\text{AsS}_4)$ Ppt (Preis, A 257 201)

Glucinum sulpharsenate

Sl sol in H_2O

Gold sulpharsenate, AuAsS_4

Sol in pure H_2O Insol in $\text{Na}_3\text{AsS}_4 + \text{Aq}$
 $2\text{Au}_2\text{S}_3, 3\text{As}_2\text{S}_5$ Sol in H_2O (Berzelius)

Iron (ferrous) sulpharsenate, $\text{Fe}_2\text{As}_2\text{S}_7$

Ppt Sol in $\text{Na}_3\text{AsS}_4 + \text{Aq}$ (Berzelius)

Iron (ferric) sulpharsenate, $\text{Fe}_4(\text{As}_2\text{S}_7)_3$

Ppt Sol in $\text{Na}_3\text{AsS}_4 + \text{Aq}$ (Berzelius)

Lead sulpharsenate, $\text{Pb}_2\text{As}_2\text{S}_7$

Ppt (Berzelius)
 $\text{Pb}_3(\text{AsS}_4)_2$ Ppt

Lithium sulpharsenate, Li_3AsS_4

Easily sol in hot, less sol in cold H_2O
Insol in alcohol
 $\text{Li}_4\text{As}_2\text{S}_7$ Completely sol in H_2O De-
comp by alcohol
 LiAsS_3 Known only in acid solution

Magnesium sulpharsenate, $\text{Mg}_2\text{As}_2\text{S}_7$

Sol in all proportions of H_2O , and in al-
cohol
 $\text{Mg}_3(\text{AsS}_4)_2$ Sol in H_2O Decomp
alcohol
 $3\text{MgS}, \text{As}_2\text{S}_5$ Nearly insol in H_2O
 $5\text{MgS}, 2\text{As}_2\text{S}_5 + 15\text{H}_2\text{O}$ Very sol in H_2O
(Nilson)

Manganous sulpharsenate, $\text{Mn}_2\text{As}_2\text{S}_7$

Sl sol in H_2O
 $\text{Mn}_3(\text{AsS}_4)_2$ Permanent Sl sol in H_2O
 $6\text{MnS}, \text{As}_2\text{S}_5$ Sl sol in H_2O

Mercurous sulpharsenate, $(\text{Hg}_2)_2\text{As}_2\text{S}_7$

Ppt

Mercuric sulpharsenate, $\text{Hg}_2\text{As}_2\text{S}_7$

Ppt (Berzelius, Pogg 7 29)
 $\text{Hg}_3(\text{AsS}_4)_2$ Ppt (Preis, A 257 200)

Nickel sulpharsenate, $\text{Ni}_3(\text{AsS}_4)_2$

Ppt Not decomp by $\text{HCl} + \text{Aq}$ Sol in
 $\text{Na}_3\text{AsS}_4 + \text{Aq}$ (Berzelius)
 $2\text{NiS}, \text{AsS}_5$ As above

Potassium sulpharsenate, KAsS_3

Known only in alcoholic solution
 $\text{K}_4\text{As}_2\text{S}_7$ Deliquescent Sol in H_2O , from
which alcohol ppts K_3AsS_4
 K_3AsS_4 Deliquescent Very sol in H_2O ,
from which it is precipitated by alcohol
+ H_2O Very deliquescent (Nilson, J
pr (2) 14 159)

Potassium sodium sulpharsenate

Sol in H_2O

Silver sulpharsenate, Ag_3AsS_4

Ppt (Berzelius, Pogg 7 29)
 $\text{Ag}_2\text{As}_2\text{S}_7$ Ppt

Sodium sulpharsenate, NaAsS_3

Known only in alcoholic solution
 Na_4AsS_7 Sol in H_2O Alcohol ppts
 Na_3AsS_4 from H_2O solution
 $\text{Na}_3\text{AsS}_4 + 7\frac{1}{2}\text{H}_2\text{O}$ Easily sol in H_2O ,
from which it is precipitated by alcohol
+ $8\text{H}_2\text{O}$ Insol in alcohol, very sol in
 H_2O (McCay, Z anal 1895, 34 726)
+ $9\text{H}_2\text{O}$ (Nilson, J pr (2) 14 160)
 $\text{Na}_2\text{S}, 12\text{As}_2\text{S}_5$ (?) Insol in H_2O

Sodium zinc sulpharsenate, $\text{NaZnAsS}_4 + 4\text{H}_2\text{O}$

Sol in hot H_2O with decomp (Preis, A
257 202)

Strontium sulpharsenate, $\text{Sr}_2(\text{AsS}_4)_2$

Easily sol in H_2O , insol in alcohol
 $\text{Sr}_2\text{As}_2\text{S}_7$ Easily sol in H_2O , from which
 alcohol ppts $\text{Sr}_3(\text{AsS}_4)_2$

Strontium sulpharsenate sulpharsenite,

$\text{Sr}_2(\text{AsS}_4)_2, \text{Sr}_2\text{As}_2\text{S}_5 + 4\text{H}_2\text{O}$
 Easily sol in H_2O (Nilson, J pr (2) 14
 162)

Thallos sulpharsenate, Ti_3AsS_4

Not decomp by H_2O Decomp by dil
 acids Insol in dil alkali sulphides Par-
 tially decomp by boiling with a conc solu-
 tion of sodium sulphide (Hawley, J Am
 Chem Soc 1907, 29 1013)

Tin (stannous) sulpharsenate

Ppt

Tin (stannic) sulpharsenate

Ppt

Uranic sulpharsenate, $2\text{U}_2\text{S}_5, \text{As}_2\text{S}_5$

Ppt Sol in $\text{Na}_2\text{AsS}_4 + \text{Aq}$

Zinc sulpharsenate, $\text{Zn}_3(\text{AsS}_4)_2$

Ppt (Berzelius)
 $2\text{ZnS}, \text{As}_2\text{S}_5$ Ppt (Berzelius)
 $\text{ZnS}, \text{As}_2\text{S}_5$ (Wohler)

Disulpharsenic acid

See Disulphoxyarsenic acid

Sulpharseniosulphomolybdic acid**Ammonium sulpharseniosulphomolybdate,**
 $(\text{NH}_4)_4\text{AsS}_7(\text{MoS}_3)_2 + 5\text{H}_2\text{O}$

Very unstable
 Sol in H_2O with decomp (Weinland, Z
 anorg 1897, 15 49)

Barium —, $\text{Ba}_4\text{As}_2\text{S}_7(\text{MoS}_3)_2 + 14\text{H}_2\text{O}$

Sol in H_2O with decomp (Weinland)

Potassium —, $\text{K}_4\text{AsS}_3(\text{MoS}_3) + 4\text{H}_2\text{O}$

(Weinland)
 $\text{K}_4\text{AsS}_3(\text{MoS}_3) + 8\text{H}_2\text{O}$ Sol in H_2O
 Decomp by mineral acids Insol in alcohol
 (Weinland)

Sodium —, $\text{NaAsS}_3(\text{MoS}_3) + 6\text{H}_2\text{O}$

Insol in H_2O Easily sol in dil NaOH
 and $\text{NH}_3 + \text{Aq}$ (Weinland)
 $\text{Na}_4\text{AsS}_7(\text{MoS}_3) + 14\text{H}_2\text{O}$ Sol in H_2O
 Decomp by mineral acids (Weinland)

Sulpharseniosulphoxymolybdic acid**Barium sulpharseniosulphoxymolybdate,**

$\text{Ba}_2\text{AsS}_7(\text{MoS}_3)_2 + 12\text{H}_2\text{O}$
 Sol in H_2O (Weinland, Z anorg 1897,
 15 60)

Magnesium sulpharseniosulphoxymolybdate,

$\text{Mg}_2\text{As}_2\text{S}_7(\text{Mo}_2\text{S}_2\text{O}_3) + 16\text{H}_2\text{O}$

Very sol in H_2O (Weinland)

Potassium —, $\text{KAsS}_3(\text{MoSO}_2) + 2\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O with decomp (Weinland)
 $\text{K}_4\text{As}_2\text{S}_7(\text{Mo}_2\text{S}_2\text{O}_3) + 6\text{H}_2\text{O}$ Very sol
 H_2O (Weinland)
 $+ 10\text{H}_2\text{O}$ (Weinland)

Sodium —, $\text{NaAsS}_3(\text{MoSO}_2) + 5\text{H}_2\text{O}$

Sl sol in cold, very sol in hot H_2O (Wein-
 land)
 $\text{Na}_4\text{As}_2\text{S}_7(\text{Mo}_2\text{S}_2\text{O}_3) + 15\text{H}_2\text{O}$ Very so
 in H_2O (Weinland)

Sulpharsenious acid**Ammonium sulpharsenite, $\text{NH}_4\text{As}_2\text{S}_5 + 2\text{H}_2\text{O}$**

Insol in H_2O Ppt Sol in KOH
 $\text{NH}_4\text{OH} + \text{Aq}$ Sl attacked by boiling HCl
 Aq (Nilson, J pr (2) 14 42)
 $(\text{NH}_4)_4\text{As}_2\text{S}_5 = 2(\text{NH}_4)_2\text{S}, \text{As}_2\text{S}_3$ Sol
 H_2O , from which alcohol ppts $(\text{NH}_4)_3\text{AsS}_3$
 $(\text{NH}_4)_3\text{AsS}_3 = 3(\text{NH}_4)_2\text{S}, \text{As}_2\text{S}_3$ Decomp
 on air, sol in H_2O Insol in alcohol
 $(\text{NH}_4)_5\text{As}_2\text{S}_{10}$ Sol in H_2O (Nilson,
 pr (2) 14 160)

Barium sulpharsenite, $\text{Ba}_2\text{As}_2\text{S}_5$

Sl sol in H_2O Decomp by alcohol
 $+ 5\text{H}_2\text{O}$ Sl sol in H_2O (Nilson, J p
 (2) 14 46)
 $+ 15\text{H}_2\text{O}$ Sl sol in cold H_2O (Nilson)
 $\text{Ba}_3(\text{AsS}_3)_2$ Sl sol in H_2O Precipitate
 by alcohol
 $+ 14\text{H}_2\text{O}$ Sl sol in cold, easily in h
 H_2O (Nilson)
 $\text{Ba}(\text{AsS}_2)_2 + 2\text{H}_2\text{O}$ Insol in H_2O (Ni-
 son, J pr (2) 14 44)
 $\text{BaAs}_{12}\text{S}_{19}$ Insol in $\text{HCl} + \text{Aq}$ (Nilson)

Bismuth sulpharsenite, $2\text{Bi}_2\text{S}_3, \text{As}_2\text{S}_3$

Ppt

Cadmium sulpharsenite

Ppt (Berzelius, Pogg 7 146)

Calcium sulpharsenite, $\text{Ca}_2\text{As}_2\text{S}_5$

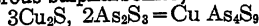
Sol in H_2O , from which alcohol ppt
 $\text{Ca}_3(\text{AsS}_3)_2$
 $\text{Ca}_3(\text{AsS}_3)_2$ Sol in H_2O
 $+ 15\text{H}_2\text{O}$ Precipitated by alcohol
 $\text{Ca}(\text{AsS}_2)_2 + 10\text{H}_2\text{O}$ Sol in H_2O (Nilso
 J pr (2) 14 54)
 $\text{CaAs}_9\text{S}_{13} + 10\text{H}_2\text{O}$ (?) Insol in cold H_2O
 Decomp by hot H_2O (Nilson)
 $\text{CaAs}_{18}\text{S}_{28} + 10\text{H}_2\text{O}$ (?) Sl sol in hot H_2O
 (Nilson)
 $\text{Ca}_7\text{As}_2\text{S}_{10} + 25\text{H}_2\text{O}$ Sl sol in cold or h
 H_2O (Nilson)

Cerous sulpharsenite, $\text{Ce}_2\text{As}_2\text{S}_5$

Ppt

Chromic sulpharsenite, $2\text{Cr}_2\text{S}_3, 3\text{As}_2\text{S}_3$ Ppt Insol in $\text{Na}_2\text{S} + \text{Aq}$ **Cobaltous sulpharsenite, $2\text{CoS}, \text{As}_2\text{S}_3$**

Ppt Sol in excess of sodium sulpharsenite + Aq

Cuprous sulpharsenite,Min *Bunnite* Decomp by hot acids and $\text{KOH} + \text{Aq}$ $2\text{Cu}_2\text{S}, \text{As}_2\text{S}_3 = \text{Cu}_4\text{As}_2\text{S}_5$ Decomp by acids, KOH and $\text{K}_2\text{S} + \text{Aq}$ (Sommerlad, Z anorg 1898, 18 434)**Cupric sulpharsenite, Cu_2AsS_3** Insol in H_2O or $\text{HCl} + \text{Aq}$ Sol in $\text{Na}_3\text{AsS}_5 + \text{Aq}$ $\text{Cu}_2\text{As}_2\text{S}_5$ Ppt (Berzelius)**Glucinum sulpharsenite, $2\text{GlS}, \text{As}_2\text{S}_3$** Ppt Sol in acids, partly sol in $\text{NH}_4\text{OH} + \text{Aq}$ **Gold sulpharsenite, $2\text{Au}_2\text{S}_3, 3\text{As}_2\text{S}_3$**

Ppt (Berzelius)

Iron (ferrous) sulpharsenitePpt Sol in $\text{Na}_3\text{AsS}_5 + \text{Aq}$ (Berzelius)**Iron (ferric) sulpharsenite**Ppt Sol in excess of a ferric salt, or $\text{Na}_3\text{AsS}_5 + \text{Aq}$ (Berzelius)**Lead sulpharsenite, $\text{Pb}_2\text{As}_2\text{S}_3$** Ppt Min *Dufrenoyite* $\text{Pb}(\text{AsS}_2)_2 = \text{PbS}, \text{As}_2\text{S}_3$ Min *Sartorite* $\text{Pb}_4\text{As}_2\text{S}_7$ Min *Jordanite***Lithium sulpharsenites**

Resemble K salts

Magnesium sulpharsenite, $\text{Mg}_2\text{As}_2\text{S}_5$ Almost completely sol in H_2O Easily sol in alcohol (Berzelius) $+8\text{H}_2\text{O}$ Sl sol in H_2O (Nilson) $\text{Mg}(\text{AsS}_2)_2 + 5\text{H}_2\text{O}$ Slowly sol in both cold and hot H_2O (Nilson, J pr (2) 14 59) $\text{Mg}_3(\text{AsS}_2)_2 + 9\text{H}_2\text{O}$ (Nilson)**Manganous sulpharsenite, $\text{Mn}_2\text{As}_2\text{S}_5$** Ppt Decomp by $\text{HCl} + \text{Aq}$ **Mercurous sulpharsenite, $(\text{Hg}_2)_2\text{As}_2\text{S}_5$**

Ppt (Berzelius)

Mercuric sulpharsenite, $\text{Hg}_2\text{As}_2\text{S}_5$

Ppt

 $\text{Hg}(\text{AsS}_2)_2$ Ppt (Berzelius, Pogg 7 149)**Nickel sulpharsenite, $\text{Ni}_3(\text{AsS}_2)_2$**

Ppt (Berzelius)

Platinum sulpharsenite, $\text{Pt}_2\text{As}_2\text{S}_5$

Ppt

Potassium sulpharsenite, $\text{K}_4\text{As}_2\text{S}_5$ Decomp by H_2O or alcohol (Berzelius)
 K_2AsS_3 Sol in H_2O Insol in alcohol (Berzelius) $\text{K}_2\text{As}_4\text{S}_7$ Sol in H_2O and alcohol (Berzelius) $\text{K}_2\text{As}_2\text{S}_5$ Decomp by H_2O (Berzelius) $+2\frac{1}{2}\text{H}_2\text{O}$ Not wholly sol in H_2O (Nilson, J pr (2) 14 30) $\text{K AsS}_3 + 8\text{H}_2\text{O}$ (Nilson) $\text{KAs}_3\text{S}_5 + \text{H}_2\text{O}$ Insol in H_2O Slowly attacked by hot $\text{HCl} + \text{Aq}$ Sol in $\text{KOH} + \text{Aq}$ (Nilson)**Silver sulpharsenite, $12\text{Ag}_2\text{S}, \text{As}_2\text{S}_3$**

Ppt (Sommerlad, Z anorg 1898, 18 428)

 $5\text{Ag}_2\text{S}, \text{As}_2\text{S}_3 = \text{Ag}_5\text{AsS}_4$ (Sommerlad) Ag_3AsS_3 Min *Proustite* Sol in $\text{HNO}_3 + \text{Aq}$ $\text{KOH} + \text{Aq}$ dissolves out Sb_2S_3 (Senarmont, A ch (3) 32 129, Wohler, A 27 159) $2\text{Ag}_2\text{S}, \text{As}_2\text{S}_3$ Partially sol in $\text{HNO}_3 + \text{Aq}$ (Berzelius) AgAsS_2 (Berzelius, Pogg 7 150)**Sodium sulpharsenite, $\text{NaAsS}_2 + \frac{1}{2}\text{H}_2\text{O}$** Attacked by $\text{HCl} + \text{Aq}$ with difficulty (Nilson, J pr (2) 14 37) $+1\frac{1}{2}\text{H}_2\text{O}$ Forms coagulum with cold, sol in hot H_2O (Nilson) $\text{Na}_2\text{As}_4\text{S}_6 + 6\text{H}_2\text{O}$ Sol in much H_2O , not easily decomp by $\text{HCl} + \text{Aq}$ (Nilson) $\text{NaAs}_3\text{S}_5 + 4\text{H}_2\text{O}$ Ppt (Nilson, J pr (2) 14 3)**Strontium sulpharsenite, $3\text{SrS}, \text{As}_2\text{S}_3 + 15\text{H}_2\text{O}$** Sol in $\text{H}_2\text{O} + \text{Aq}$ insol in alcohol (Voigt and Gottling) $2\text{SrS}, \text{As}_2\text{S}_3$ Sol in H_2O , decomp by alcohol $+15\text{H}_2\text{O}$ (Nilson, J pr (2) 14 53) $\text{Sr}(\text{AsS}_2)_2 + 2\frac{1}{2}\text{H}_2\text{O}$ Sl sol in H_2O (Nilson)**Thallous sulpharsenite, 11AsS_2** Ppt Decomp by $\text{KOH} + \text{Aq}$ (Gunning, J B 1868 247)Above compound is a mixture of As_2S_3 and Tl_2S (Hawley, J Am Chem Soc 1907, 29 1012)Min *Lorandite* (Kuenner and Loezka, C C 1904, II 844)**Tin (stannous) sulpharsenite, Sn_2AsS_4**

Ppt

Tin (stannic) sulpharsenite SnAsS_5

Ppt (Berzelius, Pogg 7 147)

Uranic sulpharsenite, $2\text{U}_2\text{S}_3, \text{As}_2\text{S}_3$

Ppt

Zinc sulpharsenite

Ppt (Berzelius, Pogg 7 145)

Zirconium sulpharsenite, $2Zr_2S_3, As_2S_3$ Ppt Insol in solutions of alkali sulpharsenites Sl sol in Na_2S Aq Not decomp by acids (Berzelius)**"Sulphatammon," $2NH_3, SO_3$**

(Rose)

Is ammonium imidosulphonate, which see (Berglund)

"Parasulphatammon," $3NH_3, 2SO_3$

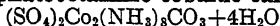
(Rose)

Is basic ammonium imidosulphonate, which see (Berglund)

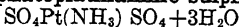
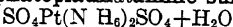
Sulphatiodic acid**Potassium sulphatiodate, $K_2HO_3SiO_4$ or $KIO_3, KHSO_4$**

Decomp by H O (Blomstrand, J pr (2) 40 317)

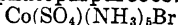
See Iodate sulphate, potassium

Sulphatooctamine cobaltic carbonateSol in H_2O (Vortmann and Blasberg, B 22 2650) $(SO_4)_3Co(NH_3)_3(CO_3)_2 + 3H_2O$ Sol in H O (V and B)

See Carbonatotetramine cobaltic sulphate (Jorgensen)

Sulphatoplatinamine sulphate,Easily sol in H O Sol in $H_2SO_4 + Aq$ **Sulphatoplatindiamine sulphate,**

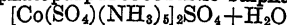
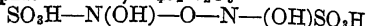
Insol in H O

Sulphatopurplecobaltic bromide,

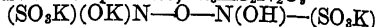
Sol in H O, from which it is precipitated by conc HBr + Aq (Jorgensen, J pr (2) 25 94)

— carbonate, $[(SO_4)Co(NH_3)_3]_2CO_3 + 4H_2O$

Sol in H O (Vortmann and Blasberg, B 22 2648)

— chloroplatinate, $2Co(SO_4)(NH_3)_3Cl, PtCl_4 + 2H_2O$ Sl sol in cold H_2O (Jorgensen)— nitrate, $Co(SO_4)(NH_3)_3(NO_3)$ Somewhat sl sol in cold H_2O (Jorgensen)**Sulphatopurplecobaltic sulphate,**Very easily sol in H_2O (Jorgensen, J pr (2) 25 94) $Co(SO_4)(NH_3)_3(HSO_4) + 2H_2O$ Sol about 25 pts of cold H_2O Sol in dil, insol in conc $NH_4OH + Aq$ (Jorgensen)**Sulphazic acid, $H_4S_2N_2O_6 =$** 

Known only in its salts (Raschig, A 241 161)

Potassium sulphazate, $K_3HS_2N_2O_6 =$ Sol in H_2O , but decomp on standing (Raschig, A 241 161)**Sulphazidic acid**

(Fremy)

See Hydroxylamine monosulphonic acid.

Sulphazilnic acid

See Oxysulphazotic acid

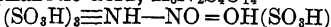
Metasulphazilnic acid

See Trisulphoxyazotic acid

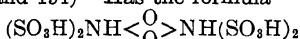
Sulphazinous acid

(Fremy)

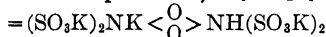
See Dihydroxylamine sulphonic acid

Sulphazotic acid, $H_6N_2S_4O_{14} =$ 

Known only in its salts (Claus, A 158 52 and 194) Has the formula



(Raschig, A 241 161)

Lead potassium sulphazotateInsol in cold, decomp by hot H_2O Insol in alcohol and ether (Fremy, A ch (3) 15 439)**Potassium sulphazotate, $K_3HN_2S_4O_{14} + H_2C$** Very sol in hot, less in cold H_2O (Raschig, A 241 161) Decomp gradually by boiling (Claus) Insol in alcohol or ether (Fremy, A ch (3) 15 428)True composition is $HON(SO_3K)_2KON(SO_3K)_2 + H_2O$ Potassium hydroxylamine disulphonate (Divers and Haga Chem Soc 1900, 77 432)

Forms basic salt

 $(SO_3K)_2NK < \overset{O}{\parallel} > NK(SO_3K)_2$, which is easily sol and decomp by H_2O (Raschig)**Potassium sodium sulphazotate,**Quite easily sol in H_2O (Raschig, A 241 161)

Disulphhydroxyazotic acid, $\text{ONH}(\text{SO}_2\text{H})_2$

Known only in its salts (Claus, A 158 52 and 194) Correct composition is hydroxylamine sulphonic acid $\text{HON}(\text{SO}_3\text{H})_2$, which see (Raschig, A 241 161)

Sulphhydroxylamic acid

(Claus)

See Hydroxylamine monosulphonic acid

Disulphhydroxyazotic acid

(Claus)

See Hydroxylamine disulphonic acid

Sulphides

The sulphides of the alkali metals are sol in H_2O , those of the alkali-earth metals are much less sol, and are decomp upon solution into hydrosulphide and hydroxide

The other sulphides are insol in H_2O

For each sulphide, see under the respective element

Sulphimide, SO_2NH

See Imidosulphamide

Trisulphimide, $\text{OHSO} \begin{smallmatrix} \text{NSO OH} \\ \text{NSO OH} \end{smallmatrix} \text{N}$
(SO_2NH)₃

Sol in methyl alcohol, sl sol in ether, insol in chloroform and benzene (Hantzsch B 1901, 34 3440)

Ammonium sulphimide, $\text{SO}_2\text{N}(\text{NH}_4)$

Sol in H_2O , insol in alcohol (Traube)

Barium —, $(\text{SO}_2\text{N})_2\text{Ba} + 2\text{H}_2\text{O}$

Sol in H_2O (Traube)

Potassium —, SO_2NK

Not very sol in H_2O

Silver —, SO_2NaAg

Sol in 500–600 pts cold, more easily in hot H_2O Sol in acids

Sodium —, SO_2NNa

Very sol in H_2O

“Sulphitammon,” NH_3 , SO_2

See Thionamic acid

Sulphobismuthous acid**Cuprous sulphobismuthite**, AuBiS_2

Min *Emplectite* Sol in $\text{HNO}_3 + \text{Aq}$
 $\text{Cu}_3\text{Bi}_4\text{S}_9$ Min *Klaprothite* Completely sol in $\text{HCl} + \text{Aq}$
 Cu_2BiS_3 Min *Wittichenite* Sol in $\text{HCl} + \text{Aq}$ and in $\text{HNO}_3 + \text{Aq}$

Cuprous lead sulphobismuthite, Cu_2S , 2PbS , Bi_2S_3

Min *Patrinite*

Sol in $\text{HNO}_3 + \text{Aq}$ with residue of S and PbSO_4

Lead —, 2PbS , Bi_2S_3

Min *Cosackite*

2PbS , $3\text{Bi}_2\text{S}_3$ Min *Chvanatite*

Potassium —, KBiS

Decomp by H_2O

Sol in $\text{HCl} + \text{Aq}$ (Schneider, Pogg 1869, 136 464)

Metasulphoboric acid, $\text{B}_2\text{S}_3\text{H}_2$

Decomp by H_2O and alcohol

1 pt is sol in 5 pts benzene

1 pt is “ “ 5 “ CS_2

Very sl sol in CS_2 at -20° 1901, 34 401)

Sulphocarbonic acid**Ammonium cuprous sulphocarbonate**, CS_3CuNH_4

This salt was formerly described as cupric sulphocarbonate ammonia, CS_3Cu , NH_3 (Hofmann, B 1903, 36 1146)

Cuprous potassium sulphocarbonate, CS_3CuK

Nearly insol in cold H_2O

Somewhat sol in hot H_2O , NaOH and $\text{NH}_4\text{OH} + \text{Aq}$ (Hofmann)

Cupric sulphocarbonate ammonia, CS_3Cu , NH_3

Very sl sol in strong $\text{NH}_4\text{OH} + \text{Aq}$, insol in cold H_2O , sl sol in hot H_2O (Hofmann, Z anorg 1897, 14 295)

Is ammonium cuprous sulphocarbonate (Hofmann, B 1903, 36 1146)

Cuprous sulphocarbonate potassium cyanide, CS_3Cu , $2\text{KCN} + 2\text{H}_2\text{O}$

Sol in H_2O and dil alkalis on warming (Hofmann, B 1903, 36 1148)

Zinc sulphocarbonate ammonia, CS_3Zn , 2NH_3

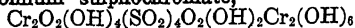
Ppt (Hofmann, Z anorg 1897, 14 277)

Sulphochromic acid, H_2CrO_4 , SO_3 (?)

Sol in H_2O (Bolley, A 56 113)

$(\text{SO}_3)_4\text{Cr}_2\text{O}_2(\text{OH})_2$ Sol in H_2O All salts even alkali salts are insol in H_2O (Recoura, Bull Soc 1896, (3) 15 315)

$[\text{Cr}_2\text{O}_2(\text{OH})_4(\text{SO}_3)_2\text{O}_8]$, $\text{Cr}_2\text{O}(\text{OH})_2(\text{SO}_3)_3$, $(\text{OH})(\text{OH})_2$ Sol in H_2O (Wyruboff, Bull Soc 1902, (3) 27 721)

Chromium sulphochromate,

Ppt, decomp by boiling H_2O (Wyrouboff, Bull Soc 1902, (3) 27 720)

Sulphochromous acid**Ferrous sulphochromite, FeCrS_4**

Insol in H_2O , and nearly so in $\text{HCl} + \text{Aq}$ (Groger, W A B 81, 2 531)

Manganous —, MnCr_2S_4

Insol in H_2O and $\text{HCl} + \text{Aq}$ (Groger)

Potassium —, $\text{K}_2\text{Cr}_2\text{S}_4$

Insol in H_2O and in hot $\text{HCl} + \text{Aq}$
Easily sol in aqua regia Slowly sol in cold, rapidly sol in hot dil $\text{HNO}_3 + \text{Aq}$ (Milbauer, Z anorg 1904, 42 443)

$\text{K}_2\text{Cr}_2\text{S}_7$ Stable in the air, sol in HNO_3 and aqua regia with decomp (Schneider, J pr 1897, (3) 56 407)

Silver —, $\text{Ag}_2\text{Cr}_2\text{S}_4$

Not attacked by $\text{HCl} + \text{Aq}$ even on heating Decomp by conc HNO_3 (Schneider, J pr 1897, (2) 56 401)

Sodium —, NaCr_2S_4

Insol in H_2O Sl attacked by dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in cold conc HNO_3 or aqua regia Sol in hot dil $\text{HNO}_3 + \text{Aq}$ (Groger)

Sol in acids with decomp (Schneider, J pr 1897, (3) 56 415)

Zinc —, ZnCr_2S_4

Insol in H_2O , sol in traces in boiling conc HCl or dil $\text{H}_2\text{SO}_4 + \text{Aq}$, sol in $\text{HNO}_3 + \text{Aq}$ (Groger, W A B 81, 2 531)

Sulphocyanhydric acid, HSCN

Sol in H_2O

Sat $\text{HSCN} + \text{Aq}$ has sp gr = 1.022 (Porrett, 1814) $\text{HSCN} + \text{Aq}$ containing 12.7% HSCN has sp gr 1.040 at 12.7° (Hermes, Z Ch 1866 417)

Sulphocyanides

Most sulphocyanides are sol in H_2O , but Cu, Pb, Hg, and Ag sulphocyanides are insol

Aluminum sulphocyanide, Al(SCN)_3

Known only in solution

$\text{Al(SCN)}_3(\text{OH})_4$ Known only in solution (Suda)

Aluminum potassium sulphocyanide,

Very hygroscopic

Sol in H_2O and alcohol (Rosenheim, Z anorg 1901, 27 302)

Ammonium sulphocyanide, NH_4SCN

Deliquescent, and very sol in H_2O
100 pts H_2O dissolve 128.1 pts at 0° and 162.2 pts at 20°

$\text{NH}_4\text{SCN} + \text{Aq}$ sat at ord temp has density of 1.138 and 100 cc contains 69.16 g NH_4SCN (Klason, J pr 1887, (2) 36 67)

By dissolving 90 g NH_4SCN in 90 g H_2O at 17° , the temp falls to -12° (Clowes, Z Ch 1866 190)

133 pts $\text{NH}_4\text{SCN} + 100$ pts H_2O at 13.2° lower the temp 31.2° (Rudorff, B 2 68)

Sol in liquid SO_2 (Walden, B 1899, 32 2864)

Difficultly sol in AsBr_3 (Walden, Z anorg 1902, 29 374)

Very easily sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 826)

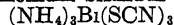
Easily sol in alcohol

Easily sol in acetone (Krug and M'Elroy)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

Difficultly sol in ethyl acetate (Naumann, B 1910, 43 314)

Ammonium bismuth sulphocyanide,

As K salt (Rosenheim and Vogelgesang Z anorg 1906, 48 215)

Ammonium cadmium sulphocyanide,

Somewhat deliquescent

Melts in crystal H_2O at 25°

Insol in alcohol (Grossmann, B 1902 35 2667)

Ammonium cadmium molybdenyl sulphocyanide, $\text{NH}_4\text{SCN} \cdot \text{Cd(SCN)}_2$ 

(Maas and Sand, B 1908, 41 1513)

Ammonium cobaltous sulphocyanide,

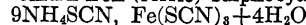
Decomp in moist air

Cannot be recryst from H_2O (Treadwell Z anorg 1901, 26 109)

$+ 4\text{H}_2\text{O}$ Sol in H_2O

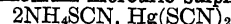
Sol in methyl, ethyl and amyl alcohol in acetone and in ether $+ \text{Aq}$

Can be recryst from H_2O or alcohol with out decomp (Rosenheim and Cohn, Z anorg 1901, 27 289)

Ammonium iron (ferric) sulphocyanide,

Deliquescent, and sol in H_2O (Kruss and Morah, A 260 207)

$3\text{NH}_4\text{SCN} \cdot \text{Fe(SCN)}_3$ Extremely deliquescent

Ammonium mercuric sulphocyanide,

Easily sol in H_2O (Fleischer, A 179 228)

$\text{NH}_4\text{Hg}(\text{SCN})_2$ Insol in cold, sol in hot H_2O (Rosenheim, Z anorg 1901, 27 284)

Ammonium molybdenyl sulphocyanide,
 $3\text{NH}_4\text{SCN}$, $\text{Mo}(\text{OH})(\text{SCN})_3 + 3\text{H}_2\text{O}$
 (Sand and Maas, B 1907, 40 4507)

Ammonium nickel sulphocyanide,
 $(\text{NH}_4)_4\text{Ni}(\text{SCN})_6 + 4\text{H}_2\text{O}$
 Sol in H_2O with decomp
 Sl sol in cold, easily sol in hot alcohol
 (Rosenheim, Z anorg 1901, 27 292)

Ammonium silver sulphocyanide, NH_4SCN ,
 AgSCN
 Decomp by H_2O

Ammonium vanadium sulphocyanide,
 $\text{V}(\text{SCN})_3$, $3\text{NH}_4\text{SCN} + 4\text{H}_2\text{O}$
 Sol in H_2O , sol in alcohol, sl sol in ether
 (Ciocci, Z anorg 1898, 19 311)

Ammonium vanadyl sulphocyanide,
 $(\text{NH}_4)_2\text{VO}(\text{SCN})_4 + 5\text{H}_2\text{O}$
 Sol in H_2O , alcohol, ether, acetone, amyl
 alcohol and ethyl acetate (Koppel, Z
 anorg 1903, 36 290)

Ammonium zinc sulphocyanide,
 $(\text{NH}_4)_2\text{Zn}(\text{SCN})_4 + 3\text{H}_2\text{O}$
 Easily sol in H_2O and in alcohol (Walden,
 Z anorg 1900, 23 374)
 $+ 4\text{H}_2\text{O}$ Easily sol in cold H_2O , acetone,
 alcohols and ether (Rosenheim and Huld-
 schunsky, B 1901, 34 3913)

Ammonium sulphocyanide mercuric bromide,
 NH_4SCN , HgBr_2
 Very sol in H_2O
 Sol in alcohol (Grossmann, B 1902, 35
 2945)
 $2\text{NH}_4\text{SCN}$, $\text{HgBr}_2 + \text{H}_2\text{O}$ Somewhat de-
 liquescent
 Very sol in H_2O
 Sol in alcohol (Grossmann)

Arsenic sulphocyanide, $\text{As}(\text{SCN})_3$
 Decomp by H_2O Insol in all ordinary
 solvents (Miguel A ch (5) 11 341)

Barium sulphocyanide, $\text{Ba}(\text{SCN})_2 + 2\text{H}_2\text{O}$
 Deliquescent Easily sol in H_2O and
 alcohol Boiling solution in alcohol contains
 32.8% anhydrous salt Solution sat at 20°
 contains 30% (Tscherniak, B 16 349)
 Cryst with $3\text{H}_2\text{O}$ (Tscherniak, B 25
 2627)

Barium cadmium sulphocyanide,
 $4\text{Ba}(\text{SCN})_2$, $\text{Cd}(\text{SCN})_2 + 10\text{H}_2\text{O}$
 Deliquescent (Grossmann, B 1902, 36
 2669)

Barium caesium cuprous sulphocyanide,
 $\text{Ba}(\text{SCN})_2$, 3CsSCN , 2CuSCN
 Rapidly decomp by H_2O (Wells, Am
 Ch J 1902, 28 273)

Barium caesium silver sulphocyanide,
 $\text{Ba}(\text{SCN})_2$, 3CsSCN , 2AgSCN
 100 pts H_2O dissolve 92 pts at 19°
 Decomp by much H_2O (Wells, Am Ch
 J 1902, 28 272)

Barium cobaltous sulphocyanide,
 $\text{BaCo}(\text{SCN})_4 + 8\text{H}_2\text{O}$
 Ppt (Rosenheim, Z anorg 1901, 27
 290)

Barium mercuric sulphocyanide,
 $\text{BaHg}(\text{SCN})_4$
 Very sol in H_2O and in alcohol (Rosen-
 heim, Z anorg 1901, 27 286)
 $\text{BaHg}(\text{SCN})_4 + 2\text{H}_2\text{O}$ Ppt Nearly in-
 sol in cold, easily sol in hot H_2O (Rosen-
 heim)

Barium potassium silver sulphocyanide,
 $\text{Ba}(\text{SCN})_2$, 4KSCN , $2\text{AgSCN} + \text{H}_2\text{O}$
 Very sol in a little H_2O Decomp by
 much H_2O (Wells, Am Ch J 1902, 28
 283)

Barium rubidium silver sulphocyanide,
 $\text{BaRb}_2\text{Ag}_2(\text{SCN})_6 + 2\text{H}_2\text{O}$
 Very sol in H_2O (Wells, Am Ch J
 1903, 30 186)
 $\text{BaRb}_4\text{Ag}_2(\text{SCN})_8 + \text{H}_2\text{O}$ Sol in H_2O
 (Wells)

Barium silver sulphocyanide, $\text{Ba}(\text{SCN})_2$,
 $2\text{AgSCN} + 2\text{H}_2\text{O}$
 Stable in the air (Wells, Am Ch J
 1902, 28 269)

Barium zinc sulphocyanide, $\text{BaZn}(\text{SCN})_4$,
 $+ 3\text{H}_2\text{O}$
 Easily sol in alcohol (Walden, Z anorg
 1900, 23 374)

Barium sulphocyanide mercuric bromide,
 $\text{Ba}(\text{SCN})_2$, $2\text{HgBr}_2 + 5\text{H}_2\text{O}$
 Very sol in H_2O (Grossmann, Z anorg
 1903, 37 420)

Bismuth sulphocyanide, basic,
 $\text{Bi}(\text{OH})(\text{SCN}) + 5\text{H}_2\text{O}$
 (Rosenheim and Vogelgesang, Z anorg
 1906, 48 214)
 $\text{Bi}(\text{SCN})_3$, $2\text{Bi}_2\text{O}_3$ Insol in H_2O , but
 when recently pptd decomp by boiling
 therewith Insol in $\text{HSCN} + \text{Aq}$ (Meitzen-
 dorf)

Bismuth sulphocyanide, $\text{Bi}(\text{SCN})_3$
 Insol or sl sol in H_2O Sol in HNO_3 ,
 HCl , and $\text{HSCN} + \text{Aq}$ (Meitzendorf, Pogg
 56 83)

Decomp by cold H_2O (Bender, B 20 723)

+14 H_2O Extremely deliquescent

Decomp by H_2O (Rosenheim and Vogelgesang, Z anorg 1906, 48 214)

Bismuth potassium sulphocyanide,

$\text{K}_3\text{Bi}(\text{SCN})_3$

Decomp by H_2O (Rosenheim and Vogelgesang, Z anorg 1906, 48 215)

Not hygroscopic

Decomp by H_2O

Easily sol in alcohol (Vanino, Z anorg 1901, 28 220)

$\text{Bi}(\text{SCN})_3$, 9KSCN Very hygroscopic

Decomp by H_2O

Sol in alcohol (Vanino, Z anorg 1901, 28 221)

Bismuth sodium sulphocyanide,

$\text{Na}_3\text{Bi}(\text{SCN})_3$

As K salt (Rosenheim and Vogelgesang, Z anorg 1906, 48 215)

Boron sulphocyanide, B(SCN)₃

Sol in benzene and ether (Cocksedge, Chem Soc 1908, (2) 93 217)

Cadmium sulphocyanide, Cd(SCN)₂

Sl sol in H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ with combination

Cadmium caesium sulphocyanide,

$\text{CsCd}(\text{SCN})_3$

Recryst from H_2O (Wells, Am Ch J 1903, 30 148)

$\text{Cs}_2\text{Cd}(\text{SCN})_3 + 2\text{H}_2\text{O}$ Very sol in H_2O

Can be recryst from conc solution but decomp on dilution to $\text{CsCd}(\text{SCN})_3$ (Wells)

Cadmium caesium silver sulphocyanide,

$\text{Cs CdAg}(\text{SCN})_3$

(Wells)

+2 H_2O (Wells)

(s $\text{CdAg}_4(\text{SCN})_3 + 2\text{H}_2\text{O}$ (Wells)

$\text{Cs}_3\text{Cd}_3\text{Ag}_{10}(\text{SCN})_3 + 6\text{H}_2\text{O}$ (Wells)

Cadmium mercuric sulphocyanide, Cd(SCN)₂,

$\text{Hg}(\text{SCN})_2$

Verv sol in hot H_2O (Grossmann, Z anorg 1903, 37 414)

Cadmium molybdenum sulphocyanide,

$\text{Cd}(\text{SCN})_2$, $\text{Mo}(\text{SCN})_4 + 2\text{H}_2\text{O}$

(Maas and Sand, B 1908, 41 1513)

+3 H_2O (Maas and Sand)

Cadmium molybdenyl potassium sulphocyanide, KSCN, 4Cd(SCN)₂,

$3\text{Mo}(\text{OH})(\text{SCN})_3 + 18\text{H}_2\text{O}$

(Mass and Sand, B 1908, 41 1513)

Cadmium molybdenyl sulphocyanide ammonia, 3Cd(SCN)₂, 2Mo(OH)(SCN) 13NH₃

(Mass and Sand, B 1908, 41 1512)

+2 H_2O (Maas and Sand)

Cadmium potassium sulphocyanide,

$\text{K}_2\text{Cd}(\text{SCN})_4 + 2\text{H}_2\text{O}$

Very sol in H_2O (Grossmann, B 190, 35 2668)

Cadmium rubidium sulphocyanide,

$\text{Rb}_2\text{Cd}(\text{SCN})_4 + 2\text{H}_2\text{O}$

Very sol in H_2O (Grossmann, B 190, 35 2668)

Cadmium sodium sulphocyanide,

$\text{NaCd}(\text{SCN})_3 + 3\text{H}_2\text{O}$

(Grossmann, B 1902, 35 2668)

Cadmium sulphocyanide ammonia, Cd(SCN) NH₃

Decomp by H_2O (Grossmann, B 190, 35 2666)

$\text{Cd}(\text{SCN})_2$, 2 NH_3 Decomp by pure H_2C (Grossmann)

Cadmium sulphocyanide ammonium bromide
 $\text{Cd}(\text{SCN})_2$, $\text{NH}_4\text{Br} + \text{H}_2\text{O}$

Can be recryst from H_2O Decomp in dil solution (Grossmann, Z anorg 190, 37 425)

$\text{Cd}(\text{SCN})_2$, 2 NH_4Br Easily splits o NH_4Br (Grossmann)

Cadmium sulphocyanide ammonium chloride
 $\text{Cd}(\text{SCN})_2$, 2 NH_4Cl

Can be recryst from H_2O Decomp in dil solution (Grossmann, Z anorg 1903, 3, 423)

Cadmium sulphocyanide potassium bromide
 $\text{Cd}(\text{SCN})_2$, $\text{KBr} + \text{H}_2\text{O}$

Recryst from H_2O (Grossmann, Z anorg 1903, 37 425)

$\text{Cd}(\text{SCN})_2$, 2 KBr Recryst from H_2C (Grossmann)

Cadmium sulphocyanide potassium chloride
 $\text{Cd}(\text{SCN})_2$, 2 KCl

Recryst from H_2O Decomp in dil solution (Grossmann, Z anorg 1903, 37 423)

Cadmium sulphocyanide potassium iodide
 $\text{Cd}(\text{SCN})_2$, 2 KI

Recryst from H_2O (Grossmann)

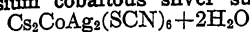
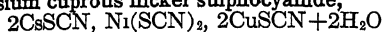
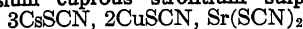
Cæsium calcium silver sulphocyanide,

2CsSCN , $\text{Ca}(\text{SCN})_2$, $2\text{AgSCN} + 2\text{H}_2\text{O}$

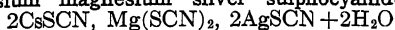
Recryst from H_2O (Wells, Am Ch 1902, 28 275)

Cæsium chromium sulphocyanide*See* Chromisulphocyanide, cæsium**Cæsium cobaltous sulphocyanide,**

Stable in the air (Shinn and Wells, Am Ch J 1903, 29 476)

Cæsium cobaltous silver sulphocyanide,Slowly attacked by H_2O , decomp by boiling H_2O . Very sl sol in CsSCN or $\text{Co}(\text{SCN})_2$ + Aq (Shinn and Wells, Am Ch J 1903, 29 478)**Cæsium cuprous sulphocyanide, CsSCN , CuSCN** H_2O separates CuSCN (Roberts, Am Ch J 1902, 28 262)**Cæsium cuprous nickel sulphocyanide,**Sl sol in H_2O (Roberts and Wells, Am Ch J 1902, 28 277)**Cæsium cuprous strontium sulphocyanide,**

As Ba salt (Wells, Am Ch J 1902, 28 275)

Cæsium magnesium silver sulphocyanide,

As Ca comp (Wells, Am Ch J 1902, 28 275)

Cæsium manganous silver sulphocyanide,Rather sl sol in H_2O (Wells)**Cæsium mercuric sulphocyanide, CsSCN , $\text{Hg}(\text{SCN})_2$** Sl sol in hot H_2O (Bristol and Wells, Am Ch J 1902, 28 260)**Cæsium mercuric sulphocyanide, 2CsSCN , $\text{Hg}(\text{SCN})_2 + \text{H}_2\text{O}$** Moderately sol in H_2O , especially when warm. Recryst without decomp (Bristol and Wells, Am Ch J 1902, 28 260)**Cæsium nickel silver sulphocyanide,**Slowly decomp by hot H_2O (Wells, Am Ch J 1902, 28 277)**Cæsium silver sulphocyanide, CsSCN , AgSCN**

Easily forms supersat solution (Wells, Am Ch J 1902, 28 264)

 $2\text{CsSCN}, \text{AgSCN}$ Stable in the air (Wells) $3\text{CsSCN}, \text{AgSCN}$ Stable in the air (Wells)**Cæsium silver strontium sulphocyanide, 3CsSCN , 2AgSCN , $\text{Sr}(\text{SCN})_2$**

As Ba comp (Wells)

Cæsium silver zinc sulphocyanide,

(Wells)

 $\text{Cs}_2\text{ZnAg}(\text{SCN})_5$ Ppt Stable in the air (Wells) $\text{CsZn}_2\text{Ag}_3(\text{SCN})_8$ Decomp by cold, more rapidly by hot H_2O (Wells) $\text{CsZn}_2\text{Ag}_4(\text{SCN})_9$ Slowly decomp by H_2O (Wells)**Cæsium zinc sulphocyanide, $\text{Cs}_2\text{Zn}(\text{SCN})_4 + 2\text{H}_2\text{O}$** Moderately sol in H_2O and can be recryst therefrom (Wells)**Calcium sulphocyanide, $\text{Ca}(\text{SCN})_2 + 3\text{H}_2\text{O}$** Deliquescent Very sol in H_2O and alcohol**Calcium silver sulphocyanide, $\text{Ca}(\text{SCN})_2$, $2\text{AgSCN} + 2\text{H}_2\text{O}$**

(Wells)

Calcium stannic sulphocyanide, $\text{CaSn}(\text{SCN})_6 + 7\text{H}_2\text{O}$ Very sol in H_2O Can be recryst therefrom Sol in alcohol and acetone (Weinland and Bames, Z anorg 1909, 62 258)**Cerous sulphocyanide, $\text{Ce}(\text{SCN})_3 + 7\text{H}_2\text{O}$** Deliquescent Sol in H_2O and alcohol (John, Bull Soc (2) 21 534)**Chromous sulphocyanide with MSCN** *See* Chromosulphocyanide, M**Chromic sulphocyanide, $\text{Cr}(\text{SCN})_3$** Deliquescent, and sol in H_2O

Somewhat sol in organic solvents (Speransky, C C 1897, I 141)

See also Chromisulphocyanhydric acid**Chromic sulphocyanide with MSCN** *See* Chromisulphocyanide, M**Cobaltous sulphocyanide, $\text{Co}(\text{SCN})_2 + \frac{1}{2}\text{H}_2\text{O}$** Sol in H_2O and alcohol, also in ether Sol in liquid SO_2 (Walden, B 1899, 32 2864)

Sol in acetone (Krug and M'Elroy)

Sol in methyl acetate (Naumann, B 1909, 42 3790)

 $+3\text{H}_2\text{O}$ Sol in H_2O and in alcohol (Rosenheim and Cohn, Z anorg 1901, 27 288)**Cobaltous mercuric sulphocyanide, $\text{Co}(\text{SCN})_2$, $\text{Hg}(\text{SCN})_2$** Very sl sol in H_2O and dil $\text{HCl} + \text{Aq}$ Easily sol in $\text{HNO}_3 + \text{Aq}$ (Cleve, J pr 91 227)

Cobaltous potassium sulphocyanide,
 $\text{CoK}_2(\text{SCN})_4$

Decomp by H_2O (Treadwell, Z anorg 1901, 26 109)
 $+4\text{H}_2\text{O}$ Sol in H_2O Sol in methyl, ethyl and amyl alcohol, in acetone and in ether+Aq Can be recryst from H_2O or alcohol without decomp (Rosenheim and Cohn, Z anorg 1901, 27 289)

Cobaltous silver sulphocyanide, $\text{CoAg}(\text{SCN})_3 + 2\text{H}_2\text{O}$

Decomp by H_2O (Shinn and Wells, Am Ch J 1903, 29 476)
 $\text{Ag}_2\text{Co}(\text{SCN})_4$ Almost insol in H_2O and in alcohol (Rosenheim, Z anorg 1901, 27 291)

Cobaltous sodium sulphocyanide,
 $\text{Na}_2\text{Co}(\text{SCN})_4 + 8\text{H}_2\text{O}$

Sol in H_2O and in alcohol (Rosenheim)

Cobaltous sulphocyanide ammonia, $\text{Co}(\text{SCN})_2 \cdot 2\text{NH}_3$ and $\text{Co}(\text{SCN})_2 \cdot 6\text{NH}_3$

(Peters, B 1908, 41 3178)
 $\text{Co}(\text{SCN})_2 \cdot 4\text{NH}_3$ Sol in H_2O and alcohol (Sand, B 1903, 36 1439)

Cobaltous sulphocyanide mercuric chloride
 $2\text{Co}(\text{SCN})_2, 2\text{HgCl}_2$

(Hantzsch and Shibata, Z anorg 1912, 7 320)

 $2\text{Co}(\text{SCN})_2, 3\text{HgCl}_2$ Easily decomp
(Hantzsch and Shibata)**Cuprous sulphocyanide, CuSCN**

1 l H_2O at 18° dissolves 0.004 mg mol or 0.5 mg CuSCN (Kohlrausch and Ros, Z phys Ch 1893, 12 241)

Insol in dil acids SI sol in cold, easl in warm conc $\text{HCl} + \text{Aq}$ Decomp by con H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ Sol with combinatio in $\text{NH}_4\text{OH} + \text{Aq}$ Insol in $\text{KSCN} + \text{Aq}$

Less sol in H_2SO_4 and $\text{H}_2\text{SO}_4 + \text{Aq}$ than 1 HNO_3 (Kuhn, Ch Z 1908, 32 1056)

Sol in $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$ (Johnson, J So Chem Ind 1889, 8 603)

$\text{KSCN} + \text{Aq}$ (85-90 g in 50 g H_2O) dissolves 18 g CuSCN (Thurnauer, B 1891, 23 770)

Sol in ether (Skey, C N 1867, 16 201)

Cupric sulphocyanide, $\text{Cu}(\text{SCN})_2$

Decomp by H_2O to cuprous salt Sol in warm HCl , H_2SO_4 , or $\text{HNO}_3 + \text{Aq}$ Sol in $\text{MSCN} + \text{Aq}$, but solutions decomp by dilution Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Solubility in $\text{NH}_4\text{OH} + \text{Aq}$ at 25° and at 40°

At 25°

Sp gr $20^\circ/25$	One gram of solution contains			1000 mols H_2O dissolve		Composition of solid salt in contact with solution
	g NH_3	g $\text{Cu}(\text{SCN})_2$	g H_2O	Mols NH_3	Mols $\text{Cu}(\text{SCN})_2$	
0 99853	0 2147	0 1522	0 6331	358 04	24 09	} $\text{Cu}(\text{SCN})_2 \cdot 4\text{NH}_3$
0 99871	0 1655	0 1124	0 7221	242 02	15 60	
1 00703	0 0993	0 0798	0 8209	127 76	9 74	
1 01336	0 0639	0 0659	0 8702	77 51	7 59	
1 01506	0 0535	0 0622	0 8843	64 05	7 04	
1 01705	0 0426	0 0596	0 8978	50 21	6 65	} $\text{Cu}(\text{SCN})_2 \cdot 2\text{NH}_3$
1 02132	0 0250	0 0511	0 9239	28 55	5 55	
1 01661	0 0198	0 0408	0 9394	22 27	4 35	
1 00816	0 0079	0 0245	0 9676	18 61	2 54	

At 40°

	0 1802	0 1976	0 6222	306 28	31 83	} $\text{Cu}(\text{SCN})_2 \cdot 4\text{NH}_3$
	0 1398	0 1658	0 6944	213 10	23 93	
	0 0758	0 1299	0 7943	101 00	16 38	
	0 0550	0 1207	0 8243	70 59	14 67	
	0 0435	0 1178	0 8388	54 82	14 07	
	0 0352	0 0876	0 8772	42 53	10 00	} $\text{Cu}(\text{SCN})_2 \cdot 2\text{NH}_3$
	0 0257	0 0655	0 9088	30 00	7 22	
	0 0177	0 0418	0 9405	19 86	4 46	
	0 0094	0 0281	0 9625	10 31	2 93	

(Horn, Am Ch J 1907, 37 471)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Cuprocupric sulphocyanide, $\text{Cu}(\text{SCN})_2$
 $\text{Cu}_2(\text{SCN})_2$

Not attacked by hot $\text{HCl} + \text{Aq}$ Insol in $\text{KSCN} + \text{Aq}$

Cupric mercuric sulphocyanide, CuHg(SCN)_4

Almost insol in cold H_2O and in alcohol,
sl sol in boiling H_2O (Rosenheim, Z anorg
1901, 27 286)

Cuprous potassium sulphocyanide, CuSCN , 6KSCN

Deliquescent. Decomp by H_2O (Thurn-
auer, B 1890, 23 770)

Cuprous sulphocyanide ammonia, $\text{Cu}_2(\text{SCN})_2$, 2NH_3

Decomp in the air (Richards, Z anorg
1898, 17 247)

$\text{Cu}_2(\text{SCN})_2$, 5NH_3 . Very unstable in the
air (Richards)

Cupric sulphocyanide ammonia, Cu(SCN)_2 , 2NH_3

Sol in little H_2O , but decomp by dilution
with pptn of basic salt. Sol in $\text{NH}_4\text{OH} + \text{Aq}$
By long standing a small amount dissolves
in H_2O with separation of CuSCN (Litter-
scheid, Arch Pharm 1901, 239 337)

Insol in H_2O . Sol in H_2O containing
a small amount of ammonia (Horn, Am
Ch J 1907, 37 477)

Cu(SCN)_2 , 4NH_3 . Very unstable in the
air

Sol in H_2O , but decomp by much H_2O
with pptn of a basic salt (Horn)

100 pts $\text{N}/10$ $\text{NH}_4\text{OH} + \text{Aq}$ dissolve 10.4
pts anhydrous salt at 25° (Pudschies, Dis-
sert)

Loses NH_3 in the air

Sol in H_2O (Kohlschutter, B 1904, 37
1156)

Decomp in the air and by H_2O and dil
and conc acids, sol in cold conc HNO_3 and
 $\text{NH}_4\text{OH} + \text{Aq}$. Sol in boiling conc HCl
(Richards, Z anorg 1898, 17 250)

Didymium sulphocyanide, $\text{D}_1(\text{SCN})_3 + 6\text{H}_2\text{O}$

Deliquescent, and sol in H_2O

Erbium sulphocyanide, $\text{Er(SCN)}_3 + 6\text{H}_2\text{O}$

Deliquescent. Sol in H_2O (Hoglund)

Glucinum sulphocyanide, Gl(SCN)_2 (?)

Sol in H_2O (Hermes, J pr 97 465)

Gold (aurous) potassium sulphocyanide, AuSCN , KSCN

Easily sol in H_2O , less in absolute alcohol
(Cleve, J pr 94 16)

Gold (aurous) potassium sulphocyanide ammonia, KAu(SCN)_2 , 5NH_3

(Peters, B 1908, 41 3173)

Gold (auric) potassium sulphocyanide ammonia, KAu(SCN)_4 , 4NH_3

(Peters)

Gold (aurous) silver sulphocyanide, AuSCN , AgSCN

Insol in H_2O . Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Gold (auric) potassium sulphocyanide

Sol in H_2O , alcohol, and ether (Cleve)

Gold (aurous) sulphocyanide ammonia, AuSCN , NH_3

Very sl sol in cold, decomp by hot H_2O

Iron (ferrous) sulphocyanide, $\text{Fe(SCN)}_2 + 3\text{H}_2\text{O}$

Very sol in H_2O , alcohol, or ether
Sol in acetone (Krug and M'Elroy)

Iron (ferric) sulphocyanide, $\text{Fe(SCN)}_3 + 3\text{H}_2\text{O}$

Deliquescent. Very sol in H_2O , alcohol,
or ether. Ether extracts the salt from
 $\text{Fe(SCN)}_3 + \text{Aq}$. Decomp by much H_2O
if pure. Not decomp by monobasic acids,
but conc H_2SO_4 , and H_3PO_4 , also oxalic,
tartaric, malic, etc., acids destroy the colour

Iron (ferric) lithium sulphocyanide, Fe(SCN)_3 , $9\text{LiSCN} + 4\text{H}_2\text{O}$

More deliquescent than the other ferric
sulphocyanides (Kruss and Moraht)

Iron (ferrous) mercuric sulphocyanide, Fe(SCN)_2 , $\text{Hg(SCN)}_2 + 2\text{H}_2\text{O}$

Moderately sol in hot H_2O (Cleve, J
pr 91 227)

Iron (ferric) potassium sulphocyanide, Fe(SCN)_3 , $3\text{KSCN} + x\text{H}_2\text{O}$

Extremely deliquescent, and sol in H_2O
(Kruss and Moraht)

Fe(SCN)_3 , $9\text{KSCN} + 4\text{H}_2\text{O}$. Hygroscopic.
Sol in H_2O without decomp. Insol in pure
anhydrous ether, but decomp by ether con-
taining traces of H_2O into Fe(SCN)_3 and
 KSCN (Kruss and Moraht, A 260 204)

Iron (ferrous) sodium sulphocyanide, $\text{Na}_4\text{Fe(SCN)}_6 + 12\text{H}_2\text{O}$

Sol in H_2O and alcohol (Rosenheim, Z
anorg 1901, 27 299)

Iron (ferric) sodium sulphocyanide, Fe(SCN)_3 , $9\text{NaSCN} + 4\text{H}_2\text{O}$

Less deliquescent than the corresponding
 NH_4 or K salt (Kruss and Moraht)

$\text{Na}_3\text{Fe(SCN)}_6 + 12\text{H}_2\text{O}$ (Rosenheim, Z
anorg 1901, 27 297)

Lanthanum sulphocyanide, $\text{La(SCN)}_3 + 7\text{H}_2\text{O}$

Deliquescent, sol in H_2O (Cleve)

Lead sulphocyanide, basic, 6PbO , $\text{Pb(SCN)}_2 + 2\text{H}_2\text{O}$

Ppt
 Pb(SCN)_2 , $\text{PbO} + \text{H}_2\text{O}$. Insol in H_2O
(Stromholm, Z anorg 1904, 38 440)

Lead sulphocyanide, $\text{Pb}(\text{SCN})_2$

Nearly insol in cold, decomp by boiling H_2O (Liebig)

Sl sol in H_2O

4.5×10^{-1} g are dissolved in 1 liter of sat solution at 20° (Böttger, Z phys Ch 1903, 46 603)

Lead sulphocyanide bromide, $\text{Pb}(\text{SCN})_2 \cdot 8\text{PbBr}_2$

(Grissom and Thorp, Am Ch J 10 219)

Lead sulphocyanide chloride, PbSCNCl

Sl sol in cold, easily sol in hot H_2O (Murtry, Chem Soc 55 50)

Sol in H_2O (Grissom and Thorp, Am Ch J 10 229)

Lead sulphocyanide iodide, $3\text{Pb}(\text{SCN})_2 \cdot \text{PbI}_2$

Sol in H_2O (Grissom and Thorp, Am Ch J 10 229)

Lithium sulphocyanide, LiSCN

Very deliquescent Sol in H_2O and alcohol (Hermes, Z Ch 1866 417)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

Magnesium sulphocyanide, $\text{Mg}(\text{SCN})_2 \cdot 4\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O and alcohol

Magnesium stannic sulphocyanide,

$\text{MgSn}(\text{SCN})_6 \cdot 6\text{H}_2\text{O}$

Hygroscopic Sol in H_2O , alcohol and acetone (Weinland and Barnes, Z anorg 1909, 62 258)

Manganous sulphocyanide, $\text{Mn}(\text{SCN})_2 \cdot 3\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O and alcohol

Mercurous sulphocyanide, $\text{Hg}_2(\text{SCN})_2$

Insol in H_2O Sol in hot $\text{HCl} + \text{Aq}$
Slowly decomp by hot aqua regia Sol in hot $\text{KSCN} + \text{Aq}$

Mercuric sulphocyanide, basic, $\text{Hg}(\text{SCN})_2 \cdot 3\text{HgO}$

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$
Insol in H_2SO_4 or $\text{HNO}_3 + \text{Aq}$ (Fleischer)
 $\text{Hg}(\text{SCN})_2 \cdot 2\text{HgO}$ Insol in H_2O Sl attacked by acids (Claus, J pr 15 401)

Mercuric sulphocyanide, $\text{Hg}(\text{SCN})_2$

Very sl sol in cold, much more easily in hot H_2O Easily sol in dil $\text{HCl} + \text{Aq}$ (Crookes, Chem Soc 4 18)

Solubility in $\text{H}_2\text{O} = 0.00218$ mol in 1 l (Grossmann, Z anorg 1904, 43 358)

More sol in H_2O than in alcohol (Peters, B 1908, 41 3180)

Very sl sol in H_2O at 25° Appreciat sol only in boiling H_2O (Jander, Disse 1902)

Sol in $\text{Hg}(\text{NO}_3)_2$ or $\text{KSCN} + \text{Aq}$, also $\text{NH}_4\text{Cl} + \text{Aq}$ Sol in many sulphocyanic + Aq

Easily sol in cold HCl , NH_4Cl , KCl , $\text{BaCl}_2 + \text{Aq}$ (Hermes, J pr 1866, (1) 477)

Very sol in liquid NH_3 (Franklin, A Ch J 1898, 20 829)

Sl sol in benzonitrile (Naumann, 1914, 47 1369)

Mercuric hydrogen sulphocyanide,

$\text{Hg}(\text{SCN})_2 \cdot 2\text{HSCN}$

Easily decomp (Hermes, Dissert 186

Mercuric nickel sulphocyanide, $\text{Hg}(\text{SCN})_2 \cdot \text{Ni}(\text{SCN})_2 \cdot 2\text{H}_2\text{O}$

Moderately sol in hot H_2O (Cleve, pr 91 227)

Very sol in $\text{MSCN} + \text{Aq}$ (Orloff, C 1906, I 1411)

Mercuric potassium sulphocyanide,

$\text{Hg}(\text{SCN})_2 \cdot \text{KSCN}$

Sol in cold, more easily in hot H_2O & in alcohol and ether Very sol in NH_4Cl $\text{KCl} + \text{Aq}$ (Claus)

$\text{K}_2\text{Hg}(\text{SCN})_4$ Very sol in H_2O , sol alcohol

Insol in anhydrous ether (Rosenhe Z anorg 1901, 27 285)

Mercuric rubidium sulphocyanide,

$\text{Hg}(\text{SCN})_2 \cdot \text{RbSCN}$

Sol in alcohol without decomp Decon by H_2O

$\text{Hg}(\text{SCN})_2 \cdot 2\text{RbSCN} + \frac{1}{2}\text{H}_2\text{O}$ Easily in H_2O without decomp (Grossmann, 1904, 37 1259)

Mercuric sodium sulphocyanide,

$\text{Na}_2\text{Hg}(\text{SCN})_3$

Very hygroscopic (Rosenheim, Z anorg 1901, 27 286)

Mercuric zinc sulphocyanide, $\text{Hg}(\text{SCN})_2 \cdot \text{Zn}(\text{SCN})_2$

Scarcely sol in cold H_2O Easily sol $\text{HCl} + \text{Aq}$ (Cleve)

Mercuric sulphocyanide ammonia,

$2\text{Hg}(\text{SCN})_2 \cdot 3\text{NH}_3 + \frac{1}{2}\text{H}_2\text{O}$

Decomp by H_2O and alcohol $\text{Hg}(\text{SCN})_2 \cdot 4\text{NH}_3$ (Peters, B 1908, 3178)

Mercuric sulphocyanide ammonium bromide, $\text{Hg}(\text{SCN})_2 \cdot \text{NH}_4\text{Br}$

Decomp by H_2O Sol in alcohol (Grossmann, Z anorg 1903, 37 418)

Mercuric sulphocyanide ammonium chloride, $\text{Hg}(\text{SCN})_2, \text{NH}_4\text{Cl}$

Decomp by H_2O Sol in warm alcohol from which it can be cryst (Grossmann)

Mercuric sulphocyanide bromide, HgSCNBr

Insol in cold H_2O , sol in hot H_2O and in alcohol (Rosenheim, Z anorg 1901, 27 282)

Mercuric sulphocyanide chloride, HgSCNCl

Insol in cold H_2O
Sol in hot H_2O and alcohol (Rosenheim)

Mercuric sulphocyanide potassium bromide, $\text{Hg}(\text{SCN})_2, 2\text{KBr}$

Very sol in H_2O (Grossmann, Z anorg 1903, 37 418)

Mercuric sulphocyanide potassium chloride, $\text{Hg}(\text{SCN})_2, \text{KCl}$

Decomp by H_2O
Not decomp by recryst from warm alcohol (Grossmann)

Molybdenum sulphocyanide, $\text{Mo}(\text{SCN})_3(?)$

Sol in H_2O and ether (Braun, Z anal 6 36)

Molybdenum potassium sulphocyanide,



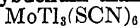
Cryst from boiling H_2O and alcohol
Chilesotti, Gazz ch it 1904, 34 (2) 493)

Molybdenum sodium sulphocyanide,



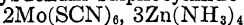
(Rosenheim, B 1909, 42 154)

Molybdenum thallous sulphocyanide,



(Rosenheim and Garfunkel, B 1908, 41 388)

Molybdenum sulphocyanide zinc amine,



(Rosenheim and Garfunkel, B 1908, 41 390)

$2\text{Mo}(\text{SCN})_6(\text{OH}), \text{Zn}_3(\text{NH}_3)_{11}$ Can be
ryst from boiling $\text{NH}_4\text{OH} + \text{Aq}$ Air-dried
alt probably has the composition
 $\text{Mo}(\text{SCN})_6(\text{OH}), 3\text{Zn}(\text{NH}_3)_4 + 2\text{H}_2\text{O}$ (Maas
and Sand, B 1908, 41 1510)

$2\text{Mo}(\text{SCN})_6(\text{OH}), \text{Zn}_3(\text{NH}_3)_{13}$ (Maas and
Sand)

Nickel sulphocyanide, $\text{Ni}(\text{SCN})_2$

Sol in H_2O (Grossmann, B 1904, 37 65)

$+ \frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O and alcohol Insol
n acetone (Krug and M'Elroy)

$+ \frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O (Rosenheim
and Cohn, Z anorg 1901, 27 292)

Nickel potassium sulphocyanide,



Sol in H_2O with decomp
Sl sol in cold, easily sol in hot alcohol
(Rosenheim, Z anorg 1901, 27 292)

Nickel sodium sulphocyanide,



Sol in H_2O with decomp
Sl sol cold, readily sol hot alcohol
(Rosenheim, Z anorg 1901, 27 292)

Nickel sulphocyanide ammonia, $\text{Ni}(\text{SCN})_2, 3\text{NH}_3$

(Peters, B 1908, 41 3178)

$\text{Ni}(\text{SCN})_2, 4\text{NH}_3$ Decomp by H_2O

Platinous sulphocyanide, $\text{Pt}(\text{SCN})_2(?)$

Insol in H_2O
See Platinosulphocyanides, and Platinoso-
sulphocyanides

Potassium sulphocyanide, KSCN

Deliquescent Very sol in H_2O 100
pts H_2O dissolve 177 2 pts at 0° , and 217 0
pts at 20°

100 g sat, $\text{KSCN} + \text{Aq}$ contain 70 5 g
 KSCN at 25° (Foote, Z phys Ch 1903, 46 81)

150 pts $\text{KSCN} + 100$ pts H_2O at 10.8°
lower the temp 34.5° (Rudorff, B 2 68)

Solubility of $\text{KSCN} + \text{AgSCN}$ at 25°

% KSCN	% AgSCN	Solid phase
70 53	0 00	KSCN
66 55	9 32	KSCN + 2KSCN, AgSCN
64 47	10 62	2KSCN, AgSCN
61 25	11 76	"
58 34	13 55	"
53 21	17 53	"
50 68	20 43	2KSCN, AgSCN + KSCN, AgSCN
49 43	20 32	KSCN, AgSCN
32 51	18 34	"
24 68	16 41	"
23 86	16 07	KSCN, AgSCN + AgSCN

(Foote, Z phys Ch 1903, 46 81)

See also AgSCN

Sol in alcohol, especially easily if boiling
Sol in acetone (Krug and M'Elroy)
Sol in liquid SO_2 (Walden, Z anorg
1902, 30 160)

100 g acetone dissolve 20 75 g KSCN at
 22° , and 20 40 g at 58°

100 g amyl alcohol dissolve 0 18 g KSCN
at 13° , 1 34 g at 65° , 2 14 g at 100° , 3 15 g
at 133.5°

100 g ethyl acetate dissolve 0 44 g KSCN
at 0° , 0 40 g at 14° , 0 20 g at 79°

100 g pyridine dissolve 6 75 g KSCN at
 0° , 6 15 g at 20° , 4 97 g at 58° , 3 88 g at

97°, 3.21 g at 115° (Laszcynski, B 1894, 27 2285)

100 g acetonitrile dissolve 11.31 g KSCN at 18° (Naumann and Schier, B 1914, 47 249)

Sl sol in benzonitrile (Naumann, B 1914, 47 1369)

Sol in methyl acetate (Naumann, B 1909, 42 3789)

Potassium molybdenyl sulphocyanide,
 $3\text{KSCN}, \text{Mo}(\text{OH})(\text{SCN})_3 + 4\text{H}_2\text{O}$

Sol in H_2O (Sand and Maas, B 1908, 41 1506)

Potassium silver sulphocyanide, KSCN, AgSCN

Decomp by H_2O

See Donk under KSCN

$2\text{KSCN}, \text{AgSCN}$ Stable in the air (Wells, Am Ch J 1902, 28 265)

See Donk under KSCN

$3\text{KSCN}, \text{AgSCN}$ (Wells)

Potassium stannic sulphocyanide,
 $\text{K}_2\text{Sn}(\text{SCN})_6 + 4\text{H}_2\text{O}$

Verv sol in H_2O

Sol in alcohol and acetone (Weinland and Barnes, Z anorg 1909, 62 258)

Potassium titanyl sulphocyanide,
 $2\text{KSCN}, \text{TiO}(\text{SCN})_2 + \text{H}_2\text{O}$

Sol in cold H_2O without immediate decomp but slowly decomp (Rosenheim and Cohn, Z anorg 1901, 28 169)

Potassium vanadium sulphocyanide,
 $3\text{KSCN}, \text{V}(\text{SCN})_3 + 4\text{H}_2\text{O}$

Sol in H_2O Sol in alcohol with a green color Sl sol in ether (Ciocci, Z anorg 1898, 19 309)

Sol in H_2O with decomp, stable in aq solution in the presence of an excess of KSCN, sol in alcohol (Locke, Am Ch J 1898, 20 604)

Potassium vanadyl sulphocyanide,
 $\text{KVO}(\text{SCN})_4 + 5\text{H}_2\text{O}$

Sol in H_2O , alcohol, ether, amyl alcohol and ethyl acetate (Koppel, Z anorg 1903, 36 292)

Potassium zinc sulphocyanide, $2\text{KSCN}, \text{Zn}(\text{SCN})_2 + 3\text{H}_2\text{O}$

Easily sol in alcohol (Walden, Z anorg 1900, 23 374)

Potassium sulphocyanide mercuric bromide, KSCN, HgBr

Very sol in H_2O

Sol in alcohol (Grossmann, B 1902, 35 2945)

$2\text{KSCN}, \text{HgBr}$ Very sol in H_2O Sol in alcohol (Grossman)

Potassium sulphocyanide mercuric iodide, $2\text{KSCN}, \text{HgI}_2$

Undecomp by solution in conc alc coh or in KSCN + Aq (Grossmann, Z anorg 1903, 37 421)

+ $2\text{H}_2\text{O}$ Decomp by H_2O (Philp Pogg, 1867, 131 94)

Silicon sulphocyanide, $\text{Si}(\text{SCN})_4$

Decomp by H_2O and alcohol Sol in CS_2 , CHCl_3 and ligrom, (Reynold Proc Chem Soc 1906, 22 17)

Silver sulphocyanide, AgSCN

1 l H_2O dissolves 1.08×10^{-6} g mol AgSCN at 25° (Kuster and Thiel, Z anorg 1902, 33 139)

1 l H_2O dissolves 1.25×10^{-6} gram-atom of silver at 25° (Abegg and Cox, Z phys Ch 1903, 46 11)

Sl sol in H_2O 1 liter of sat solution 19.96° contains 1.37×10^{-4} g (Böttge Z phys Ch 1903, 46 603)

6.4 milligrams are dissolved in 1 liter sat solution at 100° (Böttger, Z phys C 1906, 56 93)

Solubility product of AgSCN is 0.49 at 1.16×10^{-12} mols per l at 18° and 25° respectively (Kirschner, Z phys Ch 191 79 245)

Solubility in $\text{H}_2\text{O} = 1.2 \times 10^{-6}$ g mol p liter at 25° (A. E. Hill, J Am Chem Soc 1908, 30 74)

1 l H_2O dissolves 0.00025 g AgSCN 21° (Whitby, Z anorg 1910, 67 108)

Insol in acids, excepting conc H_2SO_4 , HNO_3 Insol in dl, sol in conc NH_4OH Aq Sol in KSCN + Aq Insol in AgN or $\text{NH}_4\text{SCN} + \text{Aq}$ Sol in $\text{Hg}_2(\text{NO}_3)_2$ Aq

Solubility in KSCN at 25°

Mol KSCN in 1 litre	g AgSCN in 1 litre
1 25	22 34
1 20	19 93
1 12	16 18
1 066	14 10
0 626	2 80
0 573	2 06

(Hellwig, Z anorg 1900, 25 184)

Solubility in N/10 KSCN + Aq at 18° = $\times 10^{-4}$ (Kirschner, Z phys Ch 1912, 247)

See also KSCN

1 l of a 3-N solution of AgNO_3 dissolve 0.432 g AgSCN at 25° Nearly insol in dl solution (Hellwig, Z anorg 1900, 2 179)

Insol in methyl acetate (Naumann, 1909, 42 3790)

Insol in ethyl acetate (Hamers, Disse 1906, Naumann, B 1910, 43 314)

Silver strontium sulphocyanide, 2AgSCN ,
 $\text{Sr}(\text{SCN})_2 + 2\text{H}_2\text{O}$
 Stable in the air (Wells, Am Ch J 1902,
 28 270)

Silver zinc sulphocyanide, 2AgSCN ,
 $\text{Zn}(\text{SCN})_2$
 Decomp by hot H_2O (Wells)

Silver sulphocyanide ammonia, AgSCN ,
 2NH_3
 Decomp by H_2O

Samarium sulphocyanide, $\text{Sm}(\text{SCN})_3 + 6\text{H}_2\text{O}$
 Very deliquescent (Cleve)

Sodium sulphocyanide, NaSCN
 Very deliquescent Very sol in H_2O and
 alcohol
 Sol in benzonitrile (Naumann, B 1914,
 47 1369)
 Sol in methyl acetate (Naumann, B
 1909, 42 3789)

Sodium stannic sulphocyanide, $\text{Na}_2\text{Sn}(\text{SCN})_6$
 $+ 6\text{H}_2\text{O}$
 Very sol in H_2O Sol in alcohol and ace-
 tone (Weinland and Barnes, Z anorg 1909,
 62 257)

Sodium vanadium sulphocyanide, 3NaSCN ,
 $\text{V}(\text{SCN})_3 + 12\text{H}_2\text{O}$
 Very hygroscopic Sol in H_2O and alcohol
 (Ciocci, Z anorg 1898, 19 313)

Strontium sulphocyanide, $\text{Sr}(\text{SCN})_2 + 3\text{H}_2\text{O}$
 Very deliquescent, and sol in H_2O and
 alcohol

Strontium stannic sulphocyanide, $\text{SrSn}(\text{SCN})_6$
 $+ 12\text{H}_2\text{O}$
 Sol in H_2O , alcohol and acetone (Wein-
 land and Barnes, Z anorg 1909, 62 259)

Thallium sulphocyanide, TlSCN
 Sl sol in H_2O 3.15 g are contained in
 1 liter of sat solution at 20° , 3.905 g at 25° ,
 7.269 g at 39.75° Insol in alcohol (Bott-
 ger, Z phys Ch 1903, 46 603)

Titanyl sulphocyanide, $\text{TiO}(\text{SCN})_2 + 2\text{H}_2\text{O}$
 Sol in cold H_2O

Tin (stannous) sulphocyanide, $\text{Sn}(\text{SCN})_2$
 Sol in H_2O and alcohol (Classen, J pr 96
 349)
 Sol in cold H_2O (Rosenheim, Z anorg
 1901, 28 168)

Yttrium sulphocyanide, $\text{Y}(\text{SCN})_3 + 6\text{H}_2\text{O}$
 Not deliquescent Very sol in H_2O , al-
 cohol, or ether

Zinc sulphocyanide, $\text{Zn}(\text{SCN})_2$
 Less sol in H_2O and alcohol than most other
 cyanides

Zinc sulphocyanide ammonia, $\text{Zn}(\text{SCN})_2$,
 12NH_3
 Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$

Sulphocyanoplatinic acid
See Platinosulphocyanhydric acid

Sulphocyanoplatinous acid
See Platinosulphocyanhydric acid

Sulphohypophosphoric acid

Aluminum sulphohypophosphate, $\text{Al}_2(\text{PS}_3)_3$
 Unstable in the air Sol in H_2O with de-
 comp (Friedel, C R 1894, 119 262)

Cadmium —, $\text{Cd}_2\text{P}_2\text{S}_6$
 Partially decomp in moist air Decomp
 by H_2O , cold HNO_3 or alkalis + Aq (Fer-
 rand, A ch 1899, (7) 17 423, Bull Soc 1895,
 (3) 13 116)

Chromium —, $\text{Cr}_2\text{P}_2\text{S}_6$
 Insol in HNO_3 Very sl attacked by aqua
 regia (Ferriand)

Cupric —, Cu P S_6
 Ppt (Friedel, C R 1894, 119 262)

Iron (ferrous) —, Fe P S_6
 Sol in HNO_3 and in a mixture of HNO_3
 with KClO_3 (Friedel)

Lead —, Pb P S_6
 Not decomp by boiling H_2O (Friedel)

Mercuric —, Hg P S_6
 Slowly decomp by boiling H_2O , more
 rapidly by $\text{KOH} + \text{Aq}$ (Friedel)

Nickel —, Ni P S_6
 Not attacked by boiling H_2O or hot or cold
 acids Sl attacked by aqua regia (Ferriand,
 A ch 1899, (7) 17 416)

Silver —, $\text{Ag}_4\text{P}_2\text{S}_6$
 Ppt (Friedel, C R 1894, 119 263)

Tin (stannous) hypophosphate —, SnPS_3
 Decomp by boiling H_2O Sol in dil KOH
 + Aq (Friedel, C R 1894, 119 264)

Tin (stannic) —, SnP_2S_6
 Easily decomp by boiling H_2O Sol in
 dil $\text{KOH} + \text{Aq}$ (Friedel)

Zinc sulphohypophosphate, $Zn_2P_2S_6$

Decomp in moist air Insol in H_2O Partially decomp by boiling H_2O Violently attacked by HNO_3 Sol in aqua regia Not attacked by HCl (Ferrand, A ch 1899, (7) 17 421)

Zinc —, $Zn_2P_2S_6$

Insol in H_2O Partly decomp by boiling H_2O Not decomp by HCl or HNO_3 , but by aqua regia (Ferrand, Bull Soc 1895, (3) 13 115)

Sulphomolybdic acid**Ammonium sulphomolybdate, $(NH_4)_2MoS_4$**

Easily sol in H_2O , very sl sol in alcohol (Berzelius, Pogg 83 261)

Ammonium cupric sulphomolybdate

Sl sol in H_2O (Debray, C R 96 1616)

Barium sulphomolybdate, $BaMoS_4$

More sol in H_2O than $BaMo_3S_{10}$ Known only in solution (Berzelius)

$BaS, 3MoS_2 = BaMo_3S_{10}$ Sl sol in cold, easily sol in hot H_2O Not decomp by conc cold $HNO_3 + Aq$, but more easily by dil $HNO_3 + Aq$ (Berzelius)

Cadmium sulphomolybdate

Insol in H_2O (Berzelius)

Cæsium sulphomolybdate, $Cs_2S, 3MoS_4 + 7H_2O$

As Rb comp (Herschfinkel, Dissert 1907) $3Cs_2S, 5MoS_4$ (Herschfinkel)

Calcium sulphomolybdate, $CaS, 3MoS_2$

Sol in H_2O (Berzelius)

$CaMoS_4$ More sol in H_2O than $CaS, 3MoS_2$ Known only in solution (Berzelius)

Cerium sulphomolybdate

Precipitate (Berzelius)

Cobalt sulphomolybdate, $CoMoS_4$

Sol in $K_2MoS_4 + Aq$ (Berzelius)

Cupric sulphomolybdate

(Debray, C R 96 1616)

Ferrous sulphomolybdate, $FeMoS_4$

Sol in H_2O (Berzelius)

Ferric sulphomolybdate, $Fe(MoS_4)_3$

Sol in $K_2MoS_4 + Aq$

Lead sulphomolybdate

Ppt (Berzelius)

Lithium sulphomolybdate

Not deliquescent, but very easily sol in H_2O (Berzelius)

Magnesium sulphomolybdate, $MgMoS_4$

Sol in $K_2MoS_4 + Aq$ (Berzelius)

Manganous sulphomolybdate, $MnMoS_4$

Sol in H_2O (Berzelius)

Mercurous sulphomolybdate, Hg_2MoS_4 (?)

Ppt

Mercuric sulphomolybdate, $HgMoS_4$

Insol in $K_2MoS_4 + Aq$

Nickel sulphomolybdate, $NiMoS_4$

Sol in $K_2MoO_4 + Aq$ (Berzelius)

Potassium sulphomolybdate, basic, K_4Mo

Easily sol in H_2O Insol in alcohol ether (Kruss, B 16 2050)

Potassium sulphomolybdate, K_2MoS_4

Sol in H_2O , from which it is precipitated by alcohol (Berzelius)

Rubidium sulphomolybdate, $3Rb_2S, 8MoS_4 + 30H_2O$

Very sl sol in H_2O Sol by addition NH_3 (Herschfinkel, Dissert 1907) $5Rb_2S, 6MoS_2$ (Herschfinkel)

Silver sulphomolybdate, Ag_2MoS_4

Ppt

Sodium sulphomolybdate, Na_2MoS_4

Sol in H_2O , and not precipitated by alcohol from aqueous solution (Berzelius)

Strontium sulphomolybdates

Exactly analogous to the Ba salts, wh see (Berzelius)

Zinc sulphomolybdate

Ppt Insol in H_2O (Berzelius)

Monosulphomolybdic acid,**Sodium monosulphomolybdate, Na_2MoO_3S**

Rather hygroscopic Sol in H_2O , for deep blue solution with H_2SO_4 Sol $HC_2H_3O_2 + Aq$ (Kruss, A 225 1)

Disulphomolybdic acid**Ammonium disulphomolybdate, $(NH_4)_2MoO_3S_2$**

Sl sol in cold, easily in hot H_2O Insol in sat $NH_4Cl + Aq$ and absolute alcohol Aqueous solution is decomp by boil (Bodenstab, J pr 78 186)

Potassium disulphomolybdate, $K_2MoO_2S_2$

Very sol in H_2O and alcohol Sol in $HC_2H_3O_2 + Aq$ (Kruss, B 16 2046)

Trisulphomolybdic acid

Ammonium hydrogen trisulphopyromolybdate, $NH_4HMo_2O_4S_3$

Precipitate Insol in alcohol or CS_2 (Kruss, B 16 2047)

Potassium hydrogen trisulphopyromolybdate, $KHMo_2O_4S_3$

Very easily sol in H_2O (Kruss, B 16 2048)

Sodium hydrogen trisulphopyromolybdate, $NaHMo_2O_4S_3$

Precipitate Much more sol in H_2O than the NH_4 compound (Kruss, B 16 2047)

Potassium sulphomolybdate, $K_2Mo_4S_9O_7$

Sol in H_2O , $HC_2H_3O_2$, and H_2SO_4 (Kruss, B 17 1771)

Pentasilphomolybdic acid

Potassium pentasilphomolybdate, $KMoS_5$

Sol in warm H_2O (Hofmann, Z anorg 1896, 12 62)

Persulphomolybdic acid, H_2MoS_5

Precipitate Insol in H_2O , alcohol, ether, CS_2 , and acetic acid

Decomp slowly by hot H_2SO_4 Sol in warm $KOH + Aq$, and cold $K_2S + Aq$ Not attacked by cold $KSH + Aq$, but dissolves on warming (Kruss, B 17 1773)

Ammonium persulphomolybdate, $(NH_4)_2MoS_5$

Very sl sol in cold, more easily in hot H_2O Insol in $NH_4OH + Aq$ (Berzelius)

Barium —, $BaMoS_5$

Insol in boiling H_2O or dil $HCl + Aq$ (Berzelius)

Calcium —

Difficultly sol in H_2O (Berzelius)

Cerium —

Precipitate (Berzelius)

Ferrous —

Insol in Fe salts $+ Aq$, but sol in $K_2MoS_5 + Aq$ (Berzelius)

Ferric —

Ppt

Lithium persulphomolybdate

Sl sol in cold, easily sol in hot H_2O (Berzelius)

Magnesium —

Insol precipitate (Berzelius)

Nickel —

Ppt Sol in $K_2MoS_5 + Aq$, from which it separates in 24 hours (Berzelius)

Potassium —, K_2MoS_5

Almost insol in cold, more sol in hot H_2O Insol in cold $KOH + Aq$ (Berzelius)

Potassium hydrogen —, $KHMoS_5$

Sol in H_2O (Kruss)

Sodium —, Na_2MoS_5

Sl sol in cold, easily in hot H_2O (Berzelius)

Sodium hydrogen —, $NaHMoS_5$

(Kruss)

Persulphomolybdic acid, $HMoS_5$

Sol in H_2O (Hofmann, Z anorg 1896, 12 59)

Ammonium —, $NH_4MoS_5 + H_2O$

Sl sol in H_2O and in alcohol with decomp (Hofmann)

Cæsium —, $CsMoS_5$

Almost insol in H_2O (Hofmann)

Potassium —, $KMoS_5$

Sol in H_2O (Hofmann,)

Thallium —, $TlMoS_5$

Insol in H_2O (Hofmann)

Sulphonosmic acid

Potassium sulphonosmate,

$7K_2O, 4OsO_3, 10SO_2$

Sol in H_2O (Rosenheim, Z anorg 1899, 21 127)

$+ 3H_2O$ Sol in H_2O (Rosenheim)

$+ 7H_2O$ Easily sol in H_2O , decomp in aq solution at 70° (Rosenheim)

$11K_2O, 4OsO_3, 14SO_2 + 7H_2O$ Sol in H_2O (Rosenheim)

Sodium sulphonosmate,

$3Na_2O, OsO_3, 4SO_2 + 5H_2O$

Easily sol in H_2O , decomp in aq solution (Rosenheim)

Sulphopalladic acid

Potassium palladious sulphopalladate, $K_2S, Pd_2S, PdS_2 = K_2Pd_2S_4$

Insol in H_2O Moderately conc $HCl + Aq$ dissolves out K without evolution of H_2S (Schneider, Pogg 141 526)

Silver sulphopalladate, Ag_2PdS_3
(Schneider)

Silver palladious sulphopalladate, $Ag_2S, Pd_2S, PdS_2 = Ag_2Pd_2S_4$
Extraordinarily stable (Schneider)

Sodium sulphopalladate, Na_2PdS_3
Slowly sol in H_2O Insol in alcohol
(Schneider, Pogg 141 520)

Sulphophosphide of M
See M phosphosulphide

Sulphophosphamic acid, $PS(OH)_2(?)$
See Thiophosphamic acid

Sulphophosphodiamic acid, $PS(OH)(NH_2)_2(?)$
See Thiophosphodiamic acid

Sulphophosphotriamide, $PS(NH_2)_3$
See Thiophosphoryl triamide

Sulphophosphoric acid, H_3PSO_3
See Thiophosphoric acid
 H_3PS_4 Known only in its salts

Ammonium sulphophosphate, $(NH_4)_3PS_4$
Stable in the air (Ephraim, B 1911, 44 3408)

Antimony sulphophosphate, $SbPS_4$
Insol in H_2O , alcohol, ether, CS_2 , $HCl + Aq$, dil $H_2SO_4 + Aq$, C_2H_5 , or $HC_2H_3O_2$ Decomp by boiling with conc $HNO_3 + Aq$, H_2SO_4 , aqua regia, KOH , $NaOH$ or $NH_4OH + Aq$ (Glatzel, B 24 3886)

Arsenic sulphophosphate, $AsPS_4$
Insol in H_2O , alcohol, $HCl + Aq$, etc Decomp by warm HNO_3 , aqua regia, dil H_2SO_4 , also sol in KOH or $NH_4OH + Aq$ (Glatzel, Z anorg 4 186)

Barium sulphophosphate, $Ba_3(PS_4)_2 + xH_2O$
(Ephraim, B 1911, 44 3409)

Bismuth sulphophosphate, $BiPS_4$
Insol in H_2O , alcohol, ether, CS_2 , benzene, $HC_2H_3O_2$, or dil $H_2SO_4 + Aq$ Decomp by boiling $HCl + Aq$, conc H_2SO_4 , HNO_3 , or aqua regia, also by $NaOH$, KOH , or $NH_4OH + Aq$ (Glatzel, Z anorg 4 186)

Cadmium sulphophosphate, $Cd_3(PS_4)_2$

Insol in H_2O , alcohol, ether, benzene, CS_2 , and $HC_2H_3O_2$ Decomp by hot $HCl + Aq$ Very sl attacked by dil $H_2SO_4 + Aq$ Slowly sol in hot HNO_3 , rapidly in aqua regia or hot conc H_2SO_4 (Glatzel, Z anorg 186)

Cuprous sulphophosphate, Cu_3PS_4

Insol in H_2O , alcohol, etc, also in HCl dil $H_2SO_4 + Aq$ Decomp by HNO_3 , aqua regia, etc, not by KOH or $NaOH + Aq$ (Glatzel)

Ferrous sulphophosphate, $Fe_3(PS_4)_2$

Insol in H_2O , alcohol, ether, etc, insol in HCl or hot dil $H_2SO_4 + Aq$ Decomp by HNO_3 , aqua regia, or conc H_2SO_4 , attacked by KOH or $NH_4OH + Aq$ (Glatzel)

Lead sulphophosphate, $Pb_3(PS_4)_2$

Insol in H_2O , alcohol, etc Decomp by warm $HCl + Aq$, conc $HNO_3 + Aq$, not attacked by $NH_4OH + Aq$, sl decomp by $K + Aq$ (Glatzel)

Manganous sulphophosphate, $Mn_3(PS_4)_2$

Insol in H_2O , alcohol, ether, benzene, C_2H_5 , or $HC_2H_3O_2$ Not attacked by $HCl + Aq$ Sol in HNO_3 , or aqua regia, with separation of S Not attacked by dil $H_2SO_4 + Aq$ (Glatzel, Z anorg 4 186)

Mercuric sulphophosphate, $Hg_3(PS_4)_2$

Insol in H_2O , alcohol, etc, also in HCl dil HNO_3 , or $H_2SO_4 + Aq$ Not attacked by conc HNO_3 , or aqua regia, easily sol in $HNO_3 + Br_2 + Aq$ (Glatzel)

Nickel sulphophosphate, $Ni_3(PS_4)_2$

As the ferrous salt (Glatzel)

Potassium sulphophosphate, $K_3PS_4 + H_2O$
Easily sol in H_2O (Ephraim, B 1911, 44 3407)

Silver sulphophosphate, Ag_3PS_4

Insol in H_2O , alcohol, etc, also in HCl dil HNO_3 , or dil $H_2SO_4 + Aq$ Decomp by conc H_2SO_4 , and aqua regia (Glatzel)

Sodium sulphophosphate, $Na_3PS_4 + 8H_2O$

Decomp by H_2O
Sol in $Na_2S + Aq$ (Glatzel, Z anorg 1905, 44 65)

Thallous sulphophosphate, Tl_3PS_4

Insol in H_2O , alcohol, etc Sol in HCl dil $H_2SO_4 + Aq$, etc Not attacked by $NH_4OH + Aq$, sl decomp by conc $KOH + Aq$ (Glatzel)

Tin (stannous) sulphophosphate, $\text{Sn}_3(\text{PS}_4)_2$
 Insol in H_2O , alcohol, etc Insol in dil
 H_2SO_4 or $\text{HCl} + \text{Aq}$ Decomp by $\text{HNO}_3 + \text{Aq}$,
 aqua regia, NH_4OH , or $\text{KOH} + \text{Aq}$ (Glatzel)

Zinc sulphophosphate, $\text{Zn}_3(\text{PS}_4)_2$

Insol in H_2O , alcohol, ether, etc Sol in
 $\text{HCl} + \text{Aq}$ or dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Easily at-
 tacked by $\text{KOH} + \text{Aq}$, sl decomp by NH_4OH
 $+ \text{Aq}$ (Glatzel)

Sulphopyrophosphoric acid

Aluminum sulphopyrophosphate, $\text{Al}_2\text{P}_2\text{S}_7$

Decomp in moist air
 Violently decomp by H_2O or acids (Fer-
 rand, A ch 1899, (7) 429)

Cadmium —, $\text{Cd}_2\text{P}_2\text{S}_7$

Decomp in moist air
 Not attacked by cold acids (Ferrand)

Chromium —, $\text{Cr}_2\text{P}_2\text{S}_7$

Decomp in moist air
 Not readily attacked by acids (Ferrand)

Cuprous —, $\text{Cu}_4\text{P}_2\text{S}_7$

Not attacked by cold H_2SO_4 or boiling
 HCl (Ferrand)
 Sol in hot conc HNO_3 (Ferrand)
 Sol in alkalis, and in all acids except HCl
 (Ferrand, C R 1896, 122 886)

Ferrous —, $\text{Fe}_2\text{P}_2\text{S}_7$

Insol in cold acids
 Sl attacked by boiling HCl or hot $\text{KOH} + \text{Aq}$
 Decomp by fused KOH (Ferrand, A
 ch 1899, (7) 17 410)

Lead —, $\text{Pb}_2\text{P}_2\text{S}_7$

Not attacked by cold HNO_3 (Ferrand,)

Mercurous —, $\text{Hg}_4\text{P}_2\text{S}_7$

Decomp by moist air or hot HNO_3 (Fer-
 rand)
 Almost insol in acids, decomp by H_2O
 and moist air (Ferrand, C R 1896, 122
 888)

Nickel —, $\text{Ni}_2\text{P}_2\text{S}_7$

Decomp by H_2O and by conc HNO_3 at
 150° in a sealed tube (Ferrand, A ch
 1899, (7) 17 418)

Silver —, $\text{Ag}_4\text{P}_2\text{S}_7$

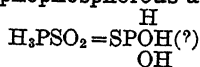
Not decomp by H_2O
 Decomp by aqua regia
 Not attacked by HNO_3 (Ferrand)

Zinc —, $\text{Zn}_2\text{P}_2\text{S}_7$

Decomp in moist air
 Decomp by H_2O

Violently attacked by cold HNO_3 (Fer-
 rand)

Sulphophosphorous acid,



See Thiophosphorous acid

H_3PS_2 Known only in its salts

Aluminum sulphophosphite, $\text{Al}_3(\text{PS}_2)_2$

Very unstable
 Decomp in the air (Ferrand, C R 1896,
 122 622)

Barium sulphophosphite, $\text{Ba}_3(\text{PS}_2)_2 + x\text{H}_2\text{O}$

Sol in dil acids
 Insol in alcohol (Ephram, B 1911, 44
 3412)

Chromous sulphophosphite, $\text{Cr}_3(\text{PS}_2)_2$

Easily attacked by hot conc HNO_3 or
 aqua regia

Decomp by boiling $\text{NaOH} + \text{Aq}$ (Fer-
 rand, A ch 1899, (7) 17 419)

Quite stable in moist air, very slowly at-
 tacked by acids (Ferrand, C R 1896, 122
 622)

Cuprous sulphophosphite, Cu_3PS_2

Not attacked by H_2O or hot conc HCl
 Sl attacked by cold fuming HNO_3
 Violently attacked by HNO_3 , aqua regia
 and boiling conc H_2SO_4
 Not attacked by boiling $\text{NaOH} + \text{Aq}$
 (Ferrand, A ch 1899, (7) 17 398)
 Fairly stable decomp by damp air (Fer-
 rand, C R 1896, 122 621)

Iron (ferrous) sulphophosphite, $\text{Fe}_3(\text{PS}_2)_2$

Very stable and resists the action of alkalis
 and acids (Ferrand, C R 1896, 122 622)
 Insol in cold acids or hot NaCl
 Sol in hot fuming HNO_3
 Insol in hot 40°C $\text{KOH} + \text{Aq}$ (Ferrand,
 A ch 1899, (7) 17 412)

Mercuric sulphophosphite, $\text{Hg}_3(\text{PS}_2)$

Decomp in moist air
 Not attacked by cold HNO_3 Decomp
 by hot HNO_3 (Ferrand)
 Unstable in the air
 Very slowly attacked by acids (Ferrand,
 C R 1896, 122 622)

Nickel sulphophosphite, $\text{Ni}_3(\text{PS}_2)_2$

Unstable in the air
 Attacked slowly by HNO_3 (Ferrand)

Silver sulphophosphite, Ag_3PS_2

Insol in most reagents (Ferrand C R
 1896, 122 622)
 Not decomp by H_2O
 Not easily attacked by acids (Ferrand,
 A ch 1899, (7) 17 414)

Sodium sulphophosphite, $\text{Na}_2\text{PS}_2 + x\text{H}_2\text{O}$

Very sol in H_2O , probably with decomp (Ephram, B 1911, 44 3410)

Zinc sulphophosphite, $\text{Zn}_2(\text{PS}_2)_2$

Decomp in moist air
Sl attacked by H_2O
Decomp by HNO_3 (Ferrand, A ch 1899, (7) 17 422)
Very unstable in the air, and attacked violently by acids (Ferrand, C R 1896, 122 622)

Sulphoplatinic acid, $\text{H}_2\text{Pt}_4\text{S}_6$

Insol in H_2O , but decomp on air (Schneider, Pogg 138 604)
 $\text{H}_4\text{Pt}_3\text{S}_5$ Insol in H_2O , but decomp very rapidly on air (Schneider)

Copper sulphoplatinate, 2CuS , 2PtS , PtS_2

Insol in H_2O HCl , HNO_3 , or aqua regia dissolve out part of the Cu (Schneider, Pogg 139 661)

Lead sulphoplatinate, 2PbS , 2PtS , PtS_2

Insol in hot or cold H_2O or $\text{HCl} + \text{Aq}$
 $\text{HNO}_3 + \text{Aq}$ dissolves out Pb partly, aqua regia dissolves completely with difficulty (Schneider, Pogg 139 662)

Mercuric sulphoplatinate chloride, 2HgS , 2PtS , PtS_2 , 2HgCl_2

Insol in H_2O , not attacked by $\text{HCl} + \text{Aq}$, and only partially sol in boiling aqua regia (Schneider)

Potassium sulphoplatinate, $\text{K Pt}_4\text{S}_6$

Insol in H_2O $\text{HCl} + \text{Aq}$ dissolves out K without evolution of H_2S
Composition its potassium platinum sulphoplatinate, K_2S , 3PtS , PtS_2 (Schneider, Pogg 138 604)
 K PtS

Silver sulphoplatinate, $2\text{Ag}_2\text{S}$, 2PtS , PtS_2

Insol in H_2O or $\text{HCl} + \text{Aq}$ $\text{HNO}_3 + \text{Aq}$ dissolves out Ag on warming Aqua regia decomp with formation of AgCl (Schneider, Pogg 138 664)

Sodium sulphoplatinate, $\text{Na}_4\text{Pt}_3\text{S}_6 = 2\text{Na}_2\text{S}$, 2PtS , PtS

Decomp by hot H_2O , with residue of PtS (Schneider)
 $\text{Na}_2\text{PtS}_2 = \text{Na}_2\text{S}$, PtS , 2PtS_2 Insol in H_2O (Schneider, J pr (2) 48 418)

Thallium sulphoplatinate, $2\text{Tl}_2\text{S}$, 2PtS , PtS_2

Insol in cold H_2O Dil acids dissolve out all the thallium (Schneider, Pogg 138 626)

Sulphoplatinous acid, H_2PtS_2

Known only in solution in H_2O , which soon decomposes (Schneider, J pr (2) 48 424)

Sodium sulphoplatinite, Na_2PtS_2

Sol in H_2O with decomp (Schneider, pr (2) 48 420)
 $\text{H}_4\text{Na}_2(\text{PtS}_2)_2$ Sol in H_2O , from which is pptd by alcohol (Schneider)

Sulphoselenantimonous acid

See Selenosulphantimonous acid

Sulphoselenarsenic acid

See Selenosulpharsenic acid

Sulphoselenostannic acid

See Selenosulphostannic acid

Sulphoselenoxyarsenic acid

See Selenosulphoxyarsenic acid

Sulphoselenyl chloride, SSeO_3Cl

Deliquescent, decomposed by H_2O (Clau nitzer, B 11 2007)

Metasulphosilicic acid**Sodium metasulphosilicate, Na_2SiS_3**

Decomp by H_2O (Hempel, Z anorg 1900, 23 41)

Sulphostannic acid, H_2SnS_3

Ppt (Kuhn, A 84 110)
Does not exist (Storch, W A B 9 2b 236)

Ammonium sulphostannate, $(\text{NH}_4)_2\text{S}$, $3\text{SnS}_2 + 6\text{H}_2\text{O}$

Easily sol in H_2O , and easily decomp (Ditte, C R 95 641)
 $(\text{NH}_4)_2\text{SnS}_3 + 3\text{H}_2\text{O}$, and $+ 7\text{H}_2\text{O}$ Decomp by acid (Stanek, Z anorg 1898, 1 124)

Barium sulphostannate, $\text{BaSnS}_3 + 8\text{H}_2\text{O}$

Sol in cold H_2O (Ditte, C R 95 641)

Calcium sulphostannate, 2CaS , $\text{SnS}_2 + 14\text{H}_2\text{C}$

Sol in H_2O (Ditte, C R 95 641)

Tetraplatinous sulphostannate, 4PtS , SnS_2

Not decomp by acids (Schneider, J pr (2) 7 214)

Platinum potassium sulphostannate, 3PtS , K_2S , SnS_2

Insol in cold H_2O Dil HCl or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ dissolves out all the potassium (Schneider, Pogg 136 109)

Platinum sodium sulphostannate, 3PtS , Na_2S , SnS_2
 Insol in cold H_2O (Schneider, Pogg 136 109)

Potassium sulphostannate, K_2SnS_3
 Sol in H_2O (Kuhn, A 84 110)
 $+3\text{H}_2\text{O}$ (Ditte, C R 95 641)
 $\text{K}_4\text{SnS}_4 + 4\text{H}_2\text{O}$ Sol in H_2O pptd by alcohol (Weinland, Z anorg 1898, 17 419)

Sodium sulphostannate, $\text{Na}_2\text{SnS}_3 + 2\text{H}_2\text{O}$
 Sl sol in H_2O (Kuhn, A 84 110)
 $+3\text{H}_2\text{O}$ (Ditte, C R 95 641)
 $+7\text{H}_2\text{O}$ Sol in H_2O (Horing, Zeitsch Pharm 1851 120)
 $\text{Na}_4\text{SnS}_4 + 12\text{H}_2\text{O}$ Melts in crystal H_2O on heating Very sol in H_2O (Kuhn)

Strontium sulphostannate, $\text{SrSnS}_3 + 12\text{H}_2\text{O}$
 Sol in H_2O (Ditte, C R 95 641)

Thallium sulphostannate, Tl_4SnS_4
 Ppt Practically insol in H_2O (Hawley, J Am Chem Soc 1907, 29 1011)

***D*₂ sulphopersulphuric acid**

Sodium *d*₂ sulphopersulphate, $\text{Na}_2\text{S}_4\text{O}_8$
 Sol in H_2O Cryst in cold with $2\text{H}_2\text{O}$ (Villiers, C R 106 851, 1354)
 Contains 4H more and is sodium tetra-
 thionate, $\text{Na}_4\text{S}_4\text{O}_6$, $2\text{H}_2\text{O}$ (Villiers, C R 108 402)

Sulphotelluric acid

Mercurous sulphotellurate, $3\text{Hg}_2\text{S}$, TeS_2
 Ppt

Mercuric —, 3HgS , TeS_2
 Ppt (Berzelius)

Potassium —, K_2TeS_4
 Sol in H_2O (Oppenheim, J pr 71 279)

Sodium —
 Sol in H_2O (Oppenheim)

Sulphotellurous acid

Ammonium sulphotellurite, $3(\text{NH}_4)_2\text{S}$, TeS_2
 Decomp on air Sol in H_2O

Barium —
 Very slowly sol in H_2O

Calcium —
 Somewhat sol in H_2O

Cerium —
 Insol ppt

Cobalt sulphotellurite, Co_3TeS_6
 Ppt

Copper —, Cu_3TeS_6
 Ppt

Ferrous —
 Ppt

Ferric —
 Ppt

Lead —
 Ppt

Lithium —
 Sol in H_2O

Magnesium —
 Sol in H_2O and alcohol

Manganous —
 Ppt

Potassium —, 3K S , TeS_2
 Sol in H_2O

Silver —, 3Ag S , TeS_2
 (Berzelius)

Sodium —
 Sol in H_2O

Strontium —
 Sol in H_2O

Zinc —, 3ZnS , TeS
 Ppt (Berzelius)

Sulphotungstic acid

Ammonium sulphotungstate, $(\text{NH}_4)_2\text{WS}_4$
 Very deliquescent Easily sol in H_2O , and still more easily in $\text{NH}_4\text{OH} + \text{Aq}$ (Corleis, A 232 244)
 More sol in pure H_2O than in H_2O acidified with HCl Decomp slowly on air (Berzelius)

Barium —
 Sol in $\text{BaS} + \text{Aq}$

Cadmium —, CdWS_4
 Ppt (Berzelius)

Calcium —
 Sol in H_2O and alcohol (Berzelius)

Cobalt —, CoWS_4
 Sl sol in H_2O

Copper sulphotungstate, CuWS_4

Ppt

Glucinum —, GlWS_4 Sol in H_2O (?)**Ferrous —, FeWS_4** Sol in H_2O **Ferric —**

Ppt

Lead —, PbWS_4

Ppt (Berzelus)

Magnesium —, MgWS_4 Easily sol in H_2O or alcohol**Manganous —, MnWS_4** Sol in H_2O (Berzelus)**Mercurous —**

Ppt (Berzelus)

Mercuric —, HgWS_4

Ppt (Berzelus)

Nickel —, NiWS_4

Ppt (Berzelus)

Potassium —, K_2WS_4 Sol in H_2O Alcohol precipitates from aqueous solutions, but is not entirely insol in alcohol (Berzelus)Very sol in H_2O (Corleis, A 232 264)**Potassium — nitrate, $\text{K}_2\text{WS}_4, \text{KNO}_3$** Very sol in cold or hot H_2O , from which it is precipitated by alcohol (Berzelus)**Potassium — tungstate, $\text{K}_2\text{WO}_2\text{S}_2 =$** $\text{K}_2\text{WS}_4, \text{K}_2\text{WO}_4$ Easily sol in H_2O Not precipitated by alcohol (Berzelus)Is potassium trisulphotungstate, K_2WOS_3 , which see (Corleis, A 232 244)**Silver —, AgWS_4**

Ppt (Berzelus)

Sodium —, Na_2WS_4 Very sol in H_2O , less sol in alcohol (Berzelus)

Very deliquescent (Corleis, A 232 264)

Strontium —Sol in H_2O , and in $\text{SrO} + \text{Aq}$ **Stannous —, SnWS_4**

Ppt (Berzelus)

Stannic —, SnWS_4

Ppt (Berzelus)

Zinc sulphotungstate, ZnWS_4 Sol in H_2O with subsequent pptn (Berzelus)**Monosulphotungstic acid****Potassium monosulphotungstate,** $\text{K}_2\text{WOS} + \text{H}_2\text{O}$ Deliquescent in moist air Very sol in H_2O (Corleis, A 232 244)**Disulphotungstic acid****Ammonium disulphotungstate, $(\text{NH}_4)_2\text{WO}_5$** Sol in H_2O and alcohol (Berzelus)

Decomp easily when moist (Corleis, A 232 264)

Trisulphotungstic acid**Potassium trisulphotungstate, $\text{K}_2\text{WOS}_3 + \text{H}_2\text{O}$** Hygroscopic Effloresces on dry air d easily decomposed Easily sol in H_2O (Corleis, A 232 244)**Sulphovanadic acid, $\text{V}_2\text{O}_5, 3\text{SO}_3 + 3\text{H}_2\text{C}$**

See Vanadiousulphuric acid, and Sulph vanadium

SulphovanadatesAlkali sulphovanadates are sol in H_2O Ca, Sr, and Ba sulphovanadates are sl sol in H_2O , and all other sulphovanadates are in l in H_2O (Berzelus)**Ammonium sulphovanadate, $(\text{NH}_4)_3\text{VS}_4$** Easily sol in H_2O Very sl sol in cc $\text{NH}_4\text{SH} + \text{Aq}$ Insol in ether, CS_2 , or CH_2Cl_2 (Kruss and Ohnmaier, A 263 46)

See also Sulphoxyvanadic acid

Sodium pentasulphoxyvanadate, $\text{Na}_4\text{V}_2\text{O}_{11}$ Hydroscopic, sol in H_2O with rapid comp (Locke, Am Ch J 1898, 20 375)**Sulphoxyantimonic acid****Potassium sulphonyantimonate, $\text{K}_2\text{HSbO}_5 + 2\text{H}_2\text{O}$** Sol in hot, less sol in cold H_2O Decomposed by cold H_2O (Weinland and Gutmann, Anorg 1898, 17 414)**Sulphoxyarsenic acid, $\text{H}_3\text{AsO}_5\text{S}$**

Known only in aqueous solution (McCoy, Am Ch J 10 459)

Ammonium monosulphoxyarsenate, $(\text{NH}_4)_2\text{AsSO}_5 + 3\text{H}_2\text{O}$ Decomp in the air, sol in H_2O , decomp on boiling (Weinland, B 1896, 29 1009)

Very sol in H_2O , insol in alcohol, decomp in aq solution and also in the air (Weinland, Z anorg 1897, 14 53)

Decomp in the air (McLaughlan, B 1901, 34 2166)

Ammonium hydrogen monosulphoxyarsenate, $(NH_4)_2HAsSO_3$

Ppt (McLaughlan, B 1901, 34 2168)

Barium monosulphoxyarsenate, $BaHAsO_3 + 10H_2O$

(Preis, A 257 184)

$Ba_3(AsSO_3)_2 + 6H_2O$ Ppt (Weinland, Z anorg 1897, 14 54)

Barium disulphoxyarsenate, $Ba_3(AsS_2O_2)_2 + 4H_2O$

Ppt (Preis, A 257 185)

$+6H_2O$ (Weinland and Rumpf, Z anorg 1897, 14 64)

Barium potassium trisulphoxyarsenate, $KBaAsS_3O + 7H_2O$

Ppt (McCay, Z anorg 1904, 41 469)

Barium sodium monosulphoxyarsenate, $BaNaAsSO_3 + 9H_2O$

Ppt (Weinland, Z anorg 1897, 14 55)

Barium sodium sulphoxyarsenate, $Ba_7Na_2As_5O_7S_{14} + 12H_2O$

(McCay and Foster, Z anorg 1904, 41 467)

Calcium trisulphoxyarsenate, $Ca_3(AsS_3O)_2 + 20H_2O$

Ppt (McCay and Foster, Z anorg 1904, 41 463)

Potassium monosulphoxyarsenate, K_3AsSO_3
Hydroscopic (Weinland, B 1896, 29 109)

Sol in conc KOH + Aq, free from carbonate, very hydroscopic (Weinland, Z anorg 1897, 14 51)

Potassium hydrogen monosulphoxyarsenate, $K_2HAsSO_3 + 2\frac{1}{2}H_2O$

Very hygroscopic (Weinland and Rumpf, Z anorg 1897, 14 59)

KH_2AsSO_3 Sol in H_2O , solution slowly decomp on standing (McCay, Am Ch J 10 459)

Formula given by Bouquet and Cloez (A ch (3) 13 44) is $K_2H_4As_2S_3O_5$

Potassium disulphoxyarsenate, $K_3AsS_2O_2 + 10H_2O$

Very hygroscopic, decomp by H_2O (Weinland, Z anorg 1897, 14 63)

Potassium trisulphoxyarsenate, $K_3AsS_3O + 7H_2O$

Yellow oil which cryst at -20° (McCay and Foster, Z anorg 1904, 41 468)

Sodium monosulphoxyarsenate, $Na_3AsSO_3 + 12H_2O$

Easily sol in H_2O (Preis, A 257 180) (McLaughlan, B 1901, 34 2170)

Sol in H_2O (Weinland, B 1896, 29 1009)

Sl efflorescent Insol in alcohol (McCay, Z anorg 1902, 29 42)

Sol in NaOH + Aq, decomp by boiling with conc NaOH (Weinland, Z anorg 1897, 14 49)

Sodium hydrogen monosulphoxyarsenate, NaH_2AsSO_3

Decomp by H_2O , insol in alcohol (Weinland, Z anorg 1897, 14 58)

$Na_2HAsSO_3 + 8H_2O$ Easily sol in H_2O (Preis)

Sodium disulphoxyarsenate, $Na_3AsS_2O_2 + 10H_2O$

Easily sol in H_2O (Preis)

Sol in H_2O , pptd by alcohol (McCay, B 1899, 32 2472)

Not decomp by boiling NaOH + Aq (Weinland, Z anorg 1897, 14 62)

Insol in alcohol (McCay, Z anorg 1900, 25 461)

$+11H_2O$ (McLaughlan, B 1901, 34 2170)

Insol in alcohol (McCay, Z anorg 1902, 29 46)

Sodium trisulphoxyarsenate, $Na_3AsS_3O + 11H_2O$

Decomp by H_2O (McCay and Foster, Z anorg 1904, 41 454)

Sodium trisulphoxydiarsenate, $As_2O_2S_3, 3NaO + 24H_2O$

Easily sol in H_2O (Geuther, A 240 208)

$2As_2O_2S_3, NaO + 7H_2O$ Sol in H_2O

(Nilson, J pt (2) 14 14)

Correct composition is $Na_8As_{18}S_4O_7 + 30H_2O$ (Preis)

Sodium sulphoxyarsenate, $Na_3As_{18}S_4O_7 + 30H_2O = 4NaO, 6AsS, 3AsS_2O + 30H_2O$

Decomp by H_2O Sol in NH_4OH or KOH + Aq (Preis, A 257 187)

= Sodium oxytrisulpharsenate of Nilson

Sodium pentasulphoxytetraarsenate, $Na_{12}As_4S_{11}O_{11} + 48H_2O$

Less sol in H_2O than other sulphoxyarsenates (Preis)

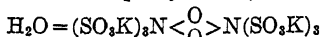
Sodium strontium trisulphoxyarsenate, $NaSrAsS_3O + 10H_2O$

Unstable (McCay and Foster, Z anorg 1904, 41 462)

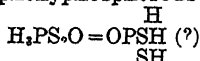
Trisulphoxyazotic acid, $\text{ON}(\text{SO}_3\text{H})_3$

Known only in its salts (Claus, A, 158 52 and 194)

Has the formula $(\text{SO}_3\text{H})_3\text{N} < \overset{\text{O}}{\underset{\text{O}}{\text{O}}} > \backslash (\text{SO}_3\text{H})_3$
(Raschig, A 241 161)

Potassium trisulphoxyazotate, $\text{ON}(\text{SO}_3\text{K})_3 +$ 

Easily sol in H_2O without decomp, even on boiling (Claus, A 157 210)

Sulphoxyphosphorous acid,

See Thiophosphorous acid

Sulphoxyvanadic acid**Ammonium pyrohexasulphoxyvanadate**,
 $(\text{NH}_4)_4\text{V}_2\text{S}_6\text{O}$

Sol in H_2O (Kruss and Ohnmaiss, A 263 53)

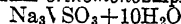
Potassium pyrohexasulphoxyvanadate,
 $\text{K}_4\text{V}_2\text{S}_6\text{O} + 3\text{H}_2\text{O}$

Melts in crystal H_2O (Kruss and Ohnmaiss)

$\text{K}_3\text{V}_2\text{S}_6\text{O}_2 + 3\text{H}_2\text{O}$ More sol in H_2O than preceding comp (K and O)

Sodium orthotrisulphoxyvanadate, $\text{Na}_3\text{VS}_3\text{O} + 5\text{H}_2\text{O}$

Very deliquescent, and easily sol in H_2O
Somewhat sol in alcohol (Kruss and Ohnmaiss)

Sodium orthomonosulphoxyvanadate,

Less sol in H_2O than other sulphonyvanadates (K and O)

Sulphur, S

The various modifications of sulphur have been classified in many different ways, and there is a difference of opinion as to whether certain forms are true allotropic modifications or not

The data, as far as concerns the solubility, may be arranged as follows —

A Sol in CS_2 1 Rhombic, octahedral, or alpha sulphur, ordinary sulphur Easily sol in CS_2 , etc See below for solubility in various solvents

2 Prismatic, monoclinic, or beta sulphur Sol in CS_2 , but is converted into A, 1 Prismatic sulphur obtained by melting brimstone is not wholly sol in CS_2 on account of admixture of gamma sulphur

Monoclinic modification is more sol than rhombic in CHCl_3 , ether and benzene (Meyer C C 1903, II 481)

3 Soft sulphur, milk of sulphur

4 Amorphous sol sulphur is also a rate modification, according to Berth

B Soft sulphur, obtained by str heating and quickly cooling, is sol in but becomes insol therein by repeatedly solving and evaporating More easily in CS_2 than A, 1

C Insol in CS_2 1 By action of st light on S in CS_2

2 By heating to b-pt, cooling sudd and allowing to stand until hard Has called gamma sulphur, but is a mixture $\frac{2}{3}$ A, 4 and $\frac{1}{3}$ insol S

3 Insol S in flowers of sulphur converted into A 1 by standing 3 days alcohol

According to Berthelot (A ch (3) 49 there are only two varieties of S I "C hedral" II "Amorphous"

I Octahedral Sol in CS_2 Scarcely a upon by $\text{KHSO}_3 + \text{Aq}$ Converted by oxid ing agents into II

II Amorphous Insol in neutral solve viz H_2O , alcohol, ether, CS_2 , etc

Sol with tolerable rapidity in $\text{KHSO}_3 +$ By long action of $\text{Na}_2\text{S} + \text{Aq}$, a portio dissolved, and the remainder converted

I Less easily oxidised by $\text{HNO}_3 + \text{Aq}$ t

I Some varieties of this modification sol to a certain extent in alcohol and et and by boiling the rest of the sulphur is converted into I, also by long-continued contact with cold alcohol Berthelot holds the modification is changed before dissolv Solutions of the alkalis, alkali salts, alkali sulphides change insol into sol sulph (Berthelot)

Elastic sulphur obtained by pouring r ten sulphur at a temp of over 260° into l contains 35% or more of a modification (S which is insol in CS_2 , hot or cold, but in absolute alcohol, this modification be converted back into ord sulphur by heating to 100° (Pelouze and Fremy) (C 2)

This modification can be obtained by action of HCl on thiosulphates (For and Gélis)

The soft pasty sulphur obtained by decomposition of H_2S by SO_2 forms an alim clear emulsion (pseudo solution) with H_2O , from which it is pptd by various salts substances which have no chemical affinity for it 23 pts S combine in this way w 100 pts H_2O When pptd by saline solutions, some of the S remains in solution When solution is exposed to the light, gradually separates out, also on boiling same takes place The above pseudo-solution is pptd by mineral acids, and the pp S may still be dissolved in fresh water, if left in contact for some time with the acid Also pptd by K salts, with loss of pov of forming pseudo-solutions Pptd by Na and Na salts without losing that pow

Alkal hydrates, carbonates, or sulphides convert it into insol S

The solution may be mixed with alcohol without change. Decomposed by long shaking with naphtha or oil of turpentine. The pseudo-solution combines with CS_2 , forming an emulsion which subsequently decomposes. The S itself is only partially sol in CS_2 (Selmi, J pr 57 49)

By treatment of amorphous "insoluble" S with CS_2 or CCl_4 , a small part goes into solution, the amount being dependent on the time of contact with the temp, and nature of the solvent, but independent of the amount of the solvent. It is assumed that this is due to a partial change of the "insoluble" into soluble S (Wigand, Z phys Ch 1910, 75 235)

"Delta" sulphur Partly sol in H_2O (Debus, Chem Soc 53 18)

A colloidal form wholly sol in H_2O exists, which, however, decomposes very easily (Engel, C R 112 866)

Black sulphur Insol in alcohol, ether, CS_2 , fatty oils even at 200° , cold alkali hydroxides + Aq, H_2SO_4 , HNO_3 , or aqua regia (Knapp, J pr (2) 43 305)

Green modification Five times more sol than ordinary sublimed sulphur in a mixture of salicylaldehyde and benzene (Orloff, C C 1902, I 1264)

The following data relate to octahedral or ordinary sulphur (A 1) —

Sol in warm liquid H_2S (Niemann), warm P_2S_5 , SBr_2 , SCl_2 , Br, NCl_3 , BaS + Aq (Dumas), in alcoholic solution of K_2S_5 , but is reprecipitated by addition of H_2O to saturation

Sol in liquid SO_2

Sol in aqueous solution of alkali sulphates, especially when hot. Sol in boiling conc HSCN + Aq, from which it mostly separates on cooling

Na_2CO_3 + Aq (5.6% Na_2CO_3) dissolves no S at 20° 0.06775% at 100° (Pohl, Dingl 197 508)

The solubility of S in Na_2S + Aq between 0° and 50° diminishes slightly with increase in temp, but increases with dilution of the solution, having its largest value in a N/16 solution of Na_2S + Aq when the relation of Na_2S to dissolved S equals about 1.4 (Kuster, Z anorg 1905, 43 56)

Sol in AlBr_3 (Isbekow, Z anorg 1913, 84 27)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

Sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 822)

Sol in liquid NH_3 1 gr S is sol in 3-4 cc liquid NH_3 (Hugot, A ch 1900, (7) 21 32)

The solubility of S in liquid NH_3 is constant from -23° to -84° and equals 39% (Ruff, Z anorg Ch 1910, 23 1830)

Solubility in liquid NH_3
(g S in 100 g solution)

t°	S	t°	S
-78	38 6	16 4	25 65
-20 5	38 1	30	21 0
0	32 34	40	18 5

(Ruff and Hecht, Z anorg 1911, 70 62)

Sol in liquid NO . (Frankland, Chem Soc 1901, 79 1361)

S_2Cl_2 dissolves 66.74% S at ord temp to form a liquid of 1.7 sp gr (Rose)

Solubility of S in S_2Cl_2 varies according to the variety of sulphur used. Aten has published an extended investigation on the subject, which see for details (Z phys Ch 1905-14, 54 86, 124, 81 268, 83 443, 86 1, 88 321)

Solubility in SnCl_4

100 g SnCl_4 dissolve at

99°	101°	110°	110°
5 8	6 2	8 7	9 1 pts solid S,

112°	112°	121°
9 4	9 9	17 0 pts liquid S

(Gerardin)

Sol in alkalis + Aq with decomp

Sol in 1926.7 pts absolute alcohol at 15° (Pohl, W A B 6 600)

Sol in 20 pts hot nearly absolute alcohol less sol in weaker alcohol (Laurogais)

Sol in 600 pts boiling alcohol of 40° B (Chevallier J ch med 2 387) in 500 pts alcohol (Meissner) 200 pts alcohol (Pelouze and Fremy)

100 pts absolute alcohol dissolve 0.42 pt at b-pt, and 0.12 pt S at 16° , 100 pts ether dissolve 0.54 pt at b-pt, and 0.19 pt S at 16° , 100 pts benzene dissolve 17.04 pts at b-pt, and 1.79 pts S at 16° , 100 pts oil of turpentine dissolve 16.16 pts at b-pt, and 1.35 pts S at 16° , 100 pts CS_2 dissolve 73.46 pts at b-pt, and 38.70 pts S at 16° , 100 pts naphtha dissolve 10.56 pts at b-pt, and 2.77 pts S at 16° , 100 pts tar-oil dissolve 26.98 pts at b-pt, and 1.51 pts S at 16° (Payen, C R 34 456)

100 pts absolute methyl alcohol dissolve 0.028 pt at 18.5° , 100 pts absolute ethyl alcohol dissolve 0.053 pt at 18.5° (de Bruyn, Z phys Ch 10 781)

Solubility in amyl alcohol

95°	110°	110°
1 5	2 1	2 2 pts solid S,

112°	112°	120°	131°
2 6	2 7	3 0	5 3 pts liquid S

(Gerardin, A ch (4) 5 134)

Quickly sol in 12.5 pts ether (Favre)

100 pts benzene dissolve 0.965 pt S at 26° , 100 pts benzene dissolve 4.377 pts S at 71° , 100 pts toluene dissolve 1.479 pts S at 23° , 100 pts ethyl ether dissolve 0.972 pt S at

23 5°, 100 pts chloroform dissolve 1 205 pts S at 22°, 100 pts phenol dissolve 16 35 pts S at 174°, 100 pts aniline dissolve 85 27 pts S at 130° (Cossa, B 1 139)

Solubility in benzene at t°

t°	S in 10 g of solution
15 17	0 1480
19 29	0 1692

(Bronsted, Z phys Ch 1906, 55 377)

A mixture of S and toluene separates into two layers, containing 33 and 92 5% S respectively (Haywood, J phys Ch 1897, 1 232)

CS₂ dissolves 0 35 pt ordinary sulphur, some varieties of S, however, are not entirely sol in CS₂, thus—

Variety of Sulphur	Pts sol in 1 pt CS ₂	Fraction of original wt insol in CS ₂
Octahedral, from Sicily	0 335	0 000
Crystallised in dry wav, recently prepared	0 415	0 029
Do, prepared 8 years	0 33	0 004
Do, prepared 9 years		0 020
Do, prepared 15 years		0 051
Red needles, recently prepared	0 382	0 023
Soft yellow, do		0 353
Do, prepared 2 years	0 316	0 157
Soft red, recently prepared	0 374	0 157
Do, prepared 5 years		0 181
Flowers of sulphur	0 351	0 113
Do, another sample		0 234
Roll brimstone, outside		0 029
Do inside		0 073

(Deville, A ch (3) 47 99)

The pt insol in CS₂ is sol in hot absolute alcohol crystallising on cooling, less sol in chloroform or ether (Deville)

100 pts pure CS₂ dissolve pts S at t°

t	pts S	t°	Pts S
-11	16 54	22	46 05
- 6	15 75	38	94 57
0	23 99	48 5	146 21
+15	37 15	55	181 34
18 5	41 65		

(Cossa, B 1 138)

Neither ordinary stick S nor flowers of S is completely sol in CS₂. Pptd S is completely sol in 5 pts CS₂ (Tittenger, C C 1894, II 267)

2 99 g S are sol in 100 grams CS₂ at — (Arctowski, C R 1895, 121 124)

Solubility in CS₂

100 g of the sat solution contain at

—77° —84 5° —89° —116°
4 84 4 46 4 29 2 99 g S

(Arctowski, Z anorg 1896, 11 274)

When 20 pts S dissolve in 50 pts CS₂ at 22° the temp is lowered 5° (Cossa)

Sat solution of S in CS₂ boils at 5° (Cossa)

Sp gr of S dissolved in CS₂ at 15°

(Pts S per 100 pts CS₂)

Sp gr	Pts S	Sp gr	Pts S	Sp gr	P	S
1 271	0 0	1 312	9 9	1 352	1	6
1 272	0 2	1 313	10 2	1 353	1	9
1 273	0 4	1 314	10 4	1 354	2	1
1 274	0 6	1 315	10 6	1 355	2	4
1 275	0 9	1 316	10 9	1 356	2	6
1 276	1 2	1 317	11 1	1 357	2	0
1 277	1 4	1 318	11 3	1 358	2	2
1 278	1 6	1 319	11 6	1 359	2	5
1 279	1 9	1 320	11 8	1 360	2	8
1 280	2 1	1 321	12 1	1 361	2	1
1 281	2 4	1 322	12 3	1 362	2	3
1 282	2 6	1 323	12 6	1 363	2	7
1 283	2 9	1 324	12 8	1 364	2	0
1 284	3 1	1 325	13 1	1 365	2	2
1 285	3 4	1 326	13 3	1 366	2	6
1 286	3 6	1 327	13 5	1 367	2	0
1 287	3 9	1 328	13 8	1 368	2	3
1 288	4 1	1 329	14 0	1 369	2	8
1 289	4 4	1 330	14 2	1 370	2	1
1 290	4 6	1 331	14 5	1 371	2	6
1 291	4 8	1 332	14 7	1 372	2	0
1 292	5 1	1 333	15 0	1 373	2	5
1 293	5 3	1 334	15 2	1 374	2	9
1 294	5 6	1 335	15 4	1 375	2	4
1 295	5 8	1 336	15 6	1 376	2	1
1 296	6 0	1 337	15 9	1 377	2	5
1 297	6 3	1 338	16 1	1 378	2	0
1 298	6 5	1 339	16 4	1 379	2	7
1 299	6 7	1 340	16 6	1 380	3	2
1 300	7 0	1 341	16 9	1 381	3	5
1 301	7 2	1 342	17 1	1 382	3	4
1 302	7 5	1 343	17 4	1 383	3	9
1 303	7 8	1 344	17 6	1 384	3	8
1 304	8 0	1 345	17 9	1 385	3	2
1 305	8 2	1 346	18 1	1 386	3	3
1 306	8 5	1 347	18 4	1 387	3	5
1 307	8 7	1 348	18 6	1 388	3	2
1 308	8 9	1 349	18 9	1 389	3	1
1 309	9 2	1 350	19 0	1 390	3	7
1 310	9 4	1 351	19 3	1 391	3	2
1 311	9 7					

(Mascagno, C N 43 192)

p gr of S dissolved in CS₂ at 15° Water at
4°=1

p gr	% S	Sp gr	% S	Sp gr	% S
2708	0 0	1 2736	0 6	1 2764	1 2
2717	0 2	1 2745	0 8	1 2774	1 4
2727	0 4	1 2755	1 0	1 2783	1 6
2792	1 8	1 3096	8 0	1 3409	14 2
2802	2 0	1 3105	8 2	1 3419	14 4
2812	2 2	1 3115	8 4	1 3430	14 6
2822	2 4	1 3125	8 6	1 3440	14 8
2832	2 6	1 3135	8 8	1 3450	15 0
2842	2 8	1 3145	9 0	1 3460	15 2
2852	3 0	1 3155	9 2	1 3471	15 4
2862	3 2	1 3165	9 4	1 3481	15 6
2872	3 4	1 3175	9 6	1 3491	15 8
2882	3 6	1 3185	9 8	1 3502	16 0
2892	3 8	1 3195	10 0	1 3512	16 2
2901	4 0	1 3205	10 2	1 3522	16 4
2911	4 2	1 3215	10 4	1 3532	16 6
2921	4 4	1 3226	10 6	1 3543	16 8
2930	4 6	1 3236	10 8	1 3553	17 0
2940	4 8	1 3246	11 0	1 3563	17 2
2949	5 0	1 3256	11 2	1 3573	17 4
2959	5 2	1 3266	11 4	1 3584	17 6
2969	5 4	1 3277	11 6	1 3594	17 8
2978	5 6	1 3287	11 8	1 3604	18 0
2988	5 8	1 3297	12 0	1 3615	18 2
2998	6 0	1 3307	12 2	1 3625	18 4
3008	6 2	1 3317	12 4	1 3635	18 6
3017	6 4	1 3328	12 6	1 3646	18 8
3027	6 6	1 3338	12 8	1 3656	19 0
3037	6 8	1 3348	13 0	1 3667	19 2
3047	7 0	1 3358	13 2	1 3677	19 4
3056	7 2	1 3368	13 4	1 3688	19 6
3066	7 4	1 3379	13 6	1 3698	19 8
3076	7 6	1 3389	13 8	1 3709	20 0
3086	7 8	1 3399	14 0		

(Pfeiffer, Z anorg 1897, 15 200)

Sol in acetone (Eidmann, C C 1899, II 14)

Solubility of S in acetone + Aq at 25°

S = millimols g S in 100 cc of the solution
A = g acetone in 100 g acetone + Aq

A	S	p gr
100	65 0	0 78540
95 36	45 0	0 79114
90 62	33 0	0 81654
85 38	25 3	0 82958

Herz and Knoch, Z anorg 1905, 45 263)

Solubility in organic solvents

Solvent	t°	Sat solution contains % S
CS ₂	-61	3 6
	-55	4 4
	-19	10 6
	-18	10 8
	-17	11 5
	-13	12 4
	-11	13 3
	-11	13 5
	-2	17 2
	+ 3	19 5
	9	23 1
	11	23 7
	14	25 9
	17	27 2
	19	28 9
	20	28 5
	21	29 7
	26	33 4
	27	34 6
	29	37 8
	30 5	39 7
	33	42 2
	40	48 7
	44	53 2
	46	56 2
	48	57 5
	53	60 0
	54	60 6
	65	67 9
	77 5	76 4
	81 0	79 4
	92 0	87 8
	98 0	90 1
Ethylene dibromide	9	1 7
	22	2 4
	40	4 4
	50	6 4
	72	12 4
	95	30 2
	105	60 0
Benzene	8	1 2
	10	1 3
	21	1 8
	30	2 6
	39	3 3
	47	4 0
	54	4 9
	65	6 8
	72	8 6
	100	17 5
	123	31 9
	127	34 0
	150	36 8
Hexane	-20	0 07
	0	0 16
	+26	0 41
	+68	1 2
	+130	5 2
	+142	6 2
	+184	8 3

(Etard, A ch 1894, (7) 2 571)

Solubility in CHCl_3 at t°	
t°	g S in 10 g of solution
12 25	0 0744
19 29	0 0918

(Bronsted, Z phys Ch 1906, 55 377)

Solubility of octahedral and prismatic S in organic solvents at t°

Solvent	t°	% prismatic S	% octahedral S
Benzene	18 6	2 004	1 512
	25 3	2 335	1 835
Chloroform	0	1 101	0 788
	15 5	1 658	1 253
	40	2 9	2 4
Ethyl ether	0	0 113	0 080
	25 3	0 253	0 200
Ethyl bromide	0	0 852	0 611
	25 3	1 676	1 307
Ethyl formate	0	0 028	0 019
Ethyl alcohol	25 3	0 066	0 052

(Bronsted, Z phys Ch 1906, 55 377)

Solubility in organic solvents at 25° (G S dissolved in 1 g mol of solvent)

Solvent	g S
Ethylene chloride	0 831
Tetrachlorethane	2 063
Dichlorethylene	1 237
Pentachlorethane	2 421
Trichlorethylene	2 43
Perchlorethylene	2 537
Carbon tetrachloride	1 354

(Hoffmann et al 1910, B 43 188)

100 g trichlorethylene dissolve 1 19 g S at 15° (Wester and Bruuns, Pharm Weekbl 1943, 51 1443)Solubility in benzyl chloride at t°

t°	g S per 100 g of solution	
	in upper layer	in lower layer
0	0 99	
17	1 78	
35	2 57	
46 1	3 64	
63 3	6 15	
78 0	9 88	
99 1	19 89	
109 6		90 62
114 6		87 99
118 8	37 29	
121 4	40 04	85 02
130 0	49 71	80 07
134 2	56 20	72 23

Above 134.2° sulphur is miscible with

benzyl chloride in all proportions, below temp two layers are formed (Bogusky, J Russ Phys Chem Soc 37 92-99, C C 1905, I 1207)

Easily sol in boiling acetic anhydride (Rosenfeld, B 13 1475)

Sol in considerable amount in warm $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, but very sl sol if dil (Bermann, B 10 866)

Sol in stearic acid + Aq (Vulpinus, Pharm (3) 13 38)

Acetic ether dissolves 6% S (Favre, Difficultly sol in methyl acetate (Naumann, B 1909, 42 3790)

Sol in ethyl acetate (Naumann, B 37 3601)

Sl sol in benzonitrile at ord temp more sol at higher temp (Naumann, 1914, 47 1369)

Sol in 12 pts hot petroleum from A but nearly insol in cold (de Saussure, 100 pts nicotine at 100° dissolve 10 S, but this separates out as the solution (Klever, C C 1872 434)

Sol in warm aniline (Barral, A 20 352)

Easily sol in hot, less sol in cold (Fritzsche)

Very sol in aniline and quinoline, esp when warm (Hofmann)

Sol in quinoline but reacts with the with evolution of H (Beckmann and Z anorg 1906, 51 236)

 $\frac{1}{2}$ ccm oleic acid dissolves 0 0335 6 days (Gates, J phys Chem 19 143)

Sol in 26 pts of boiling, sl sol creosote

Sol by digestion in 2 pts oil of turp Sol in hot oil of copaiba, crystall cooling

Sol in hot oil of mandarin, crystall on cooling

Sol in hot oil of caraway, crystall cooling

Somewhat sol in hot, less in cold spirit

Sl sol in lignone, bromoform, col zene, but easily in hot benzene (Mann, Chem Soc 1 262)

Sol in ethyl sulphide, and carbonyl chloride (Rathke, A 152 187)

Sol in mercuric methyl

Sol in 20 pts ethyl nitrate, from which is not pptd by H_2O

Sol in naphtha, aldehyde, iodol, chloroform, warm chloral, sinkalr ethyl chloride, warm benzoyl chloride

100 pts methylene iodide dissolve S at 10° Melted sulphur is miscible with hot methylene iodide (Retgers, Z 3 343)

S dissolves in 2000 pts glycerine (and Garot, J Pharm (3) 26 81)

Glycerine dissolves 0 10% S (Klever, 1872 434)

100 g glycerine dissolve 0.14 g at 15.5°
(Ossendowski, Pharm J 1907, 79 575)

Sol in butyl sulphhydrate, and warm retinole

Sol in ethyl sulphhydrate

Very sol in conine, hexyl alcohol, warm allyl sulphocyanide, cacodyl oxide. Somewhat sol in hot styrene, separating out on cooling

Readily sol in warm, less readily in cold toluene or resin-oil

Sol in olive oil at 115°, from which it mostly separates on cooling

Sol in hot oil of amber, crystallising upon cooling. Sol in 2 pts hot, sl sol in cold caoutchou

Insol in valeric acid, amyl valerate, valeryl hydride

Linseed oil dissolves % S at t°

t°	% S	t	% S	t°	% S
25	0.630	95	2.587	160	9.129
60	1.852	130	4.935		

(Pohl)

Solubility in olive oil (sp gr = 0.885)

100 pts dissolve pts S at t°

t	Pts S	t	Pts S	t	Pts S
15	2.3	65	20.6	110	30.3
40	5.6	100	25.0	130	43.2

(Pelouze C R 68 1179)

Solubility in 100 pts coal-tar oil at t°

t	Pts S in		
	Oil of 0.870	Oil of 0.880	Oil of 0.852
	sp gr 1.00 100	sp gr 1.00 120	sp gr 1.00 200
15	2.1	2.3	2.5
30	3.0	4.0	5.3
50	5.2	6.1	8.3
80	11.8	13.7	15.2
100	15.2	18.7	23.0
110		23.0	26.2
120		27.0	32.0
130			38.7

t	Pts S in		
	Oil of 0.885	Oil of 1.010	Oil of 1.020
	sp gr 1.00 200	sp gr 1.00 210 310	sp gr 1.00 220 300
15	2.6	6.0	7.0
30	5.8	8.5	8.5
50	8.7	10.0	12.0
80	21.0	37.0	41.0
100	26.4	52.5	54.0
110	31.0	105.0	115.0
120	38.0	∞	∞
130	43.8	∞	∞

(Pelouze, C R 69 56)

Sulphur bromide, S₂Br₂

Decomp gradually with H₂O. Dissolves S on warming, which crystallises out on cooling. Sol in CS₂.

Decomp by current of dry air into S and Br (Hannay, Chem Soc 35 16)

Decomp slowly by cold H₂O, rapidly by hot H₂O. Decomp by dil KOH + Aq or NaHCO₃ + Aq (Korndorfer, Arch Pharm 1904, 242 156)

A study of the mpt curve of a series of mixtures of sulphur and bromine gave no evidence for the existence of the compounds SBr₂ and SBr₄ (Ruff, B 1903, 36 2446)

Sulphur monochloride, S₂Cl₂

Slowly decomp by H₂O. Miscible with CS₂ and C₆H₆. Sol in alcohol and ether with subsequent decomposition. Sol in oil of turpentine

Moderately sol in liquid NH₃ (Franklin, Am Ch J 1898, 20 830)

Sol in CCl₄ and C₆H₆ (Oddo, Gazz ch it 1899, 29 (2) 318)

Sulphur dichloride, SCl₂

Decomp slowly with H₂O, immediately by alcohol or ether

Sulphur tetrachloride, SCl₄

Violently decomp by H₂O. Decomp at temperatures above -22° (Michaelis, A 170 1)

Sulphur stannic chloride, 2SnCl₄, SnCl₄

Decomp by H₂O. Sol in dil HNO₃ + Aq. Forms a mass with fuming HNO₃ which is sol in HNO₃ + Aq. Sol in POCl₃ (Casselmann)

Very hygroscopic. Fumes in moist air. Very easily sol in dry abs ether and in benzene. Sol in CHCl₃, SOCl₂, CS₂, POCl₃, ligroin and petroleum ether (Ruff, B 1904, 37 4517)

Sulphur titanium chloride, SCl₄, 2TiCl₄

Very deliquescent. Easily sol in dil HNO₃ + Aq (Weber, Pogg 132 454)

SCl₄, TiCl₄. Sol in SOCl₂, CHCl₃, CS₂ and petroleum ether (Ruff, B 1904, 37 4516)

Sulphur chloride ammonia, SCl₂, 4NH₃

Insol in H₂O, but gradually decomp thereby, sol without decomp in absolute alcohol, from which it is pptd by H₂O (Mertens)

Does not exist (Fordos and Gélis, C R 31 702)

SCl₂, 2NH₃. Decomp by H₂O. Sol in alcohol or ether (Soubeiran, A ch 67 71). Not a true chemical compound, but a mixture (Fordos and Gélis, C R 31 702)

$\text{SCl}_2, 4\text{NH}_3$ Decomp by H_2O Sl sol in absolute alcohol and ether (Soubeiran, A ch 67 71), mixture (Fordos and Gélis)

Sulphur chloride nitrogen sulphide
See Nitrogen sulphochloride

Sulphur perfluoride, SF_6

Very sl sol in H_2O , sl sol in alcohol (Moissan, C R 1900, 130 868)

Sulphur monoxide, S_2I_2

Insol in H_2O Decomp by alcohol, which dissolves out I_2 Sl sol in cold caoutchou, the solution decomposing when boiled Freely sol in glycerine Sol in 60 pts glycerine, and 82 pts olive oil (Cap and Garot, J Pharm (3) 26 81)

Very sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

Sol in CS_2 (Linebarger, Am Ch J 1895, 17 58)

Sulphur hexoxide, SI_6

Decomp on air Alcohol or alkalies dissolve out iodine (vom Rath, Pogg 110 116)

Does not exist (M'Leod, Rep Brit Assn Advn Sci 1892 690)

Sulphur stannic iodide

See Tin sulphur iodide

Sulphur sesquioxide, S_2O_3

Deliquescent Violently decomp by H_2O at ordinary temp Sol in fuming H_2SO_4 Insol in SO_2 Decomp by alcohol or other (Weber, Pogg 156 531)

Sulphur dioxide, SO_2

Liquid Insol in H_2O if brought in contact therewith below the b-pt of SO_2

Sol in 3 vols CS_2 on warming, separating out on cooling Dissolves some P, little S, and no sulphuric or phosphoric acids

Dissolves ether, chloroform, P, Br, S, I, CS, colophonum, and other gums, also benzene when warmed (Sestini, Bull Soc (2) 10 226)

Miscible with liquid SO_3 , but not with H_2SO_4

Gas

1 vol H O absorbs 50 vols SO_2 at 18 (Davy) 20 vols at ord temp (Dalton) 43 78 vols at ord temp (de Saussure) 50 vols at 20 and 760 mm (Pelouze and Fremy) 33 vol at ord temp (Thomson)

1 pt SO_2 by weight is sol in 0 1429 pt H O at 5 and the solution has 1 020 sp gr

1 pt SO_2 is sol in 0 0400 pt H O at ord temp (Priestley) in 0 0909 pt H O at 10 and sp gr of the solution is 1 0513 (Thomson)

Sol in 2 pts H O at 10 (Pierre A ch (3) 23 421)
100 vol H O at 15 and 760 mm absorb 4378 vols SO_2 gas 100 vols alcohol of 0 84 sp gr at 760 mm ab orb 11 5 vols (de Saussure 1814)

Solubility of SO_2 gas in H_2O $t^\circ = \text{temp}$ vols SO_2 reduced to 0° and 760 mm tained in 1 vol sat $\text{SO}_2 + \text{Aq}$, $V_1 = \text{SO}_2$ gas reduced to 0° and 760 mm solved by 1 vol H_2O under 760 mm sure

t°	V	V_1	t°	V	
0	68 861	79 789	21	34 986	37 70
1	67 003	77 210	22	33 910	36 17
2	65 169	74 691	23	32 847	35 02
3	63 360	72 230	24	31 800	34 26
4	61 576	69 828	25	30 766	32 86
5	59 816	67 485	26	29 748	31 84
6	58 080	65 200	27	28 744	30 22
7	56 369	62 973	28	27 754	29 14
8	54 683	60 805	29	26 788	28 10
9	53 021	58 697	30	25 819	27 61
10	51 383	56 647	31	24 873	26 51
11	49 770	54 655	32	23 942	25 78
12	48 182	52 723	33	23 025	24 44
13	46 618	50 849	34	22 122	23 47
14	45 079	49 033	35	21 234	22 80
15	43 564	47 276	36	20 361	21 68
16	42 073	45 578	37	19 502	20 86
17	40 608	43 939	38	18 658	20 41
18	39 165	42 360	39	17 827	19 37
19	37 749	40 838	40	17 013	18 66
20	36 206	39 374			

(Schonfeld, A 95 5)

This table may be formulated as follo
1 vol H_2O absorbs 79 789—260 t
0 029349 t^2 vols SO_2 at temp between 0 an
20°, or 1 vol sat solution contains 68 1-
1 87025 $t + 0 01225t^2$ vols SO_2 Coeffici t
absorption between 21° and 40°=75 2
2 1716 $t + 0 01903t^2$ vols SO_2 or 1 vol sa
solution between 21° and 40° contains 6 95
—1 38898 $t + 0 00726t^2$ vols SO_2

Solubility of SO_2 in H_2O at various temp an
760 mm $t^\circ = \text{temp}$, G = grunme SC
dissolved in 1 g H_2O , V = vols SC di
solved in 1 g H O

t	G	V	t	G	
8	0 168	58 7	30	0 078	2 3
10	0 154	53 9	32	0 073	2 7
12	0 142	49 6	34	0 069	2 3
14	0 130	45 6	36	0 065	2 8
16	0 121	42 2	38	0 062	2 6
18	0 112	39 3	40	0 058	2 4
20	0 104	36 4	42	0 055	1 3
22	0 098	34 2	44	0 053	1 4
24	0 092	32 3	46	0 050	1 4
26	0 087	30 5	48	0 047	1 4
28	0 083	28 9	50	0 045	1 6

(Sims, A 118 340)

Solubility of SO_2 in H_2O at various pressures
 P = "partial pressure," i.e. the total pressure minus the tension of aqueous vapour at given temp, G at P = weight SO_2 in grammes, which is dissolved in 1 g H_2O at pressure P , G at 760 = calculated weight SO_2 that would be contained in 1 g H_2O at 760 mm if the absorption were proportional to the pressure, V = the volume of G grammes of SO_2 at 0° and 760 mm

P	7°			
	G at P	G at 760	V at P	V at 760
30	0 010	0 263	3 634	92 06
40	0 013	0 242	4 451	84 55
50	0 015	0 223	5 129	77 95
60	0 017	0 218	6 024	76 28
70	0 020	0 213	6 868	74 55
80	0 022	0 210	7 743	73 55
90	0 025	0 208	8 598	72 62
100	0 027	0 205	9 421	71 60
120	0 032	0 201	11 09	70 20
140	0 036	0 197	12 71	69 00
160	0 041	0 195	14 34	68 15
180	0 046	0 193	15 97	67 40
200	0 050	0 191	17 59	66 83
220	0 055	0 190	19 19	66 30
240	0 059	0 188	20 79	65 84
260	0 064	0 187	22 40	65 44
280	0 069	0 186	23 99	65 10
300	0 073	0 185	25 59	64 81
350	0 085	0 184	29 55	64 16
400	0 096	0 182	33 51	63 65
450	0 107	0 181	37 44	63 25
500	0 118	0 180	41 42	62 94
550	0 130	0 179	45 31	62 60
600	0 141	0 178	49 20	62 32
650	0 152	0 178	53 10	62 09
700	0 163	0 177	56 98	61 86
750	0 174	0 176	60 88	61 69
760	0 176	0 176	61 65	61 65
800	0 185	0 176	64 74	61 50
850	0 196	0 175	68 57	61 30
900	0 207	0 175	72 41	61 15
950	0 218	0 175	76 25	61 00
1000	0 229	0 174	80 01	60 88
1050	0 240	0 174	83 97	60 77
1100	0 251	0 174	87 80	60 65
1200	0 273	0 173	95 45	60 45
1300	0 295	0 172	103 00	60 25

P	20°			
	G at P	G at 760	V at P	V at 760
40	0 007	0 143	2 637	50 09
50	0 009	0 138	3 171	48 20
60	0 011	0 135	3 718	47 10
70	0 012	0 131	4 205	45 64
80	0 013	0 127	4 663	44 30
90	0 015	0 125	5 169	43 65
100	0 016	0 124	5 692	43 25
120	0 019	0 121	6 683	42 33
140	0 022	0 119	7 690	41 75
160	0 025	0 118	8 666	41 17
180	0 028	0 117	9 652	40 75
200	0 030	0 116	10 62	40 35
220	0 033	0 115	11 59	40 03
240	0 036	0 114	12 54	39 70
260	0 038	0 112	13 45	39 30
280	0 041	0 112	14 41	39 10
300	0 044	0 111	15 34	38 87
350	0 050	0 110	17 66	38 35
400	0 059	0 109	20 56	38 10
450	0 064	0 108	22 37	37 77
500	0 071	0 107	24 67	37 50
550	0 077	0 106	26 93	37 20
600	0 083	0 105	29 14	36 90
650	0 090	0 105	31 39	36 70
700	0 096	0 105	33 62	36 50
750	0 103	0 104	35 94	36 43
760	0 104	0 104	36 43	36 43
800	0 110	0 104	38 32	36 40
1000	0 137	0 104	47 85	36 37
1300	0 178	0 104	62 10	36 31
1600	0 218	0 104	76 35	36 27
1900	0 259	0 104	90 53	36 21

P	39.8			
	G at P	G at 760	V at P	V at 760
200	0 016	0 062	5 675	21 57
300	0 024	0 061	8 368	21 20
400	0 031	0 060	11 03	20 95
500	0 039	0 059	13 67	20 77
600	0 047	0 059	16 29	20 64
760	0 059	0 059	20 50	20 50
800	0 062	0 059	21 58	20 50
1000	0 077	0 059	26 84	20 40
1500	0 113	0 057	39 65	20 09
2000	0 149	0 057	52 11	19 80

P	50			
	G at P	G at 760	V at P	V at 760
200	0 012	0 045	4 156	15 97
400	0 024	0 045	8 275	15 72
600	0 035	0 045	12 36	15 65
760	0 045	0 045	15 62	15 62
800	0 047	0 045	16 43	15 60
1000	0 059	0 045	20 51	15 59
1500	0 088	0 044	30 73	15 57
2000	0 012	0 044	39 07	15 55

1 g H₂O dissolves 0.0909 g SO₂ = 34.73 cc (at 25°) at 25° and 748 mm pressure (Walden and Centnerszwer, Z phys Ch 1901, 42 462)

Solubility of SO₂ in H₂O at t° and 760 mm pressure

t°	G SO per 1 g H ₂ O	t°	G SO ₂ per 1 g H ₂ O
0	0.236	7	0.176
2	0.218	8	0.168
4	0.201	10	0.154
6	0.184	12	0.142

(Roozeboom, R t c 1884, 3 29)

From a gas containing 10% by vol of SO₂ at 10°, 1.63% by wt is dissolved by 1 litre of H₂O, if the pressure is increased to 5 atmospheres, 8.14% by wt is dissolved (Harpf, Chem Zeitschr, 1905, 4 136)

Solubility of SO₂ in H₂O at t°

C = g SO₂ in 1 cc of the solution

P = Pressure in mm of Hg

t°	C	P	$\frac{C}{P} \times 10^4$
0	0.000537	0.4	13.4
	0.00237	3.5	6.78
	0.01227	29.4	4.17
	0.03894	109.4	3.48
25	0.000534	1.4	3.81
	0.00234	11.75	2.00
	0.01212	87.9	1.379
	0.03750	313.0	1.198
50	0.000525	4.9	1.07
	0.002276	30.5	0.746
	0.01181	204.5	0.577
	0.03628	696.0	0.521

(Lindner, M 1912, 33 645)

Sp gr of sat solution at—

0° 10° 20° 40°

1.06091 1.05472 1.02386 0.95548

(Bunsen and Schonfeld A 95 2)

Sat SO₂+Aq has sp gr = 1.0040 (Berthollet)

Sp gr of sat SO₂+Aq at t°

t°	Sp gr	t	Sp gr	t	Sp gr
0	1.0609	9	1.0548	17	1.0358
1	1.0596	10	1.0547	18	1.0321
2	1.0585	11	1.0528	19	1.0281
3	1.0576	12	1.0505	20	1.0239
4	1.0569	13	1.0481	21	1.0195
5	1.0562	14	1.0454	22	1.0147
6	1.0557	15	1.0424	23	1.0099
7	1.0552	16	1.0392	24	0.9991
8	1.0549				

(Scheff, A 107 312)

Sp gr of SO₂+Aq at 4°

% SO ₂	Sp gr	% SO ₂	Sp gr	% SO ₂	Sp
1	1.0024	8	1.0217	15	1.0
2	1.0049	9	1.0247	16	1.0
3	1.0075	10	1.0278	17	1.0
4	1.0102	11	1.0311	18	1.0
5	1.0130	12	1.0343	19	1.0
6	1.0158	13	1.0376	20	1.0
7	1.0187	14	1.0410	21	1.0

(Scheff, calculated by Gerlach, Z anal 8)

Sp gr of SO₂+Aq

% SO ₂	Temp	Sp gr
0.99	15.5°	1.0051
2.05	"	1.0102
2.87	"	1.0148
4.04	"	1.0204
4.99	"	1.0252
5.89	"	1.0297
7.01	"	1.0353
8.08	"	1.0399
8.68	"	1.0438
9.80	"	1.0492
10.75	"	1.0541
11.65	12.5°	1.0597
13.09	11.0°	1.0668

(Giles and Scheerer, Jour Soc Ch Inc 4 303)

Sp gr of SO₂+Aq

% SO	Sp gr	% SO ₂	Sp gr	% SO ₂	Sp
1	1.0052	4	1.0167	7	1.0
2	1.0094	5	1.0208	8	1.0
3	1.0134	6	1.0242	9	1.0

(Anthon)

Sp gr of SO₂+Aq

% SO	Sp gr	% SO ₂	Sp gr	% SO ₂	Sp
1	1.0042	5	1.0210	8	1.0
2	1.0083	6	1.0252	9	1.0
3	1.0125	7	1.0295	10	1.0
4	1.0167				

(Hager, Adjumenta varia, Leipzig, 1 6 146)

Sp gr of $\text{SO}_2 + \text{Aq}$ at 15°

% SO_2	Sp gr	% SO_2	Sp gr	% SO_2	Sp gr
0.5	1.0028	4.0	1.0221	7.5	1.0401
1.0	1.0056	4.5	1.0248	8.0	1.0426
1.5	1.0085	5.0	1.0275	8.5	1.0450
2.0	1.0113	5.5	1.0302	9.0	1.0474
2.5	1.0141	6.0	1.0328	9.5	1.0497
3.0	1.0168	6.5	1.0353	10.0	1.0520
3.5	1.0194	7.0	1.0377		

(Scott, Polyt Centralbl **1873** 826)

Conc H_2SO_4 absorbs 0.009 pt by weight (58 vols), and SO_2 is more soluble in dilute $\text{H}_2\text{SO}_4 + \text{Aq}$, the more H_2O there is present (Kolb, Dingl **209** 270)

Solubility in H_2SO_4

Sp gr of H_2SO_4	Absorbs SO_2 per kg	Absorbs SO_2 per litre
1.841	0.009	5.8
1.839	0.014	8.9
1.540	0.021	11.2
1.407	0.032	15.9
1.227	0.068	29.7
1.020	0.135	49.0

(Kolb, Bull Soc Ind Mullhouse, **1872** 224)

Coefficient of absorption for H_2SO_4 (1.841 sp gr at 15° and 760 mm) is 28.14 at 17° , and 28.86 at 16° (Dunn, C N **43** 121)

Solubility of SO_2 in H_2SO_4 of 1.84 sp gr

t	Sp gr of sat solution	Coeff of absorption (760 mm)	t°	Sp gr of sat solution	Coeff of absorption (760 mm)
0		53	50	1.8186	9.5
10	1.8232	35.0	60	1.8165	7.0
20	1.8225	25.0	70	1.8140	5.5
25	1.8221	21.0	80	1.8112	4.5
30	1.8216	18.0	90	1.8080	4.0
40	1.8205	13.0			

(Dunn, C N 1882, **45** 272, Calc by Seidell, Solubilities, 1st Ed)Solubility of SO_2 in $\text{H}_2\text{SO}_4 + \text{Aq}$

t°	Sp gr of H_2SO_4 solution	Approx % H_2SO_4	Coeff of absorption	t°	Sp gr of H_2SO_4 solution	Approx % H_2SO_4	Coeff of absorption
6.9	1.139	20	48.67	15.2	1.173	25	31.82
6.9	1.300	40	45.38	16.8	1.151	21	31.56
8.6	1.482	58	39.91	14.8	1.277	36	30.41
9.8	1.703	78	29.03	15.1	1.458	56	29.87
5.5	0.67	10	36.78	15.6	1.609	70	25.17
6.6	1.102	15	34.08	15.0	1.739	81	20.83

(Dunn, C N 1882, **45** 272, Seidell, Solubilities, 1st Ed)

Coefficient of absorption in H_2SO_4 (sp gr = 1.841) = 5.8, (sp gr = 1.839) = 8.9 (Lunge)

Solubility in salts + Aq at 35° l = coefficient of absorption of SO_2 in the given salt solution at 35° lo = coefficient of absorption of SO_2 in water at $35^\circ = 22.43$

Salt		3 normal	2 o normal	2 normal	1 o normal	1 normal	0 o normal
KI	1	45.43	41.87	38.04	34.64	30.25	26.30
	l-lo	23.00	19.44	15.61	12.21	7.82	3.87
KBr	1	36.14	34.12	31.93	29.64	27.49	24.83
	l-lo	13.71	11.69	9.50	7.21	5.01	2.40
KCl	1	30.02	28.93	27.94	26.54	25.15	23.74
	l-lo	7.59	6.50	5.31	4.11	2.72	1.31
KCNS	1	42.94	38.13	35.05	32.03	28.79	25.63
	l-lo	18.51	15.70	12.62	9.60	6.36	3.20
NH_4NO_3	1	27.43	26.66	25.57	24.78	24.23	23.35
	l-lo	5.00	4.23	3.14	2.35	1.80	0.92
KNO_3	1	27.33	26.54	25.72	24.79	24.03	23.27
	l-lo	4.90	4.11	3.29	2.36	1.60	0.84

Solubility in salts + Aq at 35° — *Continued*l = coefficient of absorption of SO₂ in the given salt solution at 35°l₀ = coefficient of absorption of SO₂ in water at 35° = 22.43

Salt		3 normal	2.5 normal	2 normal	1.5 normal	1 normal	0	norm
$\frac{1}{2}(\text{NH}_4)_2\text{SO}_4$	1	24.60	24.23	23.93	23.49	23.14	—	2.91
	l-l ₀	2.17	1.80	1.50	1.06	0.71	—	0.48
$\frac{1}{2}\text{CdI}_2$	1	24.30	23.99	23.71	23.38	23.06	—	2.75
	l-l ₀	1.87	1.56	1.28	0.95	0.63	—	0.32
$\frac{1}{2}\text{Na}_2\text{SO}_4$	1	19.27	19.79	20.20	20.81	21.35	—	1.88
	l-l ₀	-3.16	-2.64	-2.23	-1.62	-1.08	—	0.55
$\frac{1}{2}\text{CdBr}_2$	1	19.17	19.70	20.60	20.81	21.46	—	1.88
	l-l ₀	-3.26	-2.73	-1.83	-1.62	-0.97	—	0.55
$\frac{1}{2}\text{CdCl}_2$	1	18.68	19.23	20.02	20.55	21.23	—	1.73
	l-l ₀	-3.75	-3.20	-2.41	-1.88	-1.20	—	0.70
$\frac{1}{2}\text{CdSO}_4$	1	16.25	17.41	18.31	19.42	20.43	—	1.45
	l-l ₀	-6.81	-5.02	-4.12	-3.01	-2.00	—	0.98

Solubility in salts + Aq at 25°

l = coefficient of absorption of SO₂ in the given solution at 25°l₀ = coefficient of absorption of SO₂ in water at 25° = 32.76

Salt		3 normal	2.5 normal	2 normal	1.5 normal	1 normal	0	norm
KI	1	68.36	62.63	56.75	50.58	44.76	—	3.66
	l-l ₀	35.60	29.87	23.99	17.82	12.00	—	5.90
$\frac{1}{2}\text{CdI}_2$	1	35.77	34.98	34.74	34.16	33.76	—	3.27
	l-l ₀	3.01	2.22	1.98	1.40	1.00	—	0.51
NH ₄ Br	1	52.25	49.17	46.06	42.78	39.46	—	3.28
	l-l ₀	19.49	16.41	13.30	10.02	6.70	—	3.52
KBr	1	52.26	48.87	44.96	42.41	39.11	—	3.94
	l-l ₀	19.00	15.71	12.70	9.15	6.35	—	3.18
NaBr	1	37.74	36.84	36.26	35.27	34.54	—	3.76
	l-l ₀	4.98	4.08	3.50	2.51	1.78	—	1.00
$\frac{1}{2}\text{CdBr}_2$	1	27.46	28.15	29.27	30.17	31.01	—	1.91
	l-l ₀	-5.30	-4.61	-3.49	-2.59	-1.75	—	0.85
NH ₄ Cl	1	42.78	41.37	39.76	38.06	36.37	—	4.58
	l-l ₀	10.02	8.61	7.00	5.30	3.61	—	1.80
KCl	1	42.27	40.96	39.32	37.76	36.05	—	4.42
	l-l ₀	9.51	8.20	6.56	5.00	3.29	—	1.66

Solubility in salts + Aq at 25°—*Continued*l = coefficient of absorption of SO₂ in the given solution at 25°l₀ = coefficient of absorption of SO₂ in water at 25° = 32.76

Salt		3 normal	2.5-normal	2 normal	1.5-normal	1 normal	0.5 normal
NaCl	l	31.36	31.51	31.76	31.96	32.25	32.46
	l-l ₀	-1.40	-1.25	-1.00	-0.80	-0.51	-0.30
$\frac{1}{2}$ CdCl ₂	l	26.06	27.09	28.16	29.46	30.55	31.66
	l-l ₀	-6.70	-5.67	-4.60	-3.30	-2.21	-1.10
NH ₄ CNS	l	61.46	57.01	52.26	47.26	42.74	37.78
	l-l ₀	28.70	24.25	19.50	14.50	9.98	5.02
KCNS	l	61.26	55.87	51.86	47.02	42.38	37.57
	l-l ₀	28.50	23.11	19.10	14.26	9.62	4.81
NaCNS	l	48.34	45.86	43.37	40.78	38.24	35.44
	l-l ₀	15.58	13.10	10.61	8.02	5.48	2.68
NH ₄ NO ₃	l	39.14	38.01	37.27	36.28	35.07	33.96
	l-l ₀	6.38	5.25	4.51	3.52	2.31	1.20
KNO ₃	l	38.52	37.57	36.66	35.77	34.79	33.80
	l-l ₀	5.76	4.81	3.90	3.01	2.03	1.04
$\frac{1}{2}$ (NH ₄) ₂ SO ₄	l	35.96	35.47	34.95	34.34	33.82	33.35
	l-l ₀	3.20	2.71	2.19	1.58	1.06	0.59
$\frac{1}{2}$ K ₂ SO ₄	l					33.61	33.20
	l-l ₀					0.85	0.48
$\frac{1}{2}$ Na ₂ SO ₄	l	28.44	28.66	29.51	30.45	31.14	31.96
	l-l ₀	-4.32	-4.10	-3.25	-2.31	-1.62	-0.80
$\frac{1}{2}$ CdSO ₄	l	23.76	25.14	26.58	28.24	29.71	31.11
	l-l ₀	-9.00	-7.62	-6.18	-4.52	-3.05	-1.85

(Fox, Z. phys. Ch. 1902, 41, 462.)

Sol. in Cl₂ + Aq. Sol. in Br. Solidification curves determined (Van der Goot, Z. phys. Ch. 1913, 84, 419.)

Solubility of SO in alcohol 1 vol alcohol at
t° and 760 mm dissolves V vols SO₂ gas
at 0° and 760 mm

t°	V	t°	V	t°	V
0	328 62	9	201 33	17	130 61
1	311 98	10	190 31	18	124 58
2	295 97	11	179 91	19	119 17
3	280 58	12	170 13	20	114 48
4	265 81	13	160 98	21	110 22
5	251 67	14	152 45	22	106 68
6	238 16	15	144 55	23	103 77
7	225 26	16	137 27	24	101 47
8	212 98				

(Bunsen's Gasometry)

100 pts absolute methyl alcohol dissolve
247 pts SO₂ at 0° and 760 mm, 47 pts at 26°
and 760 mm, 100 pts absolute ethyl alcohol
dissolve 115 pts SO₂ at 0° and 760 mm, 32 3
pts at 26° and 760 mm (de Bruyn, Z phys
Ch 10 783)

Sol in ether

Absorbed by oil of turpentine

Rapidly absorbed by anhydrous aldehyde in
the cold, 11 pts aldehyde absorbing 19 pts
SO₂

Absorption coefficient of aldehyde for SO₂
is 1 4 times greater than that of alcohol, and
7 times greater than that of H₂O (Geuther
and Cartmell, Proc Roy Soc 10 111)

1 pt camphor dissolves 0 880 pt by weight
(=308 vols) SO₂ at 0° and 725 mm, 1 pt
glacial HC₂H₃O₂ dissolves 0 961 pt by weight
(=318 vols) SO at 0° and 725 mm, 1 pt
formic acid dissolves 0 821 pt by weight
(=351 vols) SO₂ at 0° and 725 mm, 1 pt
acetone dissolves 2 07 pts by weight (=589
vols) SO at 0° and 725 mm, 1 pt sulphuryl
chloride dissolves 0 323 pt by weight (=187
vols) SO₂ at 0° and 725 mm (Schulze,
J pr (2) 24 168)

Solubility of SO₂ in CHCl₃

C = g SO in 1 cc of the solution

P = Pressure in mm Hg

t	C	P	$\frac{C}{P} \times 10^4$
0	0 000701	2 7	2 6
	0 001790	5 6	3 14
	0 006982	22 0	3 17
	0 03097	90 2	3 43
	0 08217	219 6	3 74
20	0 000669	5 7	1 17
	0 001712	12 9	1 37
	0 006723	48 0	1 40
	0 02904	208 2	1 47
	0 07839	488 8	1 60

(Lindner, M 1912, 33 645)

Distribution of SO₂ between H₂O and C Cl₄
at 20°

c₁ = g SO₂ per l of H₂O solution
c₂ = g SO₂ per l of CHCl₃ solution

C ₁	C ₂	C ₁ /C ₂
1 738	1 123	1 55
1 753	1 122	1 56
2 326	1 704	1 37
2 346	1 703	1 38
2 628	1 897	1 38
3 039	2 395	1 27
3 058	2 385	1 28
3 686	3 063	1 20
3 735	3 062	1 22
4 226	3 626	1 17
5 269	4 798	1 10
5 372	4 813	1 12
6 588	6 183	1 07
31 92	33 84	0 94
33 26	37 25	0 89

(McCrae, Z anorg 1903, 35 12)

Distribution of SO₂ between HCl+Ac and
CHCl₃ at 20°

c₁ = g SO₂ per l of HCl+Aq solution

c₂ = g SO₂ per l of CHCl₃ solution

HCl = normality of HCl+Aq used

HCl	C ₁	C	C ₁ 2
0 05-N	1 86	1 46	1 8
	3 076	2 830	1 8
	4 277	4 07	1 4
	5 340	5 42	0 6
	1 25	1 41	0 8
0 1 -N	1 324	1 416	0 3
	2 78	3 08	0 0
	3 86	4 08	0 4
	5 161	5 715	0 0
	1 268	1 509	0 4
0 2 -N	1 914	2 274	0 4
	2 464	3 040	0 1
	3 967	4 898	0 1
	1 202	1 614	0 9
	1 894	2 263	0 3

(McCrae, Z anorg 1903, 35 14)

Sulphur dioxide ammonia, SO₂, NH₃

Very hygroscopic Easily sol in H₂O with
decomp (Schumann, Z anorg 1900 23
49)

SO₂, 2NH₃ Somewhat hygroscopic

Sol in H₂O with evolution of NH₃ (hu
mann, Z anorg 1900, 23 50)

5SO₂, 4NH₃ Very deliquescent

Very sol in H₂O (Divers and O wa,
Chem Soc 1901, 79 1103)

Sulphur trioxide, SO₃

Fumes on air Miscible with H₂O, with
evolution of much heat Sol in H₂SO₄ De-
comp by alcohol and ether

Exists in two modifications, one of which is liquid and miscible with H_2SO_4 , while the solid form is only slowly sol therein

Miscible with CS_2 at 30° , but at 15° CS_2 dissolves only $1\frac{1}{8}$ pt SO_3 , and SO_3 , $1\frac{1}{8}$ pt CS_2 (Schultz-Sellack, Pogg 139 480)

There is only one modification, the liquid, which absorbs H_2O and becomes solid (Rebs, A 246 356)

Miscible with liquid SO_2 (Schultz-Sellack)

See also Sulphuric acid

Sulphur heptoxide, S_2O_7

Fumes on air Slowly decomp at 0° , instantaneously on warming Sol in conc H_2SO_4 (Berthelot, J pr (2) 17 48)

Forms compound $S_2O_7 \cdot 2H_2O$

Formula is SO_4 , according to Traube (B 24. 1764), and S_2O_7 is $SO_3 + SO_4$

See also Marshall (Chem Soc 59 771)

Traube (B 26 148) denies the existence of SO_4

Sulphur oxybromide, $SOBr_2$

See Thionyl bromide

Sulphur oxychloride, $SOCl_2$

See Thionyl chloride

$SOCl_2$ See Sulphuryl chloride

SO_2Cl_2 See Pyrosulphuryl chloride

HSO_3Cl See Sulphuryl hydroxyl chloride

S_2OCl_4 Decomp by H_2O and alcohol (Ogier, C R 94 446)

Mixture of about $17SOCl_2 + 2SOCl$ and $5SO_2Cl_2$ (Knoll, B 1898, 31 2183)

Sulphur oxytetrachloride, $S_2O_4Cl_4$

Violently decomp by H_2O , dil acids, or alcohol (Millon, A ch (3) 29 327)

Sol in warm S_2Cl_2 (Carius, A 106 295)

Decomp violently with CS_2

Sulphur oxyfluoride, SO_2F_2

See Sulphuryl fluoride

SOF_2 See Thionyl fluoride

Sulphur diphosphide, P_2S

See Phosphorus monosulphide

Sulphur tetrachloride, P_4S

See Phosphorus semisulphide

Sulphuretted hydrogen, H_2S

See Hydrogen sulphide

Sulphuric acid, H_2SO_4

Miscible with H_2O in all proportions

Sp gr of $H_2SO_4 + Aq$

Baume degrees	Sp gr	% H_2SO_4	Baume degrees	Sp gr	% H_2SO_4
66	1.842	100	66	1.844	100
60	1.720	84.22	60	1.717	82.34
50	1.618	74.32	50	1.618	74.32
40	1.524	66.40	40	1.603	72.70
30	1.466	58.02	30	1.586	71.17
20	1.370	50.41	20	1.566	69.80
10	1.310	43.21	10	1.550	68.03
5	1.260	38.02	5	1.532	66.45
	1.210	30.12		1.515	64.37
	1.162	24.01		1.500	62.80
	1.114	17.39		1.482	61.32
	1.076	11.73		1.466	59.80
	1.023	6.60		1.454	58.02

(Vauquelin A ch 76 260)

(Darcet A ch (2) 1 198)

Sp gr of $H_2SO_4 + Aq$

% H_2SO_4	Sp gr at 15°	Sp gr at 20°	% H_2SO_4	Sp gr at 15°	Sp gr at 25°
0	0.9986	0.9950	50	1.3808	1.3780
2	1.0110	1.0110	50	1.4347	
5	1.0284	1.0272	60	1.4860	1.4767
10	1.0609	1.0604	60	1.5402	
15	1.0998		70	1.5946	1.5863
20	1.1378	1.3311	70	1.6534	
25	1.1767		80	1.7092	1.6996
30	1.2154	1.2078	80	1.7602	
35	1.2582		90	1.8050	1.7940
40	1.2976	1.2888	90	1.8318	
45	1.3409		100	1.8406	1.8286

(Dele enne 1823)

Sp gr at 15° and b pt of $H_2SO_4 + Aq$

Sp gr	% SO_3	B pt	Sp gr	% SO_3	B pt
1.860	81	326	1.769	67	217°
1.849	80	318	1.757	66	210
1.848	79	310	1.744	65	205
1.847	78	301	1.730	64	200
1.845	77	293	1.715	63	195
1.842	76	285	1.699	62	190
1.838	75	277	1.684	61	186
1.833	74	268	1.670	60	182
1.827	73	260	1.650	58.6	177
1.819	72	253	1.620	50	143
1.810	71	245	1.408	40	127
1.801	70	238	1.300	30	115
1.791	69	230	1.200	20	107
1.780	68	224	1.100	10	103

(Dalt n \ Syst 2 210)

Sp gr of $H_2SO_4 + Aq$ at 15°

Sp gr	% SO_3	% H_2SO_4	Sp gr	% SO_3	% H_2SO_4
1.8485	81.54	100	1.5975	57.08	70
1.8460	79.90	98	1.5760	55.45	68
1.8410	78.28	96	1.5503	53.82	66
1.8336	76.60	94	1.5250	52.18	64
1.8233	75.02	92	1.5006	50.55	62
1.8115	73.39	90	1.4860	48.92	60
1.7962	71.75	88	1.4660	47.29	58
1.7774	70.12	86	1.4460	45.66	56
1.7570	68.49	84	1.4265	44.03	54
1.7360	66.86	82	1.4073	42.40	52
1.7120	65.23	80	1.3884	40.77	50
1.6870	63.60	78	1.3697	39.14	48
1.6630	61.97	76	1.3530	37.51	46
1.6415	60.34	74	1.3345	35.88	44
1.6204	58.71	72	1.3165	34.25	42

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ at 15° —Continued

Sp gr	% SO_4	% H_2SO_4	Sp gr	% SO_3	% H_2SO_4
1 2999	32 61	40	1 1410	16 31	20
1 2323	30 98	38	1 1246	14 68	18
1 2334	29 35	36	1 1090	13 05	16
1 2199	27 72	34	1 0933	11 41	14
1 2134	25 09	32	1 0839	9 78	12
1 2181	24 46	30	1 0822	8 15	10
1 2032	22 83	28	1 0644	6 52	8
1 1876	21 20	26	1 0405	4 89	6
1 1706	19 57	24	1 0238	3 25	4
1 1549	17 94	22	1 0140	1 63	2

(Lre Schw J 35 444)

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$

Degrees Baume	Sp gr	At 0°		At 15°	
		% SO_3	% H_2SO_4	% SO_3	% H_2SO_4
5	1 036	5 1	4 2	5 4	4 5
10	1 075	10 3	8 4	10 9	8 9
15	1 116	15 5	12 7	16 3	13 3
20	1 161	21 2	17 3	22 4	18 3
25	1 209	27 2	22 2	28 3	23 1
30	1 252	33 6	27 4	34 8	28 4
33	1 296	37 6	30 7	38 9	31 8
35	1 320	40 4	33 0	41 6	34 0
37	1 332	41 7	34 1	43 0	35 1
38	1 345	43 1	35 2	44 3	36 2
39	1 357	44 5	36 3	45 5	37 2
40	1 370	45 9	37 5	46 9	38 3
41	1 383	47 3	38 6	48 4	39 5
42	1 397	48 7	39 7	49 9	40 7
43	1 410	50 0	40 8	51 2	41 8
44	1 424	51 4	41 9	52 7	42 9
45	1 438	52 8	43 1	54 1	44 1
46	1 453	54 3	44 3	55 4	45 2
47	1 468	55 7	45 5	56 9	46 4
48	1 483	57 1	46 6	58 2	47 5
49	1 498	58 5	47 8	59 6	48 7
50	1 514	60 0	49 0	61 1	50 0
51	1 530	61 4	50 1	62 6	51 1
52	1 546	62 9	51 3	63 9	52 2
53	1 563	64 4	52 6	65 4	53 4
54	1 580	65 9	53 8	66 9	54 6
55	1 597	67 4	55 0	68 4	55 8
56	1 615	68 9	56 2	70 0	57 1
57	1 634	70 5	57 5	71 6	58 4
58	1 652	72 1	58 9	73 2	59 7
59	1 671	73 6	60 1	74 7	61 0
60	1 691	75 2	61 4	76 3	62 3
61	1 711	76 9	62 8	78 0	63 6
62	1 732	78 6	64 2	79 8	65 1
63	1 754	80 4	65 7	81 7	66 7
64	1 776	82 2	67 2	83 9	68 5
65	1 799	84 0	68 7	86 0	70 4
66	1 819	85 8	70 3	88 5	73 0
67	1 839	87 6	72 2	91 8	74 9
68	1 857	89 4	73 8	94 5	77 7
69	1 876	91 3	75 5	97 5	81 6
70	1 895	93 2	77 5	100 0	
71	1 914	95 0	79 5		
72	1 933	96 9	81 6		
73	1 952	98 8	83 6		
74	1 971	100 0	85 6		

(Bineau A ch (3) 26 121)

The sp gr found at t can be reduced to sp gr at
0 by multiplying by $\frac{144.38}{144.38 + t}$ or by using the follow-
ing table (Bineau)

Correction of sp gr for temperature to be added or subtracted
lowering of the temp of 10 or corresponding increase

Sp gr of acid at 0	Corr	Sp gr of acid at 0°	Corr	Sp gr of acid at 0	Corr
1 04	0 002	1 15	0 005	1 45	0 38
1 07	0 003	1 20	0 006	1 70	0 39
1 10	0 004	1 30	0 007	1 85	0 396

(Bineau)

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ at 15° a = %, b = %
gr if % is SO_3 , c = sp gr if % is F

a	b	c	a	b	c
1	1 009	1 0064	51	1 530	1 08
2	1 017	1 013	52	1 545	1 18
3	1 025	1 019	53	1 556	1 28
4	1 034	1 0256	54	1 573	1 38
5	1 041	1 032	55	1 585	1 48
6	1 049	1 039	56	1 600	1 586
7	1 058	1 0464	57	1 615	1 69
8	1 067	1 0536	58	1 627	1 80
9	1 076	1 061	59	1 642	1 90
10	1 085	1 068	60	1 656	1 10
11	1 095	1 0756	61	1 675	1 12
12	1 104	1 083	62	1 689	1 23
13	1 114	1 091	63	1 701	1 34
14	1 123	1 098	64	1 716	1 45
15	1 133	1 106	65	1 730	1 57
16	1 142	1 1136	66	1 742	1 78
17	1 150	1 121	67	1 755	1 80
18	1 160	1 129	68	1 770	1 92
19	1 170	1 136	69	1 781	1 04
20	1 180	1 144	70	1 792	1 15
21	1 190	1 1516	71	1 802	1 27
22	1 200	1 159	72	1 810	1 39
23	1 210	1 167	73	1 819	1 51
24	1 220	1 174	74	1 825	1 63
25	1 229	1 182	75	1 830	1 75
26	1 239	1 190	76	1 834	1 86
27	1 248	1 198	77	1 837	1 98
28	1 258	1 2066	78	1 839	1 710
29	1 268	1 215	79	1 841	1 722
30	1 278	1 223	80	1 842	1 734
31	1 288	1 231	81		1 745
32	1 300	1 239	82		756
33	1 310	1 2476	83		767
34	1 320	1 256	84		777
35	1 332	1 264	85		786
36	1 344	1 272	86		794
37	1 354	1 281	87		802
38	1 367	1 289	88		809
39	1 378	1 2976	89		816
40	1 390	1 306	90		822
41	1 401	1 315	91		827
42	1 415	1 324	92		831
43	1 427	1 333	93		834
44	1 440	1 342	94		8356
45	1 451	1 351	95		8376
46	1 465	1 361	96		8384
47	1 478	1 370	97		840
48	1 490	1 379	98		8406
49	1 501	1 3886	99		842
50	1 517	1 398	100		8426

(Bineau, calculated by Gerlach, Z anal 292)

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ at 15° , H_2O at $0^\circ = 1$

% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr
1	1 006	35	1 264	68	1 592
2	1 012	36	1 272	69	1 604
3	1 018	37	1 281	70	1 615
4	1 025	38	1 290	71	1 626
5	1 032	39	1 298	72	1 638
6	1 039	40	1 307	73	1 650
7	1 046	41	1 316	74	1 662
8	1 053	42	1 324	75	1 674
9	1 061	43	1 333	76	1 684
10	1 069	44	1 342	77	1 697
11	1 076	45	1 352	78	1 710
12	1 084	46	1 361	79	1 721
13	1 091	47	1 370	80	1 732
14	1 099	48	1 379	81	1 743
15	1 106	49	1 389	82	1 753
16	1 114	50	1 399	83	1 763
17	1 122	51	1 409	84	1 773
18	1 129	52	1 418	85	1 783
19	1 137	53	1 428	86	1 792
20	1 145	54	1 438	87	1 800
21	1 153	55	1 448	88	1 807
22	1 161	56	1 459	89	1 814
23	1 168	57	1 469	90	1 820
24	1 176	58	1 480	91	1 825
25	1 184	59	1 491	92	1 8294
26	1 191	60	1 501	93	1 8339
27	1 199	61	1 512	94	1 8372
28	1 207	62	1 523	95	1 8390
29	1 215	63	1 535	96	1 8406
30	1 223	64	1 546	97	1 8410
31	1 231	65	1 558	98	1 8412
32	1 239	66	1 569	99	1 8403
33	1 247	67	1 580	100	1 8384
34	1 256				

(From 1-91 % according to Kolb, calculated by Gerlach, from 92-100% according to Lunge and Naef, calculated by Gerlach, Z anal 27 316)

Sp gr of H_2SO_4 at 15° compared with H_2O at 4° and 0 mm pressure

Sp gr	% SO_3	% H_2SO_4	Sp gr	% SO_3	% H_2SO_4
1 000	0 07	0 09	1 075	8 90	10 90
1 005	0 08	0 10	1 080	9 47	11 60
1 010	1 28	1 57	1 085	10 04	12 30
1 015	1 88	2 30	1 090	10 60	12 99
1 020	2 47	3 03	1 095	11 16	13 67
1 025	3 07	3 76	1 100	11 71	14 35
1 030	3 67	4 49	1 105	12 27	15 07
1 035	4 27	5 23	1 110	12 82	15 71
1 040	4 87	5 96	1 115	13 36	16 36
1 045	5 45	6 67	1 120	13 89	17 01
1 050	6 02	7 37	1 125	14 42	17 66
1 055	6 59	8 07	1 130	14 95	18 31
1 060	7 16	8 77	1 135	15 48	18 96
1 065	7 73	9 47	1 140	16 01	19 61
1 070	8 32	10 19	1 145	16 54	20 26

Sp gr of H_2SO_4 etc—Continued

Sp gr	% SO ₃	% H ₂ SO ₄	Sp gr	% SO ₃	% H ₂ SO ₄
1 150	17 07	20 91	1 455	45 31	55 50
1 155	17 59	21 55	1 460	45 69	55 97
1 160	18 11	22 19	1 465	46 07	56 43
1 165	18 64	22 83	1 470	46 45	56 90
1 170	19 06	23 47	1 475	46 83	57 37
1 175	19 69	24 12	1 480	47 21	57 83
1 180	20 21	24 76	1 485	47 57	58 28
1 185	20 73	25 40	1 490	47 95	58 74
1 190	21 26	26 04	1 495	48 34	59 22
1 195	21 78	26 68	1 500	48 73	59 70
1 200	22 30	27 32	1 505	49 12	60 18
1 205	22 82	27 95	1 510	49 51	60 65
1 210	23 33	28 58	1 515	49 89	61 12
1 215	23 84	29 21	1 520	50 28	61 59
1 220	24 36	29 84	1 525	50 66	62 06
1 225	24 88	30 48	1 530	51 04	62 53
1 230	25 39	31 11	1 535	51 43	63 00
1 235	25 88	31 70	1 540	51 78	63 43
1 240	26 35	32 28	1 545	52 12	63 85
1 245	26 83	32 86	1 550	52 46	64 26
1 250	27 29	33 40	1 555	52 79	64 67
1 255	27 76	34 00	1 560	53 12	65 08
1 260	28 22	34 57	1 565	53 46	65 49
1 265	28 69	35 14	1 570	53 80	65 90
1 270	29 15	35 71	1 575	54 13	66 30
1 275	29 62	36 29	1 580	54 46	66 71
1 280	30 10	36 87	1 585	54 80	67 13
1 285	30 57	31 45	1 590	55 18	67 59
1 290	31 04	38 03	1 595	55 55	68 05
1 295	31 52	38 61	1 600	55 93	68 51
1 300	31 99	39 19	1 605	56 30	68 97
1 305	32 46	39 77	1 610	56 68	69 43
1 310	32 94	40 35	1 615	57 05	69 89
1 315	33 41	40 93	1 620	57 40	70 32
1 320	33 88	41 50	1 625	57 75	70 74
1 325	34 35	42 08	1 630	58 09	71 16
1 330	34 80	42 66	1 635	58 43	71 57
1 335	35 27	43 20	1 640	58 74	71 99
1 340	35 71	43 74	1 645	59 10	72 40
1 345	36 14	44 28	1 650	59 45	72 88
1 350	36 58	44 82	1 655	59 78	73 23
1 355	37 02	45 35	1 660	60 11	73 64
1 360	37 45	45 88	1 665	60 46	74 07
1 365	37 89	46 41	1 670	60 82	74 51
1 370	38 32	46 94	1 675	61 20	74 97
1 375	38 75	47 47	1 680	61 57	75 42
1 380	39 18	48 00	1 685	61 93	75 86
1 385	39 62	48 53	1 690	62 29	76 30
1 390	40 05	49 06	1 695	62 64	76 73
1 395	40 48	49 59	1 700	63 00	77 17
1 400	40 91	50 11	1 705	63 35	77 60
1 405	41 33	50 63	1 710	63 70	78 04
1 410	41 76	51 15	1 715	64 07	78 48
1 415	42 17	51 66	1 720	64 43	78 92
1 420	42 57	52 15	1 725	64 78	79 36
1 425	42 96	52 63	1 7 0	65 14	79 80
1 430	43 36	53 11	1 735	65 50	80 24
1 435	43 75	53 59	1 740	65 86	80 68
1 440	44 14	54 07	1 745	66 22	81 12
1 445	44 53	54 55	1 750	66 58	81 56
1 450	44 92	55 03	1 755	66 94	82 00

Sp gr of $H_2SO_4 + Aq$ at 15° —Continued

Sp gr	% H_2SO_4	% H_2O	Sp gr	% H_2SO_4	% H_2O
1.2999	32.61	40	1.1410	16.31	20
1.2922	33.98	38	1.1246	14.88	18
1.2854	29.35	36	1.1090	13.05	16
1.2499	27.72	34	1.0933	11.41	14
1.2334	23.09	32	1.0839	9.78	12
1.2184	24.46	30	1.0822	8.15	10
1.2032	22.83	28	1.0544	6.52	8
1.1876	21.20	26	1.0405	4.89	6
1.1706	19.57	24	1.0298	3.23	4
1.1549	17.94	22	1.0140	1.63	2

(Lre Schw J 35 444)

Sp gr of $H_2SO_4 + Aq$

Degrees Baumé	Sp gr	At 0°		At 15°	
		% H_2SO_4	% H_2O	% H_2SO_4	% H_2O
5	1.036	5.1	4.2	5.4	4.5
10	1.070	10.3	8.4	10.9	8.9
15	1.116	15.5	12.7	16.3	13.3
20	1.161	21.2	17.3	22.4	18.3
25	1.209	27.2	22.2	28.3	23.1
30	1.252	33.6	27.4	34.8	28.4
33	1.290	37.6	30.7	38.9	31.8
35	1.320	41.4	33.0	41.6	34.0
36	1.332	41.7	34.1	43.0	35.1
37	1.345	43.1	35.2	44.3	36.2
38	1.357	44.5	35.3	45.5	37.2
39	1.370	45.9	37.5	46.9	38.3
40	1.383	47.3	38.6	48.4	39.5
41	1.397	48.7	39.7	49.9	40.7
42	1.410	50.0	40.8	51.2	41.8
43	1.424	51.4	41.9	52.7	42.9
44	1.438	52.8	43.1	54.0	44.1
45	1.453	54.3	44.3	55.4	45.2
46	1.468	55.7	45.5	56.9	46.4
47	1.483	57.1	46.6	58.2	47.7
48	1.498	58.5	47.8	59.6	48.7
49	1.514	60.0	49.0	61.1	50.0
50	1.530	61.4	50.1	62.6	51.1
51	1.545	62.9	51.3	63.9	52.2
52	1.563	64.4	52.6	65.4	53.4
53	1.581	65.9	53.8	66.9	54.6
54	1.597	67.4	55.0	68.4	55.8
55	1.615	68.9	56.2	70.0	57.1
56	1.634	70.0	57.5	71.6	58.4
57	1.652	72.1	58.8	73.2	59.7
58	1.671	73.6	60.1	74.7	61.0
59	1.691	75.2	61.4	76.3	62.3
60	1.711	76.7	62.8	78.0	63.6
61	1.732	78.3	64.2	79.8	65.1
62	1.753	80.4	65.7	81.7	66.7
63	1.774	82.4	67.2	83.9	68.5
64	1.796	84.6	69.0	85.3	70.4
65	1.817	86.4	71.3	89.5	73.0
66	1.830	88.1	72.2	91.8	74.9
67	1.847	90.4	73.8	94.5	77.7
68	1.862	91.3	74.5	100.0	81.6
69	1.877	92.5	75.5		
70	1.897	100.0	81.6		

(Bin au A ch (3) 26 121)

The p gr found at t° can be reduced to sp gr at 0° by multiplying by $\frac{144.38}{144.38 + t}$ or by using the following table (Bineau)

Correction of sp gr for temperature to be added lowering of the temp of 10° or subtracted corresponding increase

Sp gr of acid at 0°	Corr	Sp gr of acid at 0°	Corr	Sp gr of acid at 0°	Corr
1.04	0.002	1.15	0.005	1.40	0.005
1.07	0.003	1.20	0.006	1.70	0.005
1.10	0.004	1.30	0.007	1.85	0.005

Sp gr of $H_2SO_4 + Aq$ at 15° a = %, b = %, c = sp gr if % is SO_3 , c = sp gr if % is H_2O

a	b	c	a	b	c
1	1.009	1.0064	51	1.530	1.43
2	1.017	1.013	52	1.545	1.43
3	1.025	1.019	53	1.556	1.43
4	1.034	1.0256	54	1.573	1.43
5	1.041	1.032	55	1.585	1.43
6	1.049	1.039	56	1.600	1.436
7	1.058	1.0464	57	1.615	1.439
8	1.067	1.0536	58	1.627	1.440
9	1.076	1.061	59	1.642	1.440
10	1.085	1.068	60	1.656	1.440
11	1.095	1.0756	61	1.675	1.442
12	1.104	1.083	62	1.689	1.443
13	1.114	1.091	63	1.701	1.444
14	1.123	1.098	64	1.716	1.445
15	1.133	1.106	65	1.730	1.447
16	1.142	1.1136	66	1.742	1.448
17	1.150	1.121	67	1.755	1.449
18	1.160	1.129	68	1.770	1.452
19	1.170	1.136	69	1.781	1.454
20	1.180	1.144	70	1.792	1.455
21	1.190	1.1516	71	1.802	1.457
22	1.200	1.159	72	1.810	1.459
23	1.210	1.167	73	1.819	1.461
24	1.220	1.174	74	1.825	1.463
25	1.229	1.182	75	1.830	1.465
26	1.239	1.190	76	1.834	1.466
27	1.248	1.198	77	1.837	1.468
28	1.258	1.2066	78	1.839	1.469
29	1.268	1.215	79	1.841	1.470
30	1.278	1.223	80	1.842	1.471
31	1.288	1.231	81		1.472
32	1.300	1.239	82		1.473
33	1.310	1.2476	83		1.474
34	1.320	1.256	84		1.475
35	1.332	1.264	85		1.476
36	1.344	1.272	86		1.477
37	1.354	1.281	87		1.478
38	1.367	1.289	88		1.479
39	1.378	1.2976	89		1.480
40	1.390	1.306	90		1.481
41	1.401	1.315	91		1.482
42	1.415	1.324	92		1.483
43	1.427	1.333	93		1.484
44	1.440	1.342	94		1.485
45	1.451	1.351	95		1.486
46	1.465	1.361	96		1.487
47	1.478	1.370	97		1.488
48	1.490	1.379	98		1.489
49	1.501	1.3886	99		1.490
50	1.517	1.398	100		1.491

(Bineau, calculated by Gerlach, Z anal 8 12)

Sp gr of $H_2SO_4 + Aq$ at 15° , H_2O at $0^\circ = 1$

H_2SO_4	Sp gr	H_2SO_4	Sp gr	H_2SO_4	Sp gr
1	1.006	35	1.264	68	1.592
2	1.012	36	1.272	69	1.604
3	1.018	37	1.281	70	1.615
4	1.025	38	1.290	71	1.626
5	1.032	39	1.298	72	1.638
6	1.039	40	1.307	73	1.650
7	1.046	41	1.316	74	1.662
8	1.053	42	1.324	75	1.674
9	1.061	43	1.333	76	1.684
10	1.069	44	1.342	77	1.697
11	1.076	45	1.352	78	1.710
12	1.084	46	1.361	79	1.721
13	1.091	47	1.370	80	1.732
14	1.099	48	1.379	81	1.743
15	1.106	49	1.389	82	1.753
16	1.114	50	1.399	83	1.763
17	1.122	51	1.409	84	1.773
18	1.129	52	1.418	85	1.783
19	1.137	53	1.428	86	1.792
20	1.145	54	1.438	87	1.800
21	1.153	55	1.448	88	1.807
22	1.161	56	1.459	89	1.814
23	1.168	57	1.469	90	1.820
24	1.176	58	1.480	91	1.825
25	1.184	59	1.491	92	1.8294
26	1.191	60	1.501	93	1.8339
27	1.199	61	1.512	94	1.8372
28	1.207	62	1.523	95	1.8390
29	1.215	63	1.535	96	1.8406
30	1.223	64	1.546	97	1.8410
31	1.231	65	1.558	98	1.8412
32	1.239	66	1.569	99	1.8403
33	1.247	67	1.580	100	1.8384
34	1.256				

(From 1-91 % according to Kolb, calculated by Gerlach, from 92-100% according to Lunge and Naef, calculated by Gerlach, Z anal 27 316)

Sp gr of H_2SO_4 at 15° compared with H_2O at 4° and 0 mm pressure

Sp gr	% H_2SO_4	% H_2O	Sp gr	% H_2SO_4	% H_2O
1.000	0.07	0.09	1.075	8.90	10.90
1.005	0.68	0.83	1.080	9.47	11.60
1.010	1.28	1.57	1.085	10.04	12.30
1.015	1.88	2.30	1.090	10.60	12.99
1.020	2.47	3.03	1.095	11.16	13.67
1.025	3.07	3.76	1.100	11.71	14.35
1.030	3.67	4.49	1.105	12.27	15.07
1.035	4.27	5.23	1.110	12.82	15.71
1.040	4.87	5.96	1.115	13.36	16.36
1.045	5.45	6.67	1.120	13.89	17.01
1.050	6.02	7.37	1.125	14.42	17.66
1.055	6.59	8.07	1.130	14.95	18.31
1.060	7.16	8.77	1.135	15.48	18.96
1.065	7.73	9.47	1.140	16.01	19.61
1.070	8.32	10.19	1.145	16.54	20.26

Sp gr of H_2SO_4 , etc—Continued

Sp gr	% H_2SO_4	% H_2O	Sp gr	% H_2SO_4	% H_2O
1.150	17.07	20.91	1.455	45.31	55.50
1.155	17.59	21.55	1.460	45.69	55.97
1.160	18.11	22.19	1.465	46.07	56.43
1.165	18.64	22.83	1.470	46.45	56.90
1.170	19.06	23.47	1.475	46.83	57.37
1.175	19.69	24.12	1.480	47.21	57.83
1.180	20.21	24.76	1.485	47.57	58.28
1.185	20.73	25.40	1.490	47.95	58.74
1.190	21.26	26.04	1.495	48.34	59.22
1.195	21.78	26.68	1.500	48.73	59.70
1.200	22.30	27.32	1.505	49.12	60.18
1.205	22.82	27.95	1.510	49.51	60.65
1.210	23.33	28.58	1.515	49.89	61.12
1.215	23.84	29.21	1.520	50.28	61.59
1.220	24.36	29.84	1.525	50.66	62.06
1.225	24.88	30.48	1.530	51.04	62.53
1.230	25.39	31.11	1.535	51.43	63.00
1.235	25.88	31.70	1.540	51.78	63.43
1.240	26.35	32.28	1.545	52.12	63.85
1.245	26.83	32.86	1.550	52.46	64.26
1.250	27.29	33.40	1.555	52.79	64.67
1.255	27.76	34.00	1.560	53.12	65.08
1.260	28.22	34.57	1.565	53.46	65.49
1.265	28.69	35.14	1.570	53.80	65.90
1.270	29.15	35.71	1.575	54.13	66.30
1.275	29.62	36.29	1.580	54.46	66.71

Sp gr of H ₂ SO ₄ , etc—Continued						Sp gr of conc H ₂ SO ₄ , etc—Continued				
Sp gr	% H ₂ O	% H ₂ SO ₄	Sp gr	% H ₂ O	% H ₂ SO ₄	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	
1 760	67 30	82 44	1 829	75 03	91 90	95 61	1 8414	93 32	1 83	
1 765	67 65	82 88	1 830	75 19	92 10	95 55	1 8413	93 29	1 83	
1 770	68 02	83 32	1 831	75 35	92 30	95 50	1 8412	93 26	1 83	
1 775	68 49	83 90	1 832	75 53	92 52	95 45	1 8411	93 23	1 83	
1 780	68 98	84 50	1 833	75 72	92 75	95 40	1 8410	93 20	1 83	
1 785	69 74	85 10	1 834	75 96	93 05	95 35	1 8409	93 17	1 83	
1 790	69 96	85 70	1 835	76 27	93 43	95 30	1 8408	93 14	1 83	
1 795	70 45	86 30	1 836	76 57	93 80	95 25	1 8407	93 12	1 83	
1 800	70 94	86 90	1 837	76 90	94 20	95 21	1 8406	93 09	1 83	
1 805	71 50	87 60	1 838	77 23	94 60	95 16	1 8405	93 06	1 83	
1 810	72 08	88 30	1 839	77 55	95 00	95 12	1 8404	93 00	1 83	
1 815	72 69	89 05	1 840	78 04	95 60	95 08	1 8403	92 98	1 83	
1 820	73 51	90 05	1 8405	78 33	95 95	95 04	1 8402	92 95	1 83	
1 821	73 63	90 20	1 8415	79 19	97 00	95 00	1 8401	92 93	1 83	
1 822	73 80	90 40	1 8410	79 76	97 70	94 96	1 8400	92 90	1 83	
1 823	73 96	90 60	1 8415	80 16	98 20	94 92	1 8399	92 87	1 83	
1 824	74 12	90 80	1 8400	80 57	98 70	94 88	1 8398	92 84	1 83	
1 825	74 29	91 00	1 8400	80 98	99 20	94 84	1 8397	92 82	1 83	
1 826	74 49	91 25	1 8395	81 18	99 45	94 81	1 8396	92 79	1 83	
1 827	74 69	91 50	1 8390	81 39	99 70	94 77	1 8395	92 77	1 83	
1 828	74 86	91 70	1 8385	81 59	99 95	94 73	1 8394	92 73	1 83	
(Lunge and Isler, Zeit angew Ch 9 129)						94 69	1 8393	92 71	1 83	
Sp gr of conc H ₂ SO ₄ at 15°						94 65	1 8392	92 69	1 83	
% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr			94 61	1 8391	92 66	1 83	
100	1 8384	99 02	1 8417			94 57	1 8390	92 63	1 83	
99 98	1 8385	98 98	1 8418			94 53	1 8389	92 61	1 83	
99 96	1 8386	98 94	1 8419			94 49	1 8388	92 59	1 83	
99 94	1 8387	98 84	1 8420			94 46	1 8387	92 56	1 83	
99 92	1 8388	98 84	1 8421			94 42	1 8386	92 54	1 83	
99 90	1 8389	98 78	1 8422			94 38	1 8385	92 52	1 83	
99 88	1 8390	98 71	1 8423			94 34	1 8384	92 49	1 83	
99 86	1 8391	98 63	1 8424			94 31	1 8383	92 46	1 83	
99 84	1 8392	98 56	1 8425			94 27	1 8382	92 44	1 83	
99 81	1 8393	98 48	1 8426			94 24	1 8381	92 41	1 83	
99 78	1 8394	98 40	1 8427			94 20	1 8380	92 39	1 83	
99 76	1 8395	98 32	1 8428			94 17	1 8379	92 37	1 83	
99 73	1 8396	98 22	1 8429			94 13	1 8378	92 34	1 83	
99 70	1 8397	98 06	1 8430			94 10	1 8377	92 32	1 83	
99 67	1 8398	97 85	1 8431			94 07	1 8376	92 29	1 83	
99 64	1 8399	97 50	1 8432			94 03	1 8375	92 27	1 83	
99 61	1 8400	97 10	1 8433			94 00	1 8374	92 24	1 83	
99 58	1 8401	96 93	1 8430			93 97	1 8373	92 22	1 83	
99 55	1 8402	96 76	1 8429			93 93	1 8372	92 19	1 83	
99 52	1 8403	96 60	1 8428			93 90	1 8371	92 17	1 83	
99 49	1 8404	96 55	1 8427			93 87	1 8370	92 15	1 83	
99 46	1 8405	96 46	1 8426			93 83	1 8369	92 12	1 83	
99 43	1 8406	96 39	1 8425			93 80	1 8368	92 10	1 83	
99 40	1 8407	96 31	1 8424			93 77	1 8367	92 07	1 83	
99 37	1 8408	96 24	1 8423			93 74	1 8366	92 05	1 83	
99 33	1 8409	96 16	1 8422			93 71	1 8365	92 02	1 83	
99 29	1 8410	96 09	1 8421			93 68	1 8364	92 00	1 83	
99 25	1 8411	96 02	1 8420			93 65	1 8363	91 98	1 83	
99 22	1 8412	95 95	1 8419			93 62	1 8362	91 95	1 82	
99 19	1 8413	95 88	1 8418			93 59	1 8361	91 93	1 82	
99 16	1 8414	95 81	1 8417			93 56	1 8360	91 91	1 82	
99 11	1 8415	95 74	1 8416			93 53	1 8359	91 88	1 82	
99 06	1 8416	95 67	1 8415			93 50	1 8358	91 86	1 82	
						93 47	1 8357	91 84	1 82	
						93 44	1 8356	91 81	1 82	
						93 41	1 8355	91 78	1 82	
						93 38	1 8354	91 76	1 82	
						93 35	1 8353	91 74	1 82	

Sp gr of conc H_2SO_4 , etc—*Continued*

% H_2SO_4	Sp gr	% H_2SO_4	Sp gr
91 72	1 8298	90 78	1 8244
91 70	1 8288	90 76	1 8243
91 68	1 8287	90 74	1 8242
91 65	1 8286	90 72	1 8241
91 63	1 8285	90 70	1 8240
91 61	1 8284	90 68	1 8239
91 59	1 8283	90 66	1 8238
91 56	1 8282	90 64	1 8237
91 54	1 8281	90 62	1 8236
91 52	1 8280	90 60	1 8235
91 50	1 8279	90 59	1 8234
91 47	1 8278	90 57	1 8233
91 45	1 8277	90 55	1 8232
91 43	1 8276	90 53	1 8231
91 41	1 8275	90 51	1 8230
91 39	1 8274	90 49	1 8229
91 37	1 8273	90 47	1 8228
91 35	1 8272	90 46	1 8227
91 32	1 8271	90 44	1 8226
91 30	1 8270	90 42	1 8225
91 28	1 8269	90 40	1 8224
91 26	1 8268	90 38	1 8223
91 24	1 8267	90 37	1 8222
91 22	1 8266	90 35	1 8221
91 20	1 8265	90 33	1 8220
91 18	1 8264	90 31	1 8219
91 16	1 8263	90 29	1 8218
91 14	1 8262	90 28	1 8217
91 12	1 8261	90 26	1 8216
91 10	1 8260	90 24	1 8215
91 08	1 8259	90 23	1 8214
91 06	1 8258	90 20	1 8213
91 04	1 8257	90 18	1 8212
91 02	1 8256	90 17	1 8211
91 00	1 8255	90 15	1 8210
90 98	1 8254	90 13	1 8209
90 96	1 8253	90 11	1 8208
90 94	1 8252	90 10	1 8207
90 92	1 8251	90 08	1 8206
90 90	1 8250	90 06	1 8205
90 88	1 8249	90 04	1 8204
90 86	1 8248	90 02	1 8203
90 84	1 8247	90 01	1 8202
90 82	1 8246	89 99	1 8201
90 80	1 8245	89 97	1 8200

(Richmond calculated from Pickering, Chem Soc 57 [64] Jour Soc Ch Ind 9 479)

Sp gr of conc H_2SO_4 +Aq at 15°

% H_2SO_4	Sp gr	% H_2SO_4	Sp gr
90	1 8185	96	1 8406
*90 20	1 8195	97	1 8410
91	1 8241	*97 70	1 8413
*91 48	1 8271	98	1 8412
92	1 8294	*98 39	1 8406
*92 83	1 8334	*98 66	1 8409
93	1 8339	99	1 8403
94	1 8372	*99 47	1 8395
*94 84	1 8387	100	1 8384
95	1 8390	*100 35	1 8411
*95 97	1 8406		

*Determined by experiment

(Lunge and Naef, Dingl 248 91)

Sp gr of H_2SO_4 +Aq at room temp containing

7 875 15 503 23 429% H_2SO_4
1 0651 1 1305 1 2003

(Wagner, W Ann 1883, 18 265)

Sp gr of H_2SO_4 +Aq at 25°

Concentration of H_2SO_4 +Aq	Sp gr
1—normal	1 0303
$\frac{1}{2}$ —“	1 0154
$\frac{1}{4}$ —“	1 0074
$\frac{1}{8}$ —“	1 0035

(Wagner, Z phys Ch 1890, 5 40)

Sp gr of dil H_2SO_4 +Aq

G equivalents H_2SO_4 per liter	t°	Sp gr t/t°
0 005049	17 345	1 000208?
0 01009	17 360	1 0004020
0 01512	17 382	1 0005879
0 02014	17 398	1 000769
0 03014	17 419	1 001125
0 002526	18 039	1 0001065
0 005050	18 040	1 0002084
0 01006	18 040	1 0004009
0 02005	18 040	1 0007668
0 03001	18 039	1 0011208
0 04980	18 040	1 0018096
0 09864	18 048	1 003460
0 146560	18 070	1 005045
0 19354	18 090	1 006580
0 28942	18 092	1 009686
0 47466	18 055	1 015616
0 4980	17 73	1 01634
4 980	17 95	1 15234
0 005176	12 997	1 0002106
0 01035	13 020	1 000411
0 01551	13 005	1 000603
0 12648	13 031	1 00443°
0 25151	13 011	1 008565
0 37672	13 007	1 012639
0 50503	12 998	1 016758

(Kohlrausch, W Ann 1894, 53 28)

Sp gr of $H_2SO_4 + Aq$			
% H_2SO_4	79 68	60 98	35 77
Sp gr 20°/20°	1 7383	1 5181	1 2719
% H_2SO_4	10 10	4 78	
Sp gr 20°/20°	1 0685	1 0317	
(Le Blanc and Rohland, Z phys Ch 1896, 19 268)			

Sp gr of $N-H_2SO_4 + Aq$ at 18°/4° = 1 0306
(Loomis, W Ann 1896, 60 550)

Sp gr of $H_2SO_4 + Aq$ at 19 4°, when p =
percent strength of solution, d = observed
density, w = volume conc in grams per

$$cc \left(\frac{pd}{100} = w \right)$$

p	d	w
94 10	1 8380	1 7295
84 59	1 7998	1 5223
73 08	1 6743	1 2235
61 35	1 5341	0 9412
40 72	1 3220	0 5383
31 94	1 2430	0 3970
23 77	1 1747	0 2792
14 72	1 1023	0 1623
9 802	1 0670	0 1046
4 826	1 0320	0 0498

(Barnes, J Phys Chem 1898, 2 546)

Sp gr of $H_2SO_4 + Aq$ at 20°

Normality of $H_2SO_4 + Aq$	% H_2SO_4	Sp gr
11 53	70 07	1 6129
9 01	59 26	1 4901
6 95	49 10	1 3872
4 77	36 68	1 2756
3 008	25 00	1 1791
1 002	9 25	1 0612

(Forchheimer, Z phys Ch 1900, 34 27)

Sp gr of conc and fuming H_2SO_4 at 15° and 45°

H_2SO_4	Total SO ₃ %	Free SO ₃ %	Sp gr at 15°	Sp gr at 45°
95 98	78 50		1 8418	
96 68	78 92		1 8429	
96 99	79 18		1 8431	
97 66	79 72		1 8434 max	
98 65	80 53		1 8403	
99 40	81 14		1 8388 min	
99 76	81 44		1 8418	
100 00	81 63	0 00	1 8500	1 822
	85 46	10 00	1 888	1 553
	88 30	20 00	1 920	1 887
	87 14	30 00	1 957	1 920
	88 97	40 00	1 979	1 945
	90 81	50 00	1 964 max	1 964 max
	92 65	60 00	1 920 max	1 959
	94 48	70 00	1 918	1 942
	96 32	80 00	1 890	1 890
	98 16	90 00	1 864	1 864
	100 00	100 00	1 844	1 814

(Knetsch, B 1901, 34 4102)

Sp gr of fuming H_2SO_4 at 35°					
Total SO ₃ %	Free SO ₃ %	Sp gr	Total SO ₃ %	Free SO ₃ %	Sp r
81 63	0	1 8186	91 18	52	1 49
81 99	2	1 8270	91 55	54	1 60
82 36	4	1 8360	91 91	56	1 72
82 73	6	1 8425	92 28	58	1 54
83 09	8	1 8498	92 65	60	1 38
83 46	10	1 8565	93 02	62	1 09
83 82	12	1 8627	93 38	64	1 72
84 20	14	1 8692	93 75	66	1 36
84 56	16	1 8756	94 11	68	1 00
84 92	18	1 8830	94 48	70	1 64
85 30	20	1 8919	94 85	72	1 02
85 66	22	1 9020	95 21	74	1 42
86 03	24	1 9092	95 58	76	1 79
86 40	26	1 9158	95 95	78	1 15
86 76	28	1 9220	96 32	80	1 51
87 14	30	1 9280	96 69	82	1 33
87 50	32	1 9338	97 05	84	1 15
87 87	34	1 9405	97 42	86	1 46
88 24	36	1 9474	97 78	88	1 30
88 60	38	1 9534	98 16	90	1 38
88 97	40	1 9584	98 53	92	1 30
89 33	42	1 9612	98 90	94	1 12
89 70	44	1 9643	99 26	96	1 35
90 07	46	1 9672	99 63	98	1 38
90 44	48	1 9702	100 00	100	1 70
90 81	50	1 9733			

(Knetsch, B 1901, 34 4101)

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
1 000	0 00	1 028	4 12	1 056	8
1 001	0 15	1 029	4 26	1 057	8
1 002	0 31	1 030	4 41	1 058	8
1 003	0 46	1 031	4 56	1 059	8
1 004	0 60	1 032	4 70	1 060	8
1 005	0 73	1 033	4 85	1 061	8
1 006	0 87	1 034	5 00	1 062	9
1 007	1 01	1 035	5 14	1 063	9
1 008	1 15	1 036	5 29	1 064	9
1 009	1 30	1 037	5 44	1 065	9
1 010	1 45	1 038	5 58	1 066	9
1 011	1 60	1 039	5 73	1 067	9
1 012	1 75	1 040	5 88	1 068	9
1 013	1 89	1 041	6 03	1 069	10
1 014	2 04	1 042	6 17	1 070	10
1 015	2 19	1 043	6 32	1 071	10
1 016	2 34	1 044	6 46	1 072	10
1 017	2 49	1 045	6 60	1 073	10
1 018	2 64	1 046	6 75	1 074	10
1 019	2 79	1 047	6 89	1 075	10
1 020	2 93	1 048	7 04	1 076	11
1 021	3 08	1 049	7 18	1 077	11
1 022	3 23	1 050	7 32	1 078	11
1 023	3 38	1 051	7 47	1 079	11
1 024	3 53	1 052	7 61	1 080	11
1 025	3 67	1 053	7 76	1 081	11
1 026	3 82	1 054	7 90	1 082	11
1 027	3 97	1 055	8 04	1 083	11

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air —
Continued

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
1 084	12 11	1 145	20 25	1 206	27 95
1 085	12 24	1 146	20 38	1 207	28 08
1 086	12 38	1 147	20 51	1 208	28 20
1 087	12 52	1 148	20 64	1 209	28 32
1 088	12 66	1 149	20 77	1 210	28 45
1 089	12 79	1 150	20 90	1 211	28 57
1 090	12 93	1 151	21 03	1 212	28 69
1 091	13 07	1 152	21 16	1 213	28 82
1 092	13 20	1 153	21 28	1 214	28 94
1 093	13 34	1 154	21 41	1 215	29 06
1 094	13 48	1 155	21 54	1 216	29 18
1 095	13 61	1 156	21 67	1 217	29 31
1 096	13 75	1 157	21 80	1 218	29 43
1 097	13 89	1 158	21 93	1 219	29 55
1 098	14 02	1 159	22 05	1 220	29 69
1 099	14 16	1 160	22 18	1 221	29 80
1 100	14 29	1 161	22 31	1 222	29 92
1 101	14 43	1 162	22 44	1 223	30 04
1 102	14 56	1 163	22 56	1 224	30 17
1 103	14 70	1 164	22 69	1 225	30 29
1 104	14 83	1 165	22 82	1 226	30 41
1 105	14 97	1 166	22 94	1 227	30 53
1 106	15 10	1 167	23 07	1 228	30 65
1 107	15 24	1 168	23 20	1 229	30 78
1 108	15 37	1 169	23 32	1 230	30 90
1 109	15 51	1 170	23 45	1 231	31 02
1 110	15 64	1 171	23 57	1 232	31 14
1 111	15 78	1 172	23 71	1 233	31 26
1 112	15 91	1 173	23 83	1 234	31 38
1 113	16 05	1 174	23 96	1 235	31 50
1 114	16 18	1 175	24 08	1 236	31 62
1 115	16 31	1 176	24 21	1 237	31 75
1 116	16 45	1 177	24 34	1 238	31 87
1 117	16 58	1 178	24 46	1 239	31 99
1 118	16 71	1 179	24 59	1 240	32 11
1 119	16 84	1 180	24 71	1 241	32 23
1 120	16 98	1 181	24 84	1 242	32 35
1 121	17 11	1 182	24 97	1 243	32 47
1 122	17 24	1 183	25 09	1 244	32 59
1 123	17 37	1 184	25 22	1 245	32 71
1 124	17 51	1 185	25 34	1 246	32 83
1 125	17 64	1 186	25 47	1 247	32 95
1 126	17 77	1 187	25 59	1 248	33 07
1 127	17 90	1 188	25 72	1 249	33 19
1 128	18 03	1 189	25 84	1 250	33 31
1 129	18 16	1 190	25 97	1 251	33 43
1 130	18 30	1 191	26 09	1 252	33 55
1 131	18 43	1 192	26 22	1 253	33 67
1 132	18 56	1 193	26 34	1 254	33 79
1 133	18 69	1 194	26 47	1 255	33 91
1 134	18 82	1 195	26 59	1 256	34 02
1 135	18 95	1 196	26 71	1 257	34 14
1 136	19 08	1 197	26 84	1 258	34 26
1 137	19 22	1 198	26 96	1 259	34 38
1 138	19 34	1 199	27 09	1 260	34 50
1 139	19 47	1 200	27 21	1 261	34 62
1 140	19 60	1 201	27 33	1 262	34 74
1 141	19 73	1 202	27 46	1 263	34 86
1 142	19 86	1 203	27 58	1 264	34 98
1 143	19 99	1 204	27 71	1 265	35 09
1 144	20 12	1 205	27 83	1 266	35 21

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air —
Continued

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
1 267	35 33	1 328	42 35	1 389	48 92
1 268	35 45	1 329	42 46	1 390	49 02
1 269	35 57	1 330	42 57	1 391	49 13
1 270	35 68	1 331	42 68	1 392	49 24
1 271	35 80	1 332	42 79	1 393	49 34
1 272	35 92	1 333	42 90	1 394	49 44
1 273	36 04	1 334	43 01	1 395	49 54
1 274	36 15	1 335	43 12	1 396	49 65
1 275	36 27	1 336	43 23	1 397	49 75
1 276	36 39	1 337	43 35	1 398	49 86
1 277	36 51	1 338	43 46	1 399	49 96
1 278	36 62	1 339	43 57	1 400	50 06
1 279	36 70	1 340	43 68	1 401	50 16
1 280	36 86	1 341	43 79	1 402	50 26
1 281	36 97	1 342	43 90	1 403	50 37
1 282	37 09	1 343	44 01	1 404	50 47
1 283	37 21	1 344	44 12	1 405	50 57
1 284	37 32	1 345	44 23	1 406	50 67
1 285	37 44	1 346	44 34	1 407	50 77
1 286	37 56	1 347	44 45	1 408	50 88
1 287	37 68	1 348	44 56	1 409	50 98
1 288	37 79	1 349	44 67	1 410	51 08
1 289	37 91	1 350	44 77	1 411	51 18
1 290	38 03	1 351	44 88	1 412	51

Sp gr of $H_2SO_4 + Aq$			
% H_2SO_4	79 68	60 98	35 77
Sp gr 20°/20°	1 7383	1 5181	1 2719
% H_2SO_4	10 10	4 78	
Sp gr 20°/20°	1 0685	1 0317	
(Le Blanc and Rohland, Z phys Ch 1896, 19 268)			

Sp gr of $N-H_2SO_4 + Aq$ at 18°/4° = 1 0306
(Loomis, W Ann 1896, 60 550)

Sp gr of $H_2SO_4 + Aq$ at 19 4°, when p =
percent strength of solution d = observed
density, w = volume conc in grams per
cc $\left(\frac{pd}{100} = w\right)$

p	d	w
94 10	1 8380	1 7295
84 59	1 7998	1 5223
73 08	1 6743	1 2235
61 35	1 5341	0 9412
40 72	1 3220	0 5383
31 94	1 2430	0 3970
23 77	1 1747	0 2792
14 72	1 1023	0 1623
9 802	1 0670	0 1046
4 826	1 0320	0 0498

(Barnes, J Phys Chem 1898, 2 546)

Sp gr of $H_2SO_4 + Aq$ at 20°

Normality of $H_2SO_4 + Aq$	% H_2SO_4	Sp gr
11 53	70 07	1 6129
9 01	59 26	1 4901
6 95	49 10	1 3872
4 77	36 68	1 2756
3 008	25 00	1 1791
1 002	9 25	1 0612

(Forchheimer, Z phys Ch 1900, 34 27)

Sp gr of total and fuming H_2SO_4 at 15° and 45°

H_2SO_4	Total SO_4 %	Free SO_4 %	Sp gr at 15	Sp gr at 45
95 98	78 50	1 8418		
96 68	78 92	1 8429		
96 99	79 18	1 8431		
97 66	79 72	1 8434 max		
98 15	80 53	1 8403		
99 40	81 14	1 8388 min		
99 76	81 44	1 8415		
100 00	81 65	0 0	1 8500	1 822
	82 46	10 0	1 858	1 855
	83 30	20 0	1 920	1 887
	87 14	30 0	1 957	1 920
	88 97	40 0	1 979	1 945
	90 81	50 0	1 02 009	1 964 max
	92 65	60 0	1 02 020 max	1 959
	94 48	70 0	1 02 018	1 942
	96 32	80 0	1 02 008	1 890
	98 16	90 0	1 990	1 864
	100 00	100 0	1 984	1 814

(Knietzsch B 1901, 34 4102)

Sp gr of fuming H_2SO_4 at 35°

Total SO_4 %	Free SO_4 %	Sp gr	Total SO_4 %	Free SO_4 %	Sp gr
81 63	0	1 8186	91 18	52	1 49
81 99	2	1 8270	91 55	54	1 60
82 36	4	1 8360	91 91	56	1 72
82 73	6	1 8425	92 28	58	1 54
83 09	8	1 8498	92 65	60	1 38
83 46	10	1 8565	93 02	62	1 09
83 82	12	1 8627	93 38	64	1 72
84 20	14	1 8692	93 75	66	1 36
84 56	16	1 8756	94 11	68	1 00
84 92	18	1 8830	94 48	70	1 64
85 30	20	1 8919	94 85	72	1 02
85 66	22	1 9020	95 21	74	1 42
86 03	24	1 9092	95 58	76	1 79
86 40	26	1 9158	95 95	78	1 15
86 76	28	1 9220	96 32	80	1 51
87 14	30	1 9280	96 69	82	1 33
87 50	32	1 9338	97 05	84	1 15
87 87	34	1 9405	97 42	86	1 46
88 24	36	1 9474	97 78	88	1 30
88 60	38	1 9534	98 16	90	1 38
88 97	40	1 9584	98 53	92	1 30
89 33	42	1 9612	98 90	94	1 32
89 70	44	1 9643	99 26	96	1 35
90 07	46	1 9672	99 63	98	1 38
90 44	48	1 9702	100 00	100	1 38
90 81	50	1 9733			1 70

(Knietzsch, B 1901, 34 4101)

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
1 000	0 00	1 028	4 12	1 056	8
1 001	0 15	1 029	4 26	1 057	8
1 002	0 31	1 030	4 41	1 058	8
1 003	0 46	1 031	4 56	1 059	8
1 004	0 60	1 032	4 70	1 060	8
1 005	0 73	1 033	4 85	1 061	8
1 006	0 87	1 034	5 00	1 062	9
1 007	1 01	1 035	5 14	1 063	9
1 008	1 15	1 036	5 29	1 064	9
1 009	1 30	1 037	5 44	1 065	9
1 010	1 45	1 038	5 58	1 066	9
1 011	1 60	1 039	5 73	1 067	9
1 012	1 75	1 040	5 88	1 068	9
1 013	1 89	1 041	6 03	1 069	10
1 014	2 04	1 042	6 17	1 070	10
1 015	2 19	1 043	6 32	1 071	10
1 016	2 34	1 044	6 46	1 072	10
1 017	2 49	1 045	6 60	1 073	10
1 018	2 64	1 046	6 75	1 074	10
1 019	2 79	1 047	6 89	1 075	10
1 020	2 93	1 048	7 04	1 076	11
1 021	3 08	1 049	7 18	1 077	11
1 022	3 23	1 050	7 32	1 078	11
1 023	3 38	1 051	7 47	1 079	11
1 024	3 53	1 052	7 61	1 080	11
1 025	3 67	1 053	7 76	1 081	11
1 026	3 82	1 054	7 90	1 082	11
1 027	3 97	1 055	8 04	1 083	11

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air —
Continued

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
1 084	12 11	1 145	20 25	1 206	27 95
1 085	12 24	1 146	20 38	1 207	28 08
1 086	12 38	1 147	20 51	1 208	28 20
1 087	12 52	1 148	20 64	1 209	28 32
1 088	12 66	1 149	20 77	1 210	28 45
1 089	12 79	1 150	20 90	1 211	28 57
1 090	12 93	1 151	21 03	1 212	28 69
1 091	13 07	1 152	21 16	1 213	28 82
1 092	13 20	1 153	21 28	1 214	28 94
1 093	13 34	1 154	21 41	1 215	29 06
1 094	13 48	1 155	21 54	1 216	29 18
1 095	13 61	1 156	21 67	1 217	29 31
1 096	13 75	1 157	21 80	1 218	29 43
1 097	13 89	1 158	21 93	1 219	29 55
1 098	14 02	1 159	22 05	1 220	29 69
1 099	14 16	1 160	22 18	1 221	29 80
1 100	14 29	1 161	22 31	1 222	29 92
1 101	14 43	1 162	22 44	1 223	30 04
1 102	14 56	1 163	22 56	1 224	30 17
1 103	14 70	1 164	22 69	1 225	30 29
1 104	14 83	1 165	22 82	1 226	30 41
1 105	14 97	1 166	22 94	1 227	30 53
1 106	15 10	1 167	23 07	1 228	30 65
1 107	15 24	1 168	23 20	1 229	30 78
1 108	15 37	1 169	23 32	1 230	30 90
1 109	15 51	1 170	23 45	1 231	31 02
1 110	15 64	1 171	23 57	1 232	31 14
1 111	15 78	1 172	23 71	1 233	31 26
1 112	15 91	1 173	23 83	1 234	31 38
1 113	16 05	1 174	23 96	1 235	31 50
1 114	16 18	1 175	24 08	1 236	31 62
1 115	16 31	1 176	24 21	1 237	31 75
1 116	16 45	1 177	24 34	1 238	31 87
1 117	16 58	1 178	24 46	1 239	31 99
1 118	16 71	1 179	24 59	1 240	32 11
1 119	16 84	1 180	24 71	1 241	32 23
1 120	16 98	1 181	24 84	1 242	32 35
1 121	17 11	1 182	24 97	1 243	32 47
1 122	17 24	1 183	25 09	1 244	32 59
1 123	17 37	1 184	25 22	1 245	32 71
1 124	17 51	1 185	25 34	1 246	32 83
1 125	17 64	1 186	25 47	1 247	32 95
1 126	17 77	1 187	25 59	1 248	33 07
1 127	17 90	1 188	25 72	1 249	33 19
1 128	18 03	1 189	25 84	1 250	33 31
1 129	18 16	1 190	25 97	1 251	33 43
1 130	18 30	1 191	26 09	1 252	33 55
1 131	18 43	1 192	26 22	1 253	33 67
1 132	18 56	1 193	26 34	1 254	33 79
1 133	18 69	1 194	26 47	1 255	33 91
1 134	18 82	1 195	26 59	1 256	34 02
1 135	18 95	1 196	26 71	1 257	34 14
1 136	19 08	1 197	26 84	1 258	34 26
1 137	19 22	1 198	26 96	1 259	34 38
1 138	19 34	1 199	27 09	1 260	34 50
1 139	19 47	1 200	27 21	1 261	34 62
1 140	19 60	1 201	27 33	1 262	34 74
1 141	19 73	1 202	27 46	1 263	34 86
1 142	19 86	1 203	27 58	1 264	34 98
1 143	19 99	1 204	27 71	1 265	35 09
1 144	20 12	1 205	27 83	1 266	35 21

Sp gr of $H_2SO_4 + Aq$ at 15°/15° in air —
Continued

Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄
1 267	35 33	1 328	42 35	1 389	48 92
1 268	35 45	1 329	42 46	1 390	49 02
1 269	35 57	1 330	42 57	1 391	49 13
1 270	35 68	1 331	42 68	1 392	49 23
1 271	35 80	1 332	42 79	1 393	49 34
1 272	35 92	1 333	42 90	1 394	49 44
1 273	36 04	1 334	43 01	1 395	49 54
1 274	36 15	1 335	43 12	1 396	49 65
1 275	36 27	1 336	43 23	1 397	49 75
1 276	36 39	1 337	43 35	1 398	49 86
1 277	36 51	1 338	43 46	1 399	49 96
1 278	36 62	1 339	43 57	1 400	50 06
1 279	36 70	1 340	43 68	1 401	50 16
1 280	36 86	1 341	43 79	1 402	50 26
1 281	36 97	1 342	43 90	1 403	50 37
1 282	37 09	1 343	44 01	1 404	50 47
1 283	37 21	1 344	44 12	1 405	50 57
1 284	37 32	1 345	44 23	1 406	50 67
1 285	37 44	1 346	44 34	1 407	50 77
1 286	37 56	1 347	44 45	1 408	50 88
1 287	37 68	1 348	44 56	1 409	50 98
1 288	37 79	1 349	44 67	1 410	51 08
1 289	37 91	1 350	44 77	1 411	51 18
1 290	38 03	1 351	44 88	1 412	51 28
1 291	38 14	1 352	44 99	1 413	51 38
1 292	38 26	1 353	45 10	1 414	51 48
1 293	38 37	1 354	45 21	1 415	51 58
1 294	38 49	1 355	45 32	1 416	51 68
1 295	38 60	1 356	45 43	1 417	51 78
1 296	38 72	1 357	45 53	1 418	51 89
1 297	38 83	1 358	45 64	1 419	51 99
1 298	38 95	1 359	45 75	1 420	52 09
1 399	39 06	1 360	45 86	1 421	52 19
1 300	39 18	1 361	45 97	1 422	52 29
1 301	39 29	1 362	46 07	1 423	52 39
1 302	39 41	1 363	46 18	1 424	52 49
1 303	39 52	1 364	46 29	1 425	52 59
1 304	39 64	1 365	46 39	1 426	52 69
1 305	39 75	1 366	46 50	1 427	52 79
1 306	39 86	1 367	46 61	1 428	52 89
1 307	39 98	1 368	46 71	1 429	52 98
1 308	40 09	1 369	46 82	1 430	53 08
1 309	40 20	1 370	46 92	1 431	53 18
1 310	40 32	1 371	47 03	1 432	53 28
1 311	40 43	1 372	47 14	1 433	53 38
1 312	40 54	1 373	47 24	1 434	53 48
1 313	40 66	1 374	47 35	1 435	53 58
1 314	40 77	1 375	47 45	1 436	53 68
1 315	40 88	1 376	47 56	1 437	53 78
1 316	40 99	1 377	47 67	1 438	53 88
1 317	41 11	1 378	47 77	1 439	53 97
1 318	41 22	1 379	47 88	1 440	54 07
1 319	41 33	1 380	47 98	1 441	54 17
1 320	41 45	1 381	48 09	1 442	54 27
1 321	41 56	1 382	48 10	1 443	54 36
1 322	41 67	1 383	48 30	1 444	54 46
1 323	41 79	1 384	48 40	1 445	54 56
1 324	41 90	1 385	48 50	1 446	54 65
1 325	42 01	1 386	48 61	1 447	54 75
1 326	42 12	1 387	48 71	1 448	54 85
1 327	42 23	1 388	48 82	1 449	54 94

Sp gr of H ₂ SO ₄ +Aq at 15°/15° in air — Continued						Sp gr of H ₂ SO ₄ +Aq at 15°/15° in air — Continued					
Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% SO ₃
1 450	55 04	1 511	60 78	1 572	66 23	1 633	71 48	1 694	76 65	1 755	81 11
1 451	55 14	1 512	60 87	1 573	66 31	1 634	71 57	1 695	76 74	1 756	81 11
1 452	55 24	1 513	60 96	1 574	66 40	1 635	71 65	1 696	76 82	1 757	81 11
1 453	55 33	1 514	61 05	1 575	66 49	1 636	71 74	1 697	76 91	1 758	81 11
1 454	55 43	1 515	61 14	1 576	66 57	1 637	71 82	1 698	76 99	1 759	81 11
1 455	55 53	1 516	61 24	1 577	66 66	1 638	71 91	1 699	77 08	1 760	81 11
1 456	55 62	1 517	61 33	1 578	66 75	1 639	71 99	1 700	77 17	1 761	81 11
1 457	55 72	1 518	61 42	1 579	66 83	1 640	72 07	1 701	77 25	1 762	81 11
1 458	55 82	1 519	61 51	1 580	66 92	1 641	72 16	1 702	77 34	1 763	81 11
1 459	55 91	1 520	61 60	1 581	67 01	1 642	72 25	1 703	77 42	1 764	81 11
1 460	56 01	1 521	61 69	1 582	67 10	1 643	72 33	1 704	77 51	1 765	81 11
1 461	56 11	1 522	61 78	1 583	67 18	1 644	72 42	1 705	77 60	1 766	81 11
1 462	56 20	1 523	61 87	1 584	67 27	1 645	72 50	1 706	77 68	1 767	81 11
1 463	56 30	1 524	61 96	1 585	67 36	1 646	72 59	1 707	77 77	1 768	81 11
1 464	56 39	1 525	62 05	1 586	67 44	1 647	72 67	1 708	77 85	1 769	81 11
1 465	56 49	1 526	62 14	1 587	67 53	1 648	72 76	1 709	77 94	1 770	81 11
1 466	56 59	1 527	62 23	1 588	67 62	1 649	72 84	1 710	78 03	1 771	81 11
1 467	56 68	1 528	62 32	1 589	67 70	1 650	72 93	1 711	78 11	1 772	81 11
1 468	56 78	1 529	62 41	1 590	67 79	1 651	73 01	1 712	78 20	1 773	81 11
1 469	56 87	1 530	62 50	1 591	67 88	1 652	73 10	1 713	78 28	1 774	81 11
1 470	56 97	1 531	62 59	1 592	67 97	1 653	73 18	1 714	78 37	1 775	81 11
1 471	57 07	1 532	62 68	1 593	68 05	1 654	73 27	1 715	78 46	1 776	81 11
1 472	57 16	1 533	62 77	1 594	68 14	1 655	73 35	1 716	78 54	1 777	81 11
1 473	57 25	1 534	62 86	1 595	68 23	1 656	73 43	1 717	78 63	1 778	81 11
1 474	57 35	1 535	62 95	1 596	68 31	1 657	73 52	1 718	78 72	1 779	81 11
1 475	57 44	1 536	63 04	1 597	68 40	1 658	73 52	1 719	78 80	1 780	81 11
1 476	57 54	1 537	63 13	1 598	68 49	1 659	73 69	1 720	78 89	1 781	81 11
1 477	57 63	1 538	63 22	1 599	68 57	1 660	73 77	1 721	78 97	1 782	81 11
1 478	57 73	1 539	63 31	1 600	68 66	1 661	73 86	1 722	79 06	1 783	81 11
1 479	57 82	1 540	63 40	1 601	68 74	1 662	73 94	1 723	79 15	1 784	81 11
1 480	57 92	1 541	63 49	1 602	68 83	1 663	74 02	1 724	79 23	1 785	81 11
1 481	58 01	1 542	63 58	1 603	68 92	1 664	74 11	1 725	79 32	1 786	81 11
1 482	58 10	1 543	63 67	1 604	69 00	1 665	74 19	1 726	79 41	1 787	81 11
1 483	58 20	1 544	63 76	1 605	69 09	1 666	74 27	1 727	79 49	1 788	81 11
1 484	58 29	1 545	63 85	1 606	69 17	1 667	74 36	1 728	79 58	1 789	81 11
1 485	58 38	1 546	63 94	1 607	69 26	1 668	74 44	1 729	79 67	1 790	81 11
1 486	58 48	1 547	64 03	1 608	69 35	1 669	74 53	1 730	79 75	1 791	81 11
1 487	58 57	1 548	64 12	1 609	69 43	1 670	74 61	1 731	79 84	1 792	81 11
1 488	58 66	1 549	64 20	1 610	69 52	1 671	74 69	1 732	79 93	1 793	81 11
1 489	58 75	1 550	64 29	1 611	69 60	1 672	74 78	1 733	80 02	1 794	81 11
1 490	58 85	1 551	64 38	1 612	69 69	1 673	74 86	1 734	80 11	1 795	81 11
1 491	58 94	1 552	64 47	1 613	69 78	1 674	74 95	1 735	80 20	1 796	81 11
1 492	59 03	1 553	64 55	1 614	69 86	1 675	75 03	1 736	80 29	1 797	81 11
1 493	59 12	1 554	64 64	1 615	69 95	1 676	75 12	1 737	80 38	1 798	81 11
1 494	59 22	1 555	64 73	1 616	70 03	1 677	75 20	1 738	80 47	1 799	81 11
1 495	59 31	1 556	64 82	1 617	70 12	1 678	75 29	1 739	80 56	1 800	81 11
1 496	59 41	1 557	64 91	1 618	70 20	1 679	75 37	1 740	80 65	1 801	81 11
1 497	59 50	1 558	65 00	1 619	70 29	1 680	75 46	1 741	80 74	1 802	81 11
1 498	59 59	1 559	65 08	1 620	70 38	1 681	75 54	1 742	80 84	1 803	81 11
1 499	59 68	1 560	65 17	1 621	70 46	1 682	75 63	1 743	80 92	1 804	81 11
1 500	59 78	1 561	65 26	1 622	70 55	1 683	75 71	1 744	81 01	1 805	81 11
1 501	59 87	1 562	65 35	1 623	70 63	1 684	75 80	1 745	81 10	1 806	81 11
1 502	59 96	1 563	65 44	1 624	70 72	1 685	75 88	1 746	81 19	1 807	81 11
1 503	60 05	1 564	65 52	1 625	70 80	1 686	75 97	1 747	81 28	1 808	81 11
1 504	60 14	1 565	65 61	1 626	70 89	1 687	76 05	1 748	81 37	1 809	81 11
1 505	60 23	1 566	65 70	1 627	70 97	1 688	76 14	1 749	81 46	1 810	81 11
1 506	60 33	1 567	65 79	1 628	71 06	1 689	76 22	1 750	81 55	1 811	81 11
1 507	60 42	1 568	65 88	1 629	71 14	1 690	76 31	1 751	81 64	1 812	81 11
1 508	60 51	1 569	65 96	1 630	71 23	1 691	76 39	1 752	81 73	1 813	81 11
1 509	60 60	1 570	66 05	1 631	71 31	1 692	76 48	1 753	81 82	1 814	81 11
1 510	60 69	1 571	66 14	1 632	71 40	1 693	76 56	1 754	81 92	1 815	81 11

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Sp gr of H ₂ SO ₄ +Aq at t° Sp gr of H ₂ O at 15°=1									
% H ₂ SO ₄	0°	10°	15°	20°	25°	30°	40°	50°	60°
0	1 00074	1 00060	1 00000	0 99910	0 99794	0 99654	0 99311	0 98895	0 98418
1	1 00833	1 00773	1 00698	1 00594	1 00465	1 00312	0 99950	0 99522	0 99034
2	1 01563	1 01466	1 01381	1 01266	1 01126	1 00963	1 00585	1 00143	0 99644
3	1 02281	1 02153	1 02055	1 01928	1 01777	1 01607	1 01216	1 00761	1 00252
4	1 03001	1 02841	1 02728	1 02590	1 02428	1 02251	1 01848	1 01383	1 00865
5	1 03728	1 03533	1 03406	1 03258	1 03086	1 02902	1 02487	1 02013	1 01484
6	1 04461	1 04232	1 04092	1 03934	1 03756	1 03565	1 03138	1 02653	1 02114
7	1 05199	1 04939	1 04786	1 04618	1 04434	1 04235	1 03796	1 03302	1 02752
8	1 05942	1 05652	1 05486	1 05308	1 05116	1 04910	1 04458	1 03952	1 03393
9	1 06689	1 06370	1 06192	1 06002	1 05799	1 05585	1 05119	1 04605	1 04041
10	1 07439	1 07093	1 06903	1 06702	1 06490	1 06267	1 05787	1 05264	1 04696
11	1 08194	1 07821	1 07619	1 07408	1 07186	1 06955	1 06462	1 05930	1 05357
12	1 08954	1 08555	1 08342	1 08120	1 07890	1 07650	1 07145	1 06604	1 06027
13	1 09718	1 09294	1 09071	1 08839	1 08600	1 08352	1 07834	1 07284	1 06703
14	1 10488	1 10040	1 09805	1 09564	1 09316	1 09061	1 08530	1 07971	1 07385
15	1 11261	1 10790	1 10546	1 10295	1 10039	1 09776	1 09233	1 08666	1 08075
16	1 12040	1 11547	1 11292	1 11033	1 10768	1 10498	1 09944	1 09368	1 08772
17	1 12823	1 12309	1 12045	1 11777	1 11505	1 11228	1 10661	1 10077	1 09476
18	1 13610	1 13076	1 12803	1 12526	1 12246	1 11963	1 11385	1 10792	1 10186
19	1 14402	1 13848	1 13566	1 13282	1 12995	1 12704	1 12115	1 11514	1 10902
20	1 15199	1 14625	1 14335	1 14043	1 13748	1 13451	1 12851	1 12242	1 11625
21	1 15998	1 15407	1 15109	1 14809	1 14508	1 14205	1 13594	1 12977	1 12353
22	1 16803	1 16194	1 15888	1 15581	1 15273	1 14964	1 14343	1 13718	1 13089
23	1 17611	1 16986	1 16673	1 16359	1 16045	1 15731	1 15100	1 14467	1 13832
24	1 18424	1 17784	1 17464	1 17143	1 16823	1 16503	1 15862	1 15221	1 14579
25	1 19240	1 18586	1 18260	1 17933	1 17607	1 17282	1 16631	1 15982	1 15335
26	1 20061	1 19393	1 19060	1 18728	1 18396	1 18066	1 17406	1 16749	1 16096
27	1 20885	1 20204	1 19865	1 19527	1 19190	1 18854	1 18186	1 17522	1 16862
28	1 21710	1 21019	1 20675	1 20332	1 19990	1 19650	1 18973	1 18302	1 17635
29	1 22539	1 21838	1 21489	1 21142	1 20796	1 20452	1 19767	1 19087	1 18414
30	1 23370	1 22661	1 22308	1 21957	1 21607	1 21259	1 20566	1 19879	1 19198
31	1 24204	1 23487	1 23131	1 22776	1 22423	1 22071	1 21371	1 20677	1 19989
32	1 25038	1 24316	1 23957	1 23600	1 23244	1 22887	1 22179	1 21476	1 20779
33	1 25878	1 25151	1 24789	1 24429	1 24069	1 23712	1 22999	1 22292	1 21589
34	1 26723	1 25990	1 25626	1 25263	1 24901	1 24540	1 23822	1 23109	1 22400
35	1 27571	1 26834	1 26468	1 26102	1 25738	1 25375	1 24652	1 23933	1 23219
36	1 28424	1 27683	1 27314	1 26947	1 26580	1 26214	1 25487	1 24763	1 24045
37	1 29283	1 28538	1 28167	1 27797	1 27429	1 27061	1 26329	1 25 01	1 24878
38	1 30149	1 29400	1 29027	1 28655	1 28284	1 27915	1 27179	1 26448	1 25721
39	1 31022	1 30268	1 29894	1 29520	1 29148	1 28776	1 28038	1 27304	1 26575
40	1 31901	1 31144	1 30767	1 30392	1 30018	1 29646	1 28905	1 28169	1 27440
41	1 32788	1 32027	1 31648	1 31271	1 30896	1 30522	1 29779	1 29042	1 28311
42	1 33683	1 32917	1 32537	1 32158	1 31782	1 31407	1 30662	1 29924	1 29193
43	1 34587	1 33817	1 33435	1 33054	1 32676	1 32300	1 31553	1 30813	1 30081
44	1 35501	1 34727	1 34342	1 33960	1 33580	1 33202	1 32452	1 31710	1 30976
45	1 36425	1 35647	1 35261	1 34877	1 34496	1 34116	1 33363	1 32618	1 31881
46	1 37361	1 36579	1 36191	1 35805	1 35422	1 35040	1 34284	1 33536	1 32797
47	1 38308	1 37522	1 37132	1 36744	1 36359	1 35975	1 35215	1 34464	1 33721
48	1 39267	1 38476	1 38084	1 37694	1 37306	1 36921	1 36157	1 35401	1 34655
49	1 40238	1 39441	1 39047	1 38654	1 38264	1 37877	1 37108	1 36349	1 35600
50	1 41219	1 40418	1 40021	1 39627	1 39235	1 38845	1 38073	1 37310	1 36556
51	1 42214	1 41407	1 41007	1 40610	1 40215	1 39823	1 39047	1 38280	1 37524
52	1 43220	1 42408	1 42005	1 41605	1 41208	1 40814	1 40033	1 39262	1 38502

Sp gr of H ₂ SO ₄ +Aq at 15°/15° in air — Continued						Sp gr of H ₂ SO ₄ +Aq at 15°/15° in air — Continued					
Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄	Sp gr	% H ₂ SO ₄
1 450	55 04	1 511	60 78	1 572	66 23	1 633	71 48	1 694	76 65	1 755	8 01
1 451	55 14	1 512	60 87	1 573	66 31	1 634	71 57	1 695	76 74	1 756	8 11
1 452	55 24	1 513	60 96	1 574	66 40	1 635	71 65	1 696	76 82	1 757	8 21
1 453	55 33	1 514	61 05	1 575	66 49	1 636	71 74	1 697	76 91	1 758	8 31
1 454	55 43	1 515	61 14	1 576	66 57	1 637	71 82	1 698	76 99	1 759	8 41
1 455	55 53	1 516	61 24	1 577	66 66	1 638	71 91	1 699	77 08	1 760	8 51
1 456	55 62	1 517	61 33	1 578	66 75	1 639	71 99	1 700	77 17	1 761	8 61
1 457	55 72	1 518	61 42	1 579	66 83	1 640	72 07	1 701	77 25	1 762	8 71
1 458	55 82	1 519	61 51	1 580	66 92	1 641	72 16	1 702	77 34	1 763	8 80
1 459	55 91	1 520	61 60	1 581	67 01	1 642	72 25	1 703	77 42	1 764	8 90
1 460	56 01	1 521	61 69	1 582	67 10	1 643	72 33	1 704	77 51	1 765	8 00
1 461	56 11	1 522	61 78	1 583	67 18	1 644	72 42	1 705	77 60	1 766	8 10
1 462	56 20	1 523	61 87	1 584	67 27	1 645	72 50	1 706	77 68	1 767	8 20
1 463	56 30	1 524	61 96	1 585	67 36	1 646	72 59	1 707	77 77	1 768	8 29
1 464	56 39	1 525	62 05	1 586	67 44	1 647	72 67	1 708	77 85	1 769	8 39
1 465	56 49	1 526	62 14	1 587	67 53	1 648	72 76	1 709	77 94	1 770	8 49
1 466	56 59	1 527	62 23	1 588	67 62	1 649	72 84	1 710	78 03	1 771	8 59
1 467	56 68	1 528	62 32	1 589	67 70	1 650	72 93	1 711	78 11	1 772	8 69
1 468	56 78	1 529	62 41	1 590	67 79	1 651	73 01	1 712	78 20	1 773	8 78
1 469	56 87	1 530	62 50	1 591	67 88	1 652	73 10	1 713	78 28	1 774	8 88
1 470	56 97	1 531	62 59	1 592	67 97	1 653	73 18	1 714	78 37	1 775	8 98
1 471	57 07	1 532	62 68	1 593	68 05	1 654	73 27	1 715	78 46	1 776	8 08
1 472	57 16	1 533	62 77	1 594	68 14	1 655	73 35	1 716	78 54	1 777	8 18
1 473	57 25	1 534	62 86	1 595	68 23	1 656	73 43	1 717	78 63	1 778	8 29
1 474	57 35	1 535	62 95	1 596	68 31	1 657	73 52	1 718	78 72	1 779	8 39
1 475	57 44	1 536	63 04	1 597	68 40	1 658	73 52	1 719	78 80	1 780	8 50
1 476	57 54	1 537	63 13	1 598	68 49	1 659	73 69	1 720	78 89	1 781	8 60
1 477	57 63	1 538	63 22	1 599	68 57	1 660	73 77	1 721	78 97	1 782	8 71
1 478	57 73	1 539	63 31	1 600	68 66	1 661	73 86	1 722	79 06	1 783	8 81
1 479	57 82	1 540	63 40	1 601	68 74	1 662	73 94	1 723	79 15	1 784	8 92
1 480	57 92	1 541	63 49	1 602	68 83	1 663	74 02	1 724	79 23	1 785	8 03
1 481	58 01	1 542	63 58	1 603	68 92	1 664	74 11	1 725	79 32	1 786	8 14
1 482	58 10	1 543	63 67	1 604	69 00	1 665	74 19	1 726	79 41	1 787	8 25
1 483	58 20	1 544	63 76	1 605	69 09	1 666	74 27	1 727	79 49	1 788	8 36
1 484	58 29	1 545	63 85	1 606	69 17	1 667	74 36	1 728	79 58	1 789	8 47
1 485	58 38	1 546	63 94	1 607	69 26	1 668	74 44	1 729	79 67	1 790	8 60
1 486	58 48	1 547	64 03	1 608	69 35	1 669	74 53	1 730	79 75	1 791	8 72
1 487	58 57	1 548	64 12	1 609	69 43	1 670	74 61	1 731	79 84	1 792	8 84
1 488	58 66	1 549	64 20	1 610	69 52	1 671	74 69	1 732	79 93	1 793	8 96
1 489	58 75	1 550	64 29	1 611	69 60	1 672	74 78	1 733	80 02	1 794	8 08
1 490	58 85	1 551	64 38	1 612	69 69	1 673	74 86	1 734	80 11	1 795	8 20
1 491	58 94	1 552	64 47	1 613	69 78	1 674	74 95	1 735	80 20	1 796	8 32
1 492	59 03	1 553	64 55	1 614	69 86	1 675	75 03	1 736	80 29	1 797	8 45
1 493	59 12	1 554	64 64	1 615	69 95	1 676	75 12	1 737	80 38	1 798	8 58
1 494	59 22	1 555	64 73	1 616	70 03	1 677	75 20	1 738	80 47	1 799	8 71
1 495	59 31	1 556	64 82	1 617	70 12	1 678	75 29	1 739	80 56	1 800	8 84
1 496	59 41	1 557	64 91	1 618	70 20	1 679	75 37	1 740	80 65	1 801	8 97
1 497	59 50	1 558	65 00	1 619	70 29	1 680	75 46	1 741	80 74	1 802	8 10
1 498	59 59	1 559	65 09	1 620	70 38	1 681	75 54	1 742	80 84	1 803	8 23
1 499	59 68	1 560	65 17	1 621	70 46	1 682	75 63	1 743	80 92	1 804	8 36
1 500	59 78	1 561	65 26	1 622	70 55	1 683	75 71	1 744	81 01	1 805	8 50
1 501	59 87	1 562	65 35	1 623	70 63	1 684	75 80	1 745	81 10	1 806	8 64
1 502	59 96	1 563	65 44	1 624	70 72	1 685	75 89	1 746	81 19	1 807	8 78
1 503	60 05	1 564	65 52	1 625	70 80	1 686	75 97	1 747	81 28	1 808	8 92
1 504	60 14	1 565	65 61	1 626	70 89	1 687	76 05	1 748	81 37	1 809	8 06
1 505	60 23	1 566	65 70	1 627	70 97	1 688	76 14	1 749	81 46	1 810	8 20
1 506	60 33	1 567	65 79	1 628	71 06	1 689	76 22	1 750	81 55	1 811	8 34
1 507	60 42	1 568	65 88	1 629	71 14	1 690	76 31	1 751	81 64	1 812	8 49
1 508	60 51	1 569	65 96	1 630	71 23	1 691	76 39	1 752	81 73	1 813	8 64
1 509	60 60	1 570	65 05	1 631	71 31	1 692	76 48	1 753	81 82	1 814	8 79
1 510	60 69	1 571	66 14	1 632	71 40	1 693	76 56	1 754	81 92	1 815	8 95

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Sp gr of H₂SO₄+Aq at t° Sp gr of H₂O at 15°=1

% H ₂ SO ₄	0	10°	15°	20°	25°	30°	40°	50°	60°
0	1 00074	1 00060	1 00000	0 99910	0 99794	0 99654	0 99311	0 98895	0 98418
1	1 00833	1 00773	1 00698	1 00594	1 00465	1 00312	0 99950	0 99522	0 99034
2	1 01563	1 01466	1 01381	1 01266	1 01126	1 00963	1 00585	1 00143	0 99644
3	1 02281	1 02153	1 02055	1 01928	1 01777	1 01607	1 01216	1 00761	1 00252
4	1 03001	1 02841	1 02728	1 02590	1 02428	1 02251	1 01848	1 01383	1 00865
5	1 03728	1 03533	1 03406	1 03258	1 03086	1 02902	1 02487	1 02013	1 01484
6	1 04461	1 04232	1 04092	1 03934	1 03756	1 03565	1 03138	1 02653	1 02114
7	1 05199	1 04939	1 04786	1 04618	1 04434	1 04235	1 03796	1 03302	1 02752
8	1 05942	1 05652	1 05486	1 05308	1 05116	1 04910	1 04458	1 03952	1 03393
9	1 06689	1 06370	1 06192	1 06002	1 05799	1 05585	1 05119	1 04605	1 04041
10	1 07439	1 07093	1 06903	1 06702	1 06490	1 06267	1 05787	1 05264	1 04696
11	1 08194	1 07821	1 07619	1 07408	1 07186	1 06955	1 06462	1 05930	1 05357
12	1 08954	1 08555	1 08342	1 08120	1 07890	1 07650	1 07145	1 06604	1 06027
13	1 09718	1 09294	1 09071	1 08839	1 08600	1 08352	1 07834	1 07284	1 06703
14	1 10488	1 10040	1 09805	1 09564	1 09316	1 09061	1 08530	1 07971	1 07385
15	1 11261	1 10790	1 10546	1 10295	1 10039	1 09776	1 09233	1 08666	1 08075
16	1 12040	1 11547	1 11292	1 11033	1 10768	1 10498	1 09944	1 09368	1 08772
17	1 12823	1 12309	1 12045	1 11777	1 11505	1 11228	1 10661	1 10077	1 09476
18	1 13610	1 13076	1 12803	1 12526	1 12246	1 11963	1 11385	1 10792	1 10186
19	1 14402	1 13848	1 13566	1 13282	1 12995	1 12704	1 12115	1 11514	1 10902
20	1 15199	1 14625	1 14335	1 14043	1 13748	1 13451	1 12851	1 12242	1 11625
21	1 15998	1 15407	1 15109	1 14809	1 14508	1 14205	1 13594	1 12977	1 12353
22	1 16803	1 16194	1 15888	1 15581	1 15273	1 14964	1 14343	1 13718	1 13089
23	1 17611	1 16986	1 16673	1 16359	1 16045	1 15731	1 15100	1 14467	1 13832
24	1 18424	1 17784	1 17464	1 17143	1 16823	1 16503	1 15862	1 15221	1 14579
25	1 19240	1 18586	1 18260	1 17933	1 17607	1 17282	1 16631	1 15982	1 15335
26	1 20061	1 19393	1 19060	1 18728	1 18396	1 18066	1 17406	1 16749	1 16096
27	1 20885	1 20204	1 19865	1 19527	1 19190	1 18854	1 18186	1 17522	1 16862
28	1 21710	1 21019	1 20675	1 20332	1 19990	1 19650	1 18973	1 18302	1 17635
29	1 22539	1 21838	1 21489	1 21142	1 20796	1 20452	1 19767	1 19087	1 18414
30	1 23370	1 22661	1 22308	1 21957	1 21607	1 21259	1 20566	1 19879	1 19198
31	1 24204	1 23487	1 23131	1 22776	1 22423	1 22071	1 21371	1 20677	1 19989
32	1 25038	1 24316	1 23957	1 23600	1 23244	1 22887	1 22179	1 21476	1 20779
33	1 25878	1 25151	1 24789	1 24429	1 24069	1 23712	1 22999	1 22292	1 21589
34	1 26723	1 25990	1 25626	1 25263	1 24901	1 24540	1 23822	1 23109	1 22400
35	1 27571	1 26834	1 26468	1 26102	1 25738	1 25375	1 24652	1 23933	1 23219
36	1 28424	1 27683	1 27314	1 26947	1 26580	1 26214	1 25487	1 24763	1 24045
37	1 29283	1 28538	1 28167	1 27797	1 27429	1 27061	1 26329	1 25 01	1 24878
38	1 30149	1 29400	1 29027	1 28655	1 28284	1 27915	1 27179	1 26448	1 25721
39	1 31022	1 30268	1 29894	1 29520	1 29148	1 28776	1 28038	1 27304	1 26575
40	1 31901	1 31144	1 30767	1 30392	1 30018	1 29646	1 28905	1 28169	1 27440
41	1 32788	1 32027	1 31648	1 31271	1 30896	1 30522	1 29779	1 29042	1 28311
42	1 33683	1 32917	1 32537	1 32158	1 31782	1 31407	1 30662	1 29924	1 29193
43	1 34587	1 33817	1 33435	1 33054	1 32676	1 32300	1 31553	1 30813	1 30081
44	1 35501	1 34727	1 34342	1 33960	1 33580	1 33202	1 32452	1 31710	1 30976
45	1 36425	1 35647	1 35261	1 34877	1 34496	1 34116	1 33363	1 32618	1 31881
46	1 37361	1 36579	1 36191	1 35805	1 35422	1 35040	1 34284	1 33535	1 32797
47	1 38308	1 37522	1 37132	1 36744	1 36359	1 35975	1 35215	1 34464	1 33721
48	1 39267	1 38476	1 38084	1 37694	1 37306	1 36921	1 36157	1 35401	1 34655
49	1 40238	1 39441	1 39047	1 38654	1 38264	1 37877	1 37108	1 36349	1 35600
50	1 41219	1 40418	1 40021	1 39627	1 39235	1 38845	1 38073	1 37310	1 36556
51	1 42214	1 41407	1 41007	1 40610	1 40215	1 39823	1 39047	1 38280	1 37524
52	1 43220	1 42408	1 42005	1 41605	1 41208	1 40814	1 40033	1 39262	1 38502

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ at t° Sp gr of H_2O at $15^\circ = 1$ *Continued*

$\frac{\% \text{H}_2\text{SO}_4}{100}$	0°	10°	15°	20°	25°	30°	40°	50°	
53	1 44239	1 43420	1 43014	1 42611	1 42211	1 41814	1 41028	1 40254	1 40
54	1 45269	1 44443	1 44034	1 43628	1 43225	1 42825	1 42034	1 41255	1 48
55	1 46311	1 45477	1 45065	1 44656	1 44250	1 43847	1 43051	1 42268	1 40
56	1 47364	1 46523	1 46107	1 45695	1 45285	1 44880	1 44078	1 43290	1 51
57	1 48427	1 47578	1 47159	1 46743	1 46331	1 45922	1 45115	1 44322	1 54
58	1 49499	1 48643	1 48221	1 47802	1 47387	1 46975	1 46162	1 45364	1 57
59	1 50583	1 49719	1 49292	1 48870	1 48452	1 48037	1 47218	1 46415	1 82
60	1 51676	1 50804	1 50374	1 49949	1 49527	1 49109	1 48285	1 47476	1 88
61	1 52778	1 51899	1 51465	1 51036	1 50611	1 50190	1 49360	1 48546	1 74
62	1 53889	1 53002	1 52564	1 52132	1 51703	1 51278	1 50442	1 49622	1 81
63	1 55008	1 54113	1 53672	1 53236	1 52804	1 52376	1 51533	1 50708	1 90
64	1 56135	1 55233	1 54788	1 54348	1 53913	1 53481	1 52632	1 51801	1 98
65	1 57270	1 56360	1 55912	1 55469	1 55030	1 54595	1 53740	1 52903	1 08
66	1 58414	1 57496	1 57044	1 56597	1 56154	1 55716	1 54854	1 54011	1 18
67	1 59565	1 58640	1 58184	1 57733	1 57287	1 56846	1 55978	1 55128	1 29
68	1 60724	1 59792	1 59332	1 58878	1 58427	1 57981	1 57104	1 56246	1 40
69	1 61892	1 60951	1 60488	1 60030	1 59577	1 59129	1 58247	1 57384	1 54
70	1 63068	1 62118	1 61651	1 61189	1 60732	1 60280	1 59391	1 58521	1 67
71	1 64251	1 63293	1 62821	1 62355	1 61894	1 61437	1 60540	1 59663	1 80
72	1 65439	1 64473	1 63997	1 63527	1 63062	1 62601	1 61696	1 60811	1 94
73	1 66633	1 65658	1 65178	1 64704	1 64234	1 63769	1 62855	1 61961	1 08
74	1 67831	1 66847	1 66362	1 65883	1 65408	1 64939	1 64015	1 63111	1 22
75	1 69030	1 68037	1 67547	1 67063	1 66584	1 66109	1 65175	1 64260	1 36
76	1 70228	1 69225	1 68731	1 68242	1 67757	1 67278	1 66332	1 65405	1 49
77	1 71424	1 70411	1 69911	1 69416	1 68926	1 68439	1 67481	1 66540	1 61
78	1 72615	1 71589	1 71083	1 70582	1 70085	1 69591	1 68616	1 67658	1 71
79	1 73798	1 72758	1 72243	1 71735	1 71231	1 70731	1 69741	1 68767	1 80
80	1 74970	1 73909	1 73386	1 72868	1 72356	1 71847	1 70842	1 69854	1 88
81	1 76120	1 75038	1 74504	1 73979	1 73458	1 72942	1 71921	1 70916	1 93
82	1 77244	1 76140	1 75595	1 75057	1 74524	1 73998	1 72962	1 71945	1 95
83	1 78312	1 77193	1 76642	1 76097	1 75557	1 75022	1 73972	1 72943	1 93
84	1 79316	1 78191	1 77636	1 77087	1 76543	1 76006	1 74943	1 73902	1 88
85	1 80250	1 79123	1 78567	1 78016	1 77470	1 76929	1 75863	1 74816	1 78
86	1 81108	1 79982	1 79428	1 78878	1 78331	1 77789	1 76721	1 75674	1 64
87	1 81887	1 80767	1 80214	1 79666	1 79123	1 78584	1 77519	1 76473	1 44
88	1 82589	1 81476	1 80926	1 80381	1 79839	1 79302	1 78242	1 77199	1 17
89	1 83216	1 82111	1 81564	1 81022	1 80484	1 79950	1 78895	1 77856	1 33
90	1 83771	1 82677	1 82135	1 81597	1 81063	1 80532	1 79483	1 78448	1 42
91	1 84263	1 83179	1 82642	1 82109	1 81580	1 81054	1 80013	1 78985	1 97
92	1 84691	1 83619	1 83088	1 82561	1 82037	1 81516	1 80487	1 79471	1 47
93	1 85059	1 83997	1 83471	1 82950	1 82432	1 81918	1 80902	1 79900	1 91
94	1 85363	1 84311	1 83790	1 83275	1 82763	1 82255	1 81253	1 80266	1 29
95	1 85598	1 84555	1 84040	1 83526	1 83022	1 82520	1 81528	1 80553	1 59
96	1 85765	1 84729	1 84217	1 83709	1 83207	1 82708	1 81724	1 80758	1 80
97	1 85854	1 84816	1 84305	1 83798	1 83297	1 82800	1 81822	1 80863	1 92
98	1 85836	1 84789	1 84275	1 83766	1 83264	1 82767	1 81792	1 80840	1 91
99	1 85671	1 84612	1 84093	1 83581	1 83076	1 82578	1 81604	1 80658	1 74
100	(1 85330)	(1 84255)	(1 83729)	(1 83213)	(1 82705)	(1 82205)	(1 81231)	(1 80288)	(1 38)

Auszug aus Band 5 der wissenschaftlichen Abhandlungen der Normaleichungskomm
 Berlin 1904, P 257 Springer's publication

(Domke, Z anorg 1905, 43 176)

Sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ at $15^\circ/15^\circ$ in air —
Continued from page 915

Sp gr	% H_2SO_4	Sp gr	% H_2SO_4	Sp gr	% H_2SO_4
816	89 11	1 828	91 30	1 840	94 57
817	89 27	1 829	91 52	1 841	94 96
818	89 44	1 830	91 74	1 842	95 40
819	89 61	1 831	91 98	1 843	96 02
820	89 79	1 832	92 22	1 844	96 93
821	89 97	1 833	92 46	1 8442	97 50
822	90 15	1 834	92 71	1 844	99 08
823	90 33	1 835	92 98	1 843	99 84
824	90 51	1 836	93 26	1 842	99 29
825	90 70	1 837	93 56	1 841	98 61
826	90 90	1 838	93 87	1 840	98 88
827	91 10	1 839	94 20	18 394	100 00

Lunge, calculated by Marshall, J Soc Chem Ind 1902, 21 1509

Sp gr at 20° of $\text{H}_2\text{SO}_4 + \text{Aq}$ containing
M g mols H_2SO_4 per liter

M	0 01	0 025	0 05
Sp gr	1 000719	1 001907	1 003551
M	0 075	0 10	0 25
Sp gr	1 005152	1 00677	1 01618
M	0 50	0 75	1 0
Sp gr	1 03218	1 04760	1 06307
M	1 5	2 0	
Sp gr	1 09345	1 12316	

(Jones and Pearce, Am Ch J 1907, 38 733)

Boiling-point of $\text{H}_2\text{SO}_4 + \text{Aq}$

% H_2SO_4	B pt	% H_2SO_4	B pt
5	101 0°	70	170 0°
10	102 0	72	174 5
15	105 5	74	180 5
20	105 0	76	189 0
25	106 5	78	199 0
30	108 0	80	207 0
35	110 0	82	218 5
40	114 0	84	227 0
45	118 5	86	238 5
50	124 0	88	251 5
53	128 5	90	262 5
56	133 0	91	268 0
60	141 5	92	274 5
62 5	147 0	93	281 5
65	153 5	94	288 5
67 5	161 0	95	295 0

(Lunge, B 11 370)

Freezing- and melting-points of $\text{H}_2\text{SO}_4 + \text{Aq}$

Sp gr at 15°	F pt	M pt
1 671	liq at -20°	
1 691	"	
1 712	"	
1 727	$-7 5$	$-7 5$
1 732	$-8 5$	$-8 5$
1 749	$-0 2$	$+4 5$
1 767	$+1 6$	$+6 5$
1 790	$+4 5$	$+8 0$
1 807	$-9 0$	$-6 0$
1 822	liq at -20°	
1 842		

(Lunge, B 15 2644)

Effect of impurities on sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$

The figures show the increase in sp gr of $\text{H}_2\text{SO}_4 + \text{Aq}$ caused by adding 0 1% of an impurity to acid of different strengths

Salt	100 %	98 %	94 %	80 %	70 %
Na_2SO_4	0 0011	0 0010	0 0007	0 0008	0 0007
CaSO_4	0 0012	0 0011	0 0009	0 0007	0 0006
$\text{Al}_2(\text{SO}_4)_3$	insol	insol	insol	0 0012?	0 0011
$\text{Fe}(\text{SO}_4)_2$			0 0006?	0 0008	0 0007
PbSO_4	0 0017	0 0014	0 0015	insol	insol
MgSO_4	0 0011	0 0010	0 0012	0 0009	0 0009
As_2O_3		0 0013		0 0010	
HSNO_3	0 0002?	0 00027		0 00023	

(Marshall, J Soc Chem Ind 1902, 21 1508)

Sp gr of mixtures of H_2SO_4 (96 5%) and
 HNO_3 (94%) at $18^\circ/18^\circ$ in air

% HNO_3 in mixture	Sp gr	% HNO_3 in mixture	Sp gr
0 00	1 8437	22 51	1 8215
0 57	1 8456	25 56	1 8112
1 05	1 8476	27 29	1 8053
4 67	1 8586	32 53	1 7863
7 17	1 8618	37 03	1 7700
7 37	1 8620	39 49	1 7601
7 75	1 8619	37 78	1 6879
9 10	1 8603	72 59	1 6227
11 33	1 8557	90 76	1 5408
12 71	1 8520	98 19	1 5080
16 52	1 8414	100 00	1 5009

(Marshall, J Soc Chem Ind 1902, 21 1508)

Miscible with alcohol, with evolution of heat and formation of ethylsulphuric acid
 $+\text{H}_2\text{O} = \text{H}_4\text{SO}_5$, also called tetrahydroxyl sulphuric acid (Marignac, A ch (3) 39 184)

Mpt $8 35^\circ$ (Pickering)
 $+2\text{H}_2\text{O} = \text{H}_6\text{SO}_6$, also called perhydroxyl sulphuric acid

Mpt $-38 9^\circ$ (Biron, J Russ Phys Chem Soc 1899, 31 517)

$+3\text{H}_2\text{O}$ (Pickering, Chem Soc 1890, 57 331)

+4H₂O Mpt -75° (Pickering, Chem Soc 1890, 57 331)

Sp gr and fr pt of hydrates of H₂SO₄

Hydrate	% H ₂ SO ₄	Sp gr of the liquid	Fr pt
H ₂ SO ₄ (pure)	100	1.842	+10.5
H ₂ SO ₄ +H ₂ O	84.48	1.777	+3.5
H ₂ SO ₄ +2H ₂ O	73.08	1.650	-70.0
H ₂ SO ₄ +4H ₂ O	57.65	1.476	-40.0
H ₂ SO ₄ +6H ₂ O	47.57	1.376	-50.0
H ₂ SO ₄ +8H ₂ O	40.50	1.311	-65.0
H ₂ SO ₄ +10H ₂ O	35.25	1.268	-88.0
H ₂ SO ₄ +11H ₂ O	33.11	1.249	-75.0
H ₂ SO ₄ +12H ₂ O	31.21	1.233	-55.0
H ₂ SO ₄ +13H ₂ O	29.52	1.219	-45.0
H ₂ SO ₄ +14H ₂ O	28.00	1.207	-40.0
H ₂ SO ₄ +15H ₂ O	26.63	1.196	-34.0
H ₂ SO ₄ +16H ₂ O	25.39	1.187	-25.6
H ₂ SO ₄ +18H ₂ O	23.22	1.170	-19.0
H ₂ SO ₄ +20H ₂ O	21.40	1.157	-17.0
H ₂ SO ₄ +25H ₂ O	17.88	1.129	-8.5
H ₂ SO ₄ +50H ₂ O	9.82	1.067	-3.5
H ₂ SO ₄ +75H ₂ O	6.77	1.045	0.0
H ₂ SO ₄ +100H ₂ O	5.16	1.032	+2.5
H ₂ SO ₄ +300H ₂ O	1.78	1.007	+4.5
H ₂ SO ₄ +1000H ₂ O	0.54	1.001	+0.5

(Pictet, C R 1894, 119 645)

Sulphuric acid, anhydrous, SO₃

See Sulphur trioxide

Disulphuric (Pyrosulphuric) acid, H₂S₂O₇

Very deliquescent Miscible with H₂O
Sol in fuming H₂SO₄ Miscible in liquid SO₂ (Schultz-Sellack)

H₂O, 2H₂SO₄ Fumes on air (Jacquelin, A ch (3) 30 343)

Tetrasulphuric acid, H₂S₄O₁₃

Fumes on air (Weber, Pogg 159 313)

Sulphates

Most sulphates are easily sol in H₂O, but Ag₂SO₄, Hg₂SO₄, and CaSO₄ are only sl sol, while BaSO₄, SrSO₄, and PbSO₄ are nearly insol therein. All sulphates are sol in conc H₂SO₄. Basic sulphates are insol in H₂O. Most sulphates are insol in alcohol. Insol in liquid NH₃. (Franklin, Am Ch J 1898, 20 823)

Aluminum sulphate, basic, 2Al₂O₃.SO₃+5H₂O

Slowly sol in 10 mols HC₂H₃O₂ (Schlumberger, Bull Soc 1895, (3) 13 41)
+7H₂O Easily sol in 8 mols dil HCl+Aq or in 10 mols 10% acetic acid in 24 hours (Schlumberger)

+10H₂O Insol in H₂O, easily sol in cold dil mineral acids, and HC₂H₃O₂+Aq (Crum, A 89 174)

Min *Felsobanyite*
+15H₂O Min *Paraluminite*
8Al₂O₃, 5SO₃+25H₂O Insol in H₂C in dil acids (Lowe, J pr 79 428)

5Al₂O₃, 3SO₃+20H₂O Easily sol in (Debray, Bull Soc (2) 7 9)

3Al₂O₃, 2SO₃+9H₂O Nearly ins conc H₂SO₄ (Bayer, Dmgl 263 211)

+20H₂O Ppt
4Al₂O₃, 3SO₃+36H₂O Insol in Easily sol in dil mineral acids, and

HC₂H₃O₂+Aq (Debray, Bull Soc (2) 1 Al₂O₃, SO₃+6H₂O=(AlO)₂SO₄+ Insol in H₂O or HC₂H₃O₂+Aq hot HCl, easily sol in warm KOH (Bottinger, A 244 225)

+9H₂O (Athanasesco, C R 103) Min *Aluminite*
[Al₂(OH)₆SO₄+2H₂O

Sol in HCl+Aq in the cold with de Very unstable (Schlumberger, Bull 1895, (3) 13 60)

3Al₂O₃, 4SO₃+9H₂O (Athanasesco, 103 271)

+30H₂O Sol in 144 pts cold, an pts boiling H₂O Easily sol in HC

HNO₃+Aq (Rammelsberg, Pogg 43 2Al₂O₃, 3SO₃ Decomp by H₂C

3Al₂O₃, SO₃ and Al₂(SO₄)₃ (Maus) Al₂O₃, 2SO₃=Al₂O(SO₄)₂

Min *Alumaine*
+H₂O Sol in small quantity of H₂ decomp by a large quantity into (Al

and Al₂(SO₄)₃ (Maus, Pogg 11 80)

+12H₂O Easily sol in hot or cold Sat solution contains 45% salt at 15°, h crystallises unchanged on evaporating

guerite, C R 90 354)

Above basic compounds are mi in (Pickering, C N 45 121, 133, 146)

Aluminum sulphate, Al₂(SO₄)₃

100 pts H₂O dissolve (a) pts Al₂ O and (b) pts Al₂(SO₄)₃+18H₂O at

	0°	10°	20°	30°	40°	50°
a	31.3	33.5	36.15	40.36	45.73	52.0
b	86.85	95.8	107.35	127.6	167.6	0

	60°	70°	80°	90°	0°
a	59.09	66.23	73.14	80.83	9.1
b	262.6	348.2	467.3	678.8	1.2

(Poggiale, A ch (3) 8 467)

See also +18H₂O

Sp gr of Al₂(SO₄)₃+Aq

°	Sp gr at			
	15	25°	35	45
Al (SO ₄) ₃				
5	1.0569	1.0503	1.045	0
10	1.1071	1.1022	1.096	08
15	1.1574	1.1522	1.146	1
20	1.2074	1.2004	1.192	18
25	1.2572	1.2487	1.2407	22

(Reuss, B 17 2888)

Sp gr of $\text{Al}_2(\text{SO}_4)_3 + \text{Aq}$ at 15° containing
 10 20 30% $\text{Al}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$,
 1 0535 1 1105 1 1710
 40 50% $\text{Al}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
 1 2355 1 3050
 Sp gr of sat solution = 1.34
 (Gerlach, Z anal 28 493)

Sp gr of $\text{Al}_2(\text{SO}_4)_3 + \text{Aq}$ at 25°

Strength of $\text{Al}_2(\text{SO}_4)_3 + \text{Aq}$	Sp gr
1 normal	1 0550
$\frac{1}{2}$ "	1 0278
$\frac{1}{4}$ "	1 0138
$\frac{1}{8}$ "	1 0068

(Wagner, Z phys Ch 1890, 5 35)

100 pts of a mixture of 1 vol $\text{H}_2\text{SO}_4 + 2$
 vols H_2O dissolve only 6.45 pts
 $\text{Al}_2(\text{SO}_4)_3$ (Baud, C R 1903, 137 494)

$\text{Al}_2(\text{SO}_4)_3$ is completely pptd from
 $\text{Al}_2(\text{SO}_4)_3 + \text{Aq}$ by an excess of glacial
 HCl (Persoz, A ch (2) 63 444)

Solubility of $\text{Al}_2(\text{SO}_4)_3 + (\text{NH}_4)_2\text{Al}_2(\text{SO}_4)_4$
 See under $(\text{NH}_4)_2\text{Al}_2(\text{SO}_4)_4$

Solubility of $\text{Al}_2(\text{SO}_4)_3 + \text{K}_2\text{Al}_2(\text{SO}_4)_4$ See
 under $\text{K}_2\text{Al}_2(\text{SO}_4)_4$

Solubility in $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$ at 25°

100 g of the solution contain

g $\text{Al}_2(\text{SO}_4)_3$	g $\text{Fe}(\text{SO}_4)_3$
27 82	0
26 01	6 064
24 21	9 819
21 64	13 02
15 22	23 28
*10 70	31 91
10 23	31 90

*Solution sat with respect to both salts
 (Wirth and Bakke, Z anorg 1914, 87 48)
 See also under $\text{Fe}_2(\text{SO}_4)_3$

Solubility of $\text{Al}_2(\text{SO}_4)_3 + \text{Li}_2\text{SO}_4$ at 30°

Composition of

Solution		Residuc		Solid phase
% Li_2SO_4	% $\text{Al}(\text{SO}_4)_3$	% Li_2SO_4	% $\text{Al}(\text{SO}_4)_3$	
25 1	0			$\text{Li}_2\text{SO}_4, \text{H}_2\text{O}$
21 93	5 34			"
16 10	14 89	63 70	4 02	"
13 63	20 76	14 72	31 17	$\text{Li}_2\text{SO}_4, \text{H}_2\text{O} +$ $\text{Al}_2(\text{SO}_4)_3, 18\text{H}_2\text{O}$
13 24	21 71	61 24	7 22	$\text{Li}_2\text{SO}_4, 4\text{H}_2\text{O}$
11 73	22 08	6 92	33 54	$\text{Al}_2(\text{SO}_4)_3, 18\text{H}_2\text{O}$
6 75	24 34	3 77	37 06	"
3 44	26 12			"
0 00	28 0			"

(Schreinemakers and de Waal, Ch Weekbl
 1906, 3 539)

100 g of sat solution of $\text{Al}(\text{SO}_4)_3$ in glycol
 contain 14.4 g $\text{Al}_2(\text{SO}_4)_3$ (de Coninck, Bull
 Ac Roy Belg 1905 359)

Insol in ethyl acetate (Naumann, B
 1910, 43 314)

Insol in acetone (Naumann, B 1904,
 37 4328)

+ $6\text{H}_2\text{O}$ Very slowly sol in cold, com-
 pletely sol in hot H_2O

+ $8\text{H}_2\text{O}$ (Margueritte-Delarcharbonny,
 C R 112 229)

+ $10\text{H}_2\text{O}$ Deliquescent (v Hauer, W
 A B 13 449)

+ $16\text{H}_2\text{O}$ Sol in conc H_2SO_4 (Baud, C
 R 1903, 137 494)

+ $17\text{H}_2\text{O}$ (Gawalowski, C C 1885
 721)

+ $18\text{H}_2\text{O}$ Permanent (Berzelius)

100 g of the aqueous solution contain
 27.82 g $\text{Al}_2(\text{SO}_4)_3$ at 25° (Wirth, Z anorg
 1913, 79 361)

Solubility of $\text{Al}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$ in $\text{H}_2\text{SO}_4 + \text{Aq}$
 at 25°

$\text{H}_2\text{SO}_4 + \text{Aq}$ % H_2SO_4	100 g of the solution contain g $\text{Al}(\text{SO}_4)_3$
0	27 82
5 23	29 21
9 90	26 21
18 70	20 44
25 50	15 40
40 70	5 07
52 25	1 216
63 70	1 243
73 64	2 915

(Wirth, Z anorg 1913, 79 361)

Hydrous salt is scarcely sol in alcohol
 (Berzelius)

Min *Alumogen*

+ $27\text{H}_2\text{O}$ Efflorescent (Margueritte-
 Delarcharbonny, C R 99 800)

Aluminum sulphate, acid, $\text{Al}_2\text{O}_3, 4\text{SO}_3 +$
 $4\text{H}_2\text{O}$

Extremely slowly sol in cold, more rapidly
 in hot H_2O (Baud, C R 1903, 137 493)

$\text{Al}_2\text{O}_3, 6\text{SO}_3 + 10\text{H}_2\text{O}$ Sol in H_2O , solu-
 tion soon decomp into $\text{Al}_2(\text{SO}_4)_3 + \text{H}_2\text{SO}_4$
 (Silberberger, M 1904, 25 221)

Aluminum ammonium sulphate (Ammonia
 alum), $(\text{NH}_4)_2\text{Al}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

100 pts H_2O dissolve 2.9 pts anhydrous
 salt at 0° , 207.7 pts anhydrous salt at 110.6°
 (Mulder)

100 pts H_2O dissolve 8.74 pts anhydrous
 salt at 17.5° (Pohl, W A B 6 597)

100 pts H_2O at t° dissolve pts
 $(NH_4)_2Al_2(SO_4)_4$

t°	Pts $(NH_4)_2Al_2(SO_4)_4$	Pts $(NH_4)_2Al_2(SO_4)_4 + 24H_2O$
0	2 10	3 90
10	4 99	9 52
20	7 74	15 13
30	10 94	22 01
40	14 88	30 92
50	20 09	44 11
60	26 70	66 65
70	35 11	90 67
80	45 66	134 47
90	58 68	209 31
100	74 53	357 48

(Poggiale, A ch (3) 8 467)

According to Locke (Am Ch J 1901, 26 174), Poggiale's tables for NH_4 and K alums are evidently transposed, and the above data are applied by Poggiale to K alum

1 l H_2O dissolves 91.9 g anhydrous, or 191.9 g hydrated salt, or 0.387 mols anhydrous salt at 25° (Locke, Am Ch J 1901, 26 175)

Solubility in H_2O at t°

t	G $(NH_4)_2Al_2(SO_4)_4$ per 100 g H_2O	G $(NH_4)_2Al_2(SO_4)_4 + 24H_2O$ per 100 g H_2O	G mol $(NH_4)_2Al_2(SO_4)_4$ per 100 g H_2O
0	2 10	3 90	0 0044
5	3 50	6 91	0 0074
10	4 99	9 52	0 0105
15	6 25	12 66	0 0132
20	7 74	15 13	0 0163
25	9 19	19 19	0 0194
30	10 94	22 01	0 0231
40	14 88	30 92	0 0314
50	20 10	44 10	0 0424
60	26 70	66 65	0 0569
95	109 7	00	0 2312

(Mulder, Poggiale Locke, Marino, Gazz ch it 1905, 35 II, 351, Berkeley, Trans Roy Soc 1904, 203 A, 214 calc by Seidell solubilities)

B-pt of sat solution is 110.6°

M-pt of $(NH_4)_2Al_2(SO_4)_4 + 24H_2O = 92^\circ$ (Tilden, Chem Soc 45 409), $= 95^\circ$ (Locke, l c)

Sp gr of aqueous solution at 15° containing

3% 6% 9%
 1 0423 1 0141 1 0282 hydrous salt

(Gerlach, Z anal 28 495)

Solubility of NH_4 alum in presence
 $(NH_4)_2SO_4$ and $Al_2(SO_4)_3$

Mixture used	100 g sat solution contains	
	g $(NH_4)_2SO_4$	g Al $(SO_4)_3$
Sat NH_4 alum at 18.5°	1 42	3
20 cc above solution + 6 g cryst $Al_2(SO_4)_3$	0 45	16
20 cc above solution + 4 g $(NH_4)_2SO_4$	20 81	0

(Rudorff, 1885, B 18 1160)

Insol in alcohol (Mulder)

Solubility of $Al(NH_4)(SO_4)_2 + 12H_2O$ mixture of 93.3 g H_2O and 23.33 g glycerine = 6.15 g (Dunlop, Pharm J 1910, 81 6)
 Solubility in 93.3 g H_2O + 23.3 g glycerine + 3.9 g phenol = 5.59 g $Al(NH_4)(SO_4)_2 + 12H_2O$ (Dunlop)
 Min *Tschermakite*

Aluminum ammonium chromium sulphate
 $Al_2(SO_4)_3, (NH_4)_2SO_4, Cr_2(SO_4)_3 + 48H_2O$

Sol in H_2O , decomp by boiling (A 94 71)

Aluminum caesium sulphate, $Al_2Cs_2(SO_4)_4 + 24H_2O$

100 pts H_2O at 17° dissolve 0.61 pt caesium alum (Redtenbacher, J 1 94 442)

Solubility in 100 pts H_2O at t° (calculated for salt dried at 130°)

t	Pts alum	t	Pts alum	t	ts um
0	0 19	25	0 49	65	38
10	0 29	35	0 69	80	29
17	0 38	50	1 235		

(Setterberg, A 211 104)

Solubility in H_2O

t	Pts anhydrous salt per litre	G anhydrous salt per li
25	4 7	0 01
30	5 89	0 01
35	7 29	0 02
40	9 00	0 02

(Locke, Am Ch J 1901, 26 180)

Solubility of $\text{Al}_2\text{Cs}_2(\text{SO}_4)_4$ in H_2O at t°
 G $\text{Al}_2\text{Cs}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$ in 100 g solution)

t°	% salt	t°	% salt
0	0 21	75	4 12
15	0 35	80	5 21
30	0 60	90	9 50
45	1 04	100 4	18 60
60	1 96		

Berkeley, Trans Roy Soc 1904, 203 A, 214)

Solubility in 100 g H_2O at t°

t°	G $\text{AlCs}(\text{SO}_4)_2$	t°	G $\text{AlCs}(\text{SO}_4)_2$	t°	G $\text{AlCs}(\text{SO}_4)_2$	t°	G $\text{AlCs}(\text{SO}_4)_2$
0	0 19	26	0 50	52	1 45	78	5 15
1	0 20	27	0 51	53	1 51	79	5 40
2	0 21	28	0 52	54	1 58	80	5 78
3	0 22	29	0 55	55	1 65	81	6 05
4	0 23	30	0 57	56	1 71	82	6 4
5	0 24	31	0 59	57	1 77	83	6 7
6	0 25	32	0 60	58	1 86	84	7 0
7	0 26	33	0 62	59	1 92	85	7 4
8	0 27	34	0 65	60	2 06	86	7 7
9	0 28	35	0 69	61	2 14	87	8 0
10	0 29	36	0 72	62	2 25	88	8 3
11	0 30	37	0 75	63	2 37	89	8 6
12	0 31	38	0 77	64	2 50	90	8 8
13	0 32	39	0 80	65	2 65	91	9 0
14	0 34	40	0 85	66	2 78	92	9 2
15	0 35	41	0 87	67	2 96	93	9 5
16	0 36	42	0 91	68	3 13	94	9 9
17	0 38	43	0 96	69	3 34	95	10 1
18	0 39	44	1 01	70	3 50	96	10 4
19	0 40	45	1 06	71	3 67	97	10 8
20	0 41	46	1 10	72	3 85	98	11 1
21	0 42	47	1 17	73	4 07	99	11 5
22	0 43	48	1 21	74	4 30	100	12 0
23	0 45	49	1 27	75	4 50		
24	0 47	50	1 30	76	4 72		
25	0 49	51	1 39	77	4 95		

Values from $0-7^\circ$ obtained by interpolation using Setterberg's values for 0° (A 1882, 211 100)

From $80-100^\circ$ they were calculated by extrapolation

(Hart and Huselton, J Am Chem Soc 1914, 36 2084)

Melts in crystal H_2O at 106° (Tilden, Chem Soc 45 409), at 120.5° (Erdmann), at 122° (Locke)

Aluminum calcium sulphate, basic, Al_2O_3 , 6CaO , $3\text{SO}_3 + 32\text{H}_2\text{O}$

Min *Etringite* Mostly sol in H_2O , sol in $\text{HCl} + \text{Aq}$

Aluminum chromium sulphate, $\text{Al}_2\text{Cr}_2(\text{SO}_4)_6$
 Insol in H_2O
 $\text{Al}_2\text{Cr}_2(\text{SO}_4)_6 \cdot \text{H}_2\text{SO}_4$ Insol in H_2O (Étard C R 86 1400)

Aluminum chromium potassium sulphate, $\text{Al}_2(\text{SO}_4)_3$, $\text{Cr}_2(\text{SO}_4)_3$, $2\text{K}_2\text{SO}_4 + 48\text{H}_2\text{O}$
 Sol in H_2O , but decomp on boiling (Vohl)

Aluminum copper sulphate, $2\text{Al}_2\text{O}_3$, 9CuO , $3\text{SO}_3 + 21\text{H}_2\text{O}$
 Min *Cyanotrichite* (Percy, Phil Mag (3) 36 103)

Aluminum hydroxylamine sulphate, $\text{Al}_2(\text{SO}_4)_3$, $(\text{NH}_2\text{OH})_2\text{SO}_4 + 24\text{H}_2\text{O}$
 Sol in H_2O (Meyerinhg, B 10 1946)

Aluminum iron (ferrous) sulphate, $\text{Al}_2(\text{SO}_4)_3$, $\text{FeSO}_4 + 24\text{H}_2\text{O}$
 Sol in H_2O (Klauser, A 14 261)

Min *Halotrichite*
 $\text{Al}_2(\text{SO}_4)_3$, $2\text{FeSO}_4 + 27\text{H}_2\text{O}$ Sol in H_2O (Berthier)
 Al_2O_3 , 2SO_3 , 6FeSO_4 Easily sol in H_2O (Phillips)
 $\text{Al}_2(\text{SO}_4)_3$, 2FeSO_4 , H_2SO_4 Insol in H_2O (Étard, C R 87 602)

Aluminum iron (ferric) sulphate, $\text{Al}(\text{SO}_4)_3$, $\text{Fe}_2(\text{SO}_4)_3$
 Insol in H_2O (Étard, C R 86 1399)
 $\text{Al}_2(\text{SO}_4)_3$, $\text{Fe}_2(\text{SO}_4)_3$, H_2SO_4 As above (Étard)
 See $\text{Al}_2(\text{SO}_4)_3 + \text{Fe}(\text{SO}_4)_3$, under $\text{Al}_2(\text{SO}_4)_3$ and $\text{Fe}_2(\text{SO}_4)_3$

Aluminum ferrous potassium sulphate, $\text{Al}_2(\text{SO}_4)_3$, 12FeSO_4 , $2\text{K}_2\text{SO}_4 + 24\text{H}_2\text{O}$
 Permanent Sl sol in H_2O (Dufrenoy)

Aluminum lead sulphate, $\text{AlPb}_2(\text{SO}_4)_5 + 20\text{H}_2\text{O}$
 Permanent, insol in H_2O (G H Bailey J Chem Soc Ind 6 415)

Aluminum lithium sulphate, $\text{LiAl}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

Sol in 24 pts cold, and 0.87 pt hot H_2O (Kralovanský, Schw J 54 349)
 Does not exist (Rammelsberg, J B 1847-48 394, Arfvedson, Gmelin)

Aluminum lithium potassium sulphate (?)
 Sol in H_2O , from which it crystallises on cooling (Joss, J pr 1 142)

Aluminum magnesium sulphate, MgSO_4 , $\text{Al}_2(\text{SO}_4)_3 + 22\text{H}_2\text{O}$

Min *Pickeringite*
 2MgSO_4 , $\text{Al}_2(\text{SO}_4)_3 + 22\text{H}_2\text{O}$ Min *Prorulumite*
 3MgSO_4 , $\text{Al}_2(\text{SO}_4)_3 + 36\text{H}_2\text{O}$ Very sol in H_2O (Klauser, A 14 264)

Aluminum magnesium manganous sulphate,
 $\text{Al}_2(\text{SO}_4)_3, \text{MgSO}_4, \text{MnSO}_4 + 25\text{H}_2\text{O}$

As sol in H_2O as K alum (Kane) Very
 sol in H_2O (Smith, Sil Am J (2) 18 379)
 Min *Bosjemanite*

Aluminum manganous sulphate, $\text{Al}_2(\text{SO}_4)_3,$
 $\text{MnSO}_4 + 25\text{H}_2\text{O}$

Sol in H_2O (Berzelius)
 + $24\text{H}_2\text{O}$ Min *Apjohnite*

Aluminum manganic sulphate, $2\text{Al}_2(\text{SO}_4)_3,$
 $\text{Mn}_2(\text{SO}_4)_3$

Insol in H_2O (Étard, C R 86 1399)

Aluminum nickel sulphate, $\text{Al}_2(\text{SO}_4)_3, 2\text{NiSO}_4,$
 H_2SO_4

Insol in H_2O , but gradually decomp
 thereby (Étard, C R 87 602)

Aluminum potassium sulphate, basic,
 $3(\text{Al}_2\text{O}_3, \text{SO}_3), \text{K}_2\text{SO}_4 + 6\text{H}_2\text{O} = \text{K}_2\text{SO}_4,$
 $3\text{Al}_2(\text{SO}_4)_3(\text{OH})_4$

Min *Alumite* Insol in H_2O Insol in
 conc $\text{HCl} + \text{Aq}$

Sol in boiling H_2SO_4 of 1 845 sp. gr, but
 more easily in a mixture of 12 g H_2SO_4 and
 15 g H_2O , and also in weaker acids, if heated
 to 210° (Mitscherlich, J pr 81 108)

+ $9\text{H}_2\text{O}$ Min *Louvirite* Sol in boil-
 ing $\text{HCl} + \text{Aq}$ (Mitscherlich, J pr 83 455)

Nearly insol in HCl or conc $\text{HNO}_3 + \text{Aq}$,
 but sol in a mixture of 1 pt H_2SO_4 and 1 pt
 H_2O (Debray, Bull Soc (2) 7 9)

$\text{Al}_2\text{O}(\text{SO}_4)_2, \text{K}_2\text{SO}_4$ Sol in H_2O , but de-
 comp by heating

With varying composition Precipitates
 Insol in H_2O Very sl sol in cold, gradually
 in hot acids (Bley, J pr 39 17) Very
 difficultly sol in warm conc $\text{HCl} + \text{Aq}$, but
 easily sol in $\text{KOH} + \text{Aq}$ (Naumann, B 8
 1630)

Aluminum potassium sulphate (Potash alum),
 $\text{KAl}(\text{SO}_4)_2 + 12\text{H}_2\text{O}$ or $\text{K}_2\text{Al}_2(\text{SO}_4)_4 =$
 $\text{K}_2\text{SO}_4, \text{Al}(\text{SO}_4)_3 + 24\text{H}_2\text{O}$

Sol in H_2O with absorption of heat
 When 100 pts H_2O at 10.8° are mixed with
 14 pts alum, the temp is lowered 1.4°
 (Rudorff, B 2 68)

Burnt alum is very slowly sol in H_2O

100 pt H_2O at t° dissolve P pts $\text{K}_2\text{Al}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

t	P	t	P
12 °	7 6	50 0	46 7
21 °	10 4	62 °	230 0
25 °	22 0	75 °	920 0
37 °	44 1	87 °	1566 6

(Brand s 1822)

Sol in 15 pt cold and 16 pts boiling H_2O (Four-
 croix) in 14 12 pts cold and 0 75 pt boiling H_2O
 (Bergmann) in 15 pts cold and 0 75 pt boiling H_2O
 (Dumas) in 11 7 pts H_2O at 15.75° (Abl)

100 pt H_2O dissolve 14 79 pts alum at 15.56° and
 133 33 pts at 100° (Lres Diet)

$\text{KAl}(\text{SO}_4)_2 + \text{Aq}$ sat at 15° contains 10 9 9 pts alum
 in every 100 pts H_2O (Miehl and Kuff)

$\text{KAl}(\text{SO}_4)_2 + \text{Aq}$ sat in cold contains 5 2% alum
 (Fourcroix) 6 7% (Boerhave)

100 pts H_2O dissolve (a) pts anhy-
 alum, and (b) pts crystallised at t°

	0°	10°	20°	30°	40°	50°
a	2 62	4 50	6 57	9 05	12 35	15 9
b	5 22	9 16	13 66	19 29	27 3	35 5

	60°	70°	80°	90°	100°
a	21 1	26 95	35 2	50 3	70
b	51 3	71 97	103 1	187 8	421

(Poggiale, A ch (3) 8 467)

According to Locke (Am Ch J 190 26
 174), Poggiale's tables for NH_4 and K are
 evidently transposed, and the data
 are applied by Poggiale to NH_4 al-

100 pts H_2O dissolve $\text{K}_2\text{Al}_2(\text{SO}_4)_4 + 2$
 corresponding to pts anhy-
 $\text{K}_2\text{Al}_2(\text{SO}_4)_4$

Temp	Pts $\text{K}_2\text{Al}_2(\text{SO}_4)_4$	Temp	Pts $\text{KAl}_2(\text{SO}_4)_3$
0	3 0	60	25
5	3 5	70	40
10	4 0	80	71
15	5 0	90	109
20	5 9	92 5	119
30	7 9	100	154
40	11 7	110	200
50	17 0	111 9	210

(Mulder, Scheik Verhandel 1864 9)

100 pts H_2O at 17° dissolve 13 pts
 $\text{K}_2\text{Al}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$, or 7 36 pts $\text{K}_2\text{Al}_2(\text{SO}_4)_4$
 (Redtenbacher, J pr 94 442)

Forms supersaturated solutions very easily
 Supersat solutions are brought to crystal-
 lization by addition of a crystal of alum or
 isomorphous substance, as chrome or
 alum Other substances as NaCl , etc have
 no action (Thomson, Chem Soc 35 99)

1 l H_2O dissolves 72 3 g anhydro,
 138 4 g hydrated salt, or 0 28 g m
 anhydrous salt at 25° (Locke, Am Ch
 J 1901, 26 175)

Solubility in H_2O at t°
 (g alum in 1000 g H_2O)

t°	g alum	t	g alum
0	57 0	75	1280
5	76 3	76	1412
10	84 9	77	1517
15	103 6	78	1680
20	120 3	79	1775
25	131 3	80	1950
30	184 9	82	2273
36	204 3	84	2661
40	250 0	84 6	2816
45	290 2	85 1	3166
50	367 8	85 3	3337
55	457 7	85 6	3372
60	585 4	86	3997
65	708 4	87	4825
70	943 8	88	6639

(Marino, Gazz ch it 1905, 35 (2) 1)

Solubility in H₂O at t°

t°	g K ₂ Al ₂ (SO ₄) ₄ per 100 g H ₂ O	g K ₂ Al ₂ (SO ₄) ₄ +24H ₂ O per 100 g H ₂ O	g mol K ₂ Al ₂ (SO ₄) ₄ per 100 g H ₂ O
0	3 0	5 65	0 0058
5	3 5	6 62	0 0038
10	4 0	7 60	0 0077
15	5 0	9 59	0 0097
20	5 9	11 40	0 0114
25	7 23	14 14	0 0140
30	8 39	16 58	0 0162
40	11 70	23 83	0 0227
50	17 00	36 40	0 0329
60	24 75	57 35	0 0479
70	40 00	110 5	0 0774
80	71 0	321 3	0 01374
90	109 0	2,275 0	0 2110
92 5	119 0	∞	0 2318

(Mulder, Poggiale, Locke, Marino, Gazz ch it 1905, **35** (2) 351, and Berkeley, Proc Roy Soc 1904, **203** A, 214, calc by Seidell, Solubilities, 1st Ed.)

M-pt of K₂Al₂(SO₄)₄+24H₂O=84 5° (Tilden, Chem Soc **45** 409), =92 5° (Erdmann), =91° (Locke)

Sp gr of sat K₂Al₂(SO₄)₄+Aq at 8°=1 045 (Anthon), at 15°=1 0488 (Michel and Krafft), at 15°=1 0456 (Stolba)

Sp gr of K₂Al₂(SO₄)₄+Aq at 15° containing 5% K₂Al₂(SO₄)₄=1 0477 (Kohlrausch, W Ann **1879** 1)

Sp gr of K₂Al₂(SO₄)₄+Aq at 15° a=pts K₂Al₂(SO₄)₄+24H₂O in 100 pts solution, b=pts K₂Al₂(SO₄)₄ in 100 pts solution, c=pts K₂Al₂(SO₄)₄ for 100 pts H₂O

a	b	c	Sp gr
4	2 1792	2 2277	1 0210
8	4 3584	4 5570	1 0420
12	6 5376	6 9950	1 0641
13	7 083	7 622	1 0690

(Gerlach, Z anal **27** 280)

Saturated solution boils at 111 9°, and contains 210 6 pts K₂Al₂(SO₄)₄+24H₂O to 100 pts H₂O (Mulder)

100 pts H₂O contain 52 pts K₂Al₂(SO₄)₄, and boils at 104 5° (Griffiths) Crust forms at 106 3°, when the solution contains 114 2 pts K₂Al₂(SO₄)₄ to 100 pts H₂O (Gerlach, Z anal **26** 426)

B-pt of K₂Al₂(SO₄)₄+Aq containing pts K₂Al₂(SO₄)₄ to 100 pts H₂O

B pt	Pts K ₂ Al(SO ₄) ₄	B pt	Pts K ₂ Al(SO ₄) ₄
100 5°	17 0	104 0°	83 9
101 0	30 2	104 5	90 7
101 5	41 8	105 0	97 6
102 0	51 6	105 5	103 9
102 5	60 4	106 0	110 5
103 0	68 7	106 5	116 9
103 5	76 7	106 7	120 55

(Gerlach, Z anal **26** 435)

K₂Al₂(SO₄)₄+Al₂(SO₄)₃
K₂Al₂(SO₄)₄ is nearly insol in sat Al₂(SO₄)₃+Aq (Crum, A **89** 156)

Solubility in Al₂(SO₄)₃+Aq Solhd Phase=K alum+Al₂(SO₄)₃

t°	g Al ₂ (SO ₄) ₃ +18H ₂ O in 1000 g H ₂ O	g K ₂ SO ₄ in 1000 g H ₂ O
0	234 73	23 45
20	824 25	30 85
35	911 02	35 29
50	1,243 21	59 55
65	1,598 00	119 43
77	1,872 11	183 80

(Marino, Gazz ch it 1905, **35** (2) 351)

Solubility is decreased by presence of Na alum (Venable, C N 1879, **40** 198)

Nearly completed pptd from sat aq solution by addition of Fe or Cr alum (v Hauer, J B **1866** 59)

K₂Al₂(SO₄)₄+MgSO₄

K₂Al₂(SO₄)₄+Aq sat at 10° and then sat with MgSO₄ at 9°, contains for 100 pts H₂O—

	At 10		At 9
Alum (anhydrous)	4 0	2 7	
MgSO ₄		31 2	31 1
		33 9	

(Mulder)

K₂Al₂(SO₄)₄+K₂SO₄

K₂Al₂(SO₄)₄+Aq at 10°, and then sat with K₂SO₄ at same temp, contains for 100 pts H₂O—

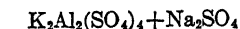
	At 10		At 9°
Alum (anhydrous)	4 0	0 86	
K ₂ SO ₄		9 16	9 7
		10 20	

(Mulder)

Solubility in $K_2SO_4 + Aq$ Solid phase =
K alum + K_2SO_4

t°	Al (SO ₄) ₃ + 18H ₂ O in 1000 g H ₂ O	g K ₂ SO ₄ in 1000 g H ₂ O	t°	Al (SO ₄) ₃ + 18H ₂ O in 1000 g H ₂ O	g K ₂ SO ₄ in 1000 g H ₂ O
0	5 06	75 83	40	73 88	163 10
5	8 658	75 18	50	126 00	195 40
10	16 07	85 78	60	249 70	238 80
15	18 52	96 50	70	529 01	323 74
30	20 56	109 30	80	1,044 04	517 27
	39 60	147 80			

(Marino, l c)



$K_2Al_2(SO_4)_4 + Aq$ sat at 10°, and then sat
with Na_2SO_4 at 9°, contains for 100 pts
H₂O—

	At 10		At 9
Alum (anhydrous)	4 0	4 1	
Na ₂ SO ₄		8 8	8 4
		12 9	

(Mulder)

Solubility of $K_2Al(SO_4)_3 + Ti_2Al_2(SO_4)_4$ in
H₂O at 25°

G K ₂ Al(SO ₄) ₃ per l	G TiAl ₂ (SO ₄) ₄ per l	Solid phase Mol % KAl(SO ₄) ₃	Sp gr
69 90	0 00	100	1 0591
74 56	0 48	99 61	1 0601
67 90	1 72	98 48	1 0598
65 30	4 52	95 45	1 0603
64 95	9 60	91 73	1 0605
53 23	18 44	82 54	1 0609
45 32	24 60	75 12	1 0609
38 02	32 48	65 73	1 0611
34 54	35 59	61 36	1 0611
28 35	42 99	51 93	1 0623
10 94	66 12	21 34	1 0654
0 00	75 46	0 00	1 0674

(Foch Z Kryst Min 1897, 28 397)

Insol in alcohol of 0.905 sp gr or less
(Anthon, J p 14 125)

Insol in acetone (Naumann, B 1904,
37 428)

Insol in methyl acetate (Naumann, B
1909, 42 3790)

Solubility in H₂O is increased by glycerine
(Dunlop, Pharm J, 1910, 31 6)

Min *Kalmit*

+8H₂O Stable in dry air (Marino, l c)

+14H₂O Converted into ord alum in
air (Marino)

Aluminum rubidium sulphate, $Al_2Rb_2(SO_4)_4 + 24H_2O$

100 pts H₂O dissolve 2.27 pts at 7°
very sol in hot H₂O (Redtenbacher
pr 94 442)

Solubility in 100 pts H₂O at t° (calculated
for salt dried at 130°)

t°	Pts alum	t°	Pts alum	t°	Pts alum
0	0 71	25	1 85	65	2 3
10	1 09	35	2 67	80	2 10
17	1 42	50	4 98		

(Setterberg, A 211 104)

Solubility in H₂O

t	Pts per litre	G mols anhydrous per litre
25	18 1	0 059
30	21 9	0 072
35	26 6	0 087
40	32 2	0 106

(Locke, Am Ch J 1901, 26 180)

Melts in crystal H₂O at 99° (Tilden,
Chem Soc 45 409), at 105° (Erdmann,
at 109° (Locke))

Aluminum silver sulphate, $Al_2Ag_2(SCO_3)_4 + 24H_2O$

Decomp by H₂O (Church and North
cote, C N 9 155)

Aluminum sodium sulphate, $Al_2Na_2(SCO_3)_4 + 24H_2O$

Very sl efflorescent

Sol in 2.14 pts H₂O at 13° or 100 pts H₂O dissolve
46.7 pts soda alum Sol in 1 pt boiling H₂O (Zellner
Schw J 36 183)

100 pts H₂O dissolve 110 pts at 13° and in a
liquid of 1.296 sp gr (Ur)

100 pts H₂O dissolve 51 pts soda alum at
16° (Augé, C R 110 1139)

100 pts H₂O dissolve 110 pts soda alum
at 0° (Tilden, Chem Soc 45 409)

100 g H₂O dissolve at
10° 15° 20° 25° 30°

36 7 38 7 40 9 43 145 8 g anhydrous salt
(Smith, J Am Chem Soc 1909, 31 47)

M-ppt of $Na_2Al_2(SO_4)_4 + 24H_2O =$
(Tilden, Chem Soc 45 409), = 63° (I ke,
Am Ch J 1901, 26 183)

Insol in absolute alcohol (Zellner
Min *Mendozite*)

Aluminum thallous sulphate, $TlAl(SO_4)_2$

0.177 g mols of anhydrous salt are sol in 1 l H_2O at 25° , or 1 l H_2O dissolves 75 g of the anhydrous, or 117.8 g of the hydrated salt at 25° (Locke, Am Ch J 1901, 26 175)

Solubility in H_2O at t°

t	G $Al_2Tl_2(SO_4)_4$ in 100 g H_2O	G $Al_2Tl(SO_4)_4$ + 24H $_2$ O in 100 g H_2O
0	3 15	4 84
5	3 80	5 86
10	4 60	7 12
20	6 40	10 00
25	7 60	11 95
30	9 38	14 89
40	14 40	23 57
50	22 50	38 41
60	35 36	65 19

(Seidell, Solubilities, 1st Ed, p 15)

$3Al_2(SO_4)_3, Tl_2SO_4 + 96H_2O$ Sol in H_2O (Lamy)

Aluminum zinc sulphate, $Al_2(SO_4)_3, ZnSO_4 + 24H_2O$

Sol in H_2O (Kane)

Aluminum sulphate chromium chloride, $Al(OH_2)_6(SO_4)_2CrCl_2(OH_2)_4 + 2H_2O$

(Werner, B 1906, 39 337)

Aluminum sulphate sodium fluoride

Decomp by H_2O (Weber, Dingl 263 112)

Ammonium sulphate, $(NH_4)_2SO_4$

Sol in H_2O with absorption of heat
75 pts $(NH_4)_2SO_4$ mixed with 100 pts H_2O lower the temperature from 13.2° to 6.8° , that is, 6.4° (Rudorff, B 2 68)

Sol in 1.31 pts H_2O at 19° (Schuff A 109 326)
Sol in 2 pts H_2O at 18.7° (Abl)
Sol in 2 pts H_2O at 15.6° and in 1 pt boiling H_2O (Foureroy)
100 pts H_2O at 62.6° dissolve 78 pts $(NH_4)_2SO_4$ (Wenzel)
100 pts H_2O at 15° dissolve 66.739 pts $(NH_4)_2SO_4$ (Michel and Krafft)

Sol in 1.3 pts cold H_2O (Vogel, N Rep Pharm 10 9)

Sol in 1.37 pts cold H_2O at 10° (Mulder, J B 1866 67)

Sol in 1.34 pts H_2O at $16-17^\circ$ (v Hauer, W A B 53, 2 221)

100 pts H_2O dissolve at

0°	10°	20°	30°	
71 00	73 65	76 30	78 95	pts $(NH_4)_2SO_4$
40°	50°	60°	70°	
81 60	84 25	86 90	89 55	pts $(NH_4)_2SO_4$
	80°	90°	100°	
92 20	94 85	97 50		pts $(NH_4)_2SO_4$

(Alluard, C R 59 500)

Solubility in 100 pts H_2O at t°

t°	Pts $(NH_4)_2SO_4$	t°	Pts $(NH_4)_2SO_4$	t°	Pts $(NH_4)_2SO_4$
0	70 6	37	80 1	74	93 1
1	70 9	38	80 4	75	93 4
2	71 1	39	80 7	76	93 8
3	71 4	40	81 0	77	94 2
4	71 6	41	81 3	78	94 5
5	71 8	42	81 7	79	94 9
6	72 1	43	82 0	80	95 3
7	72 3	44	82 3	81	96 6
8	72 5	45	82 7	82	96 0
9	72 8	46	83 0	83	96 4
10	73 0	47	83 3	84	96 8
11	73 2	48	83 7	85	97 2
12	73 5	49	84 0	86	97 6
13	73 7	50	84 4	87	98 0
14	74 0	51	84 7	88	98 4
15	74 2	52	85 1	89	98 8
16	74 4	53	85 5	90	99 2
17	74 7	54	85 8	91	99 6
18	74 9	55	86 2	92	100 0
19	75 1	56	86 6	93	100 4
20	75 4	57	86 9	94	100 8
21	75 7	58	87 3	95	101 2
22	75 9	59	87 7	96	101 6
23	76 2	60	88 0	97	102 1
24	76 4	61	88 4	98	102 5
25	76 7	62	88 7	99	102 9
26	76 9	63	89 1	100	103 3
27	77 2	64	89 5	101	103 8
28	77 5	65	89 9	102	104 2
29	77 8	66	90 2	103	104 6
30	78 0	67	90 6	104	105 1
31	78 3	68	90 9	105	105 5
32	78 6	69	91 3	106	106 0
33	78 9	70	91 6	107	106 5
34	79 2	71	92 0	108	107 0
35	79 5	72	92 4	108 9	107 5
36	79 8	73	92 7		

(Mulder, calculated from his own and other observations, Scheik Verhandel 1864 60)

100 g $(NH_4)_2SO_4 + Aq$ contain 41.4 g $(NH_4)_2SO_4$ at 0° (de Waal, Dissert 1910),
44.27 g at 30° (Schreinemakers, Z phys Ch 71 110), 47.81 g at 70° (de Waal)
 $(NH_4)_2SO_4 + Aq$ sat at 15° has sp gr 1.248
(Michel and Krafft, A ch (3) 41 471)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 15°					
% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr
1	1 0057	18	1 1035	35	1 2004
2	1 0115	19	1 1092	36	1 2060
3	1 0172	20	1 1149	37	1 2116
4	1 0230	21	1 1207	38	1 2172
5	1 0287	22	1 1265	39	1 2228
6	1 0345	23	1 1323	40	1 2284
7	1 0403	24	1 1381	41	1 2343
8	1 0460	25	1 1439	42	1 2402
9	1 0518	26	1 1496	43	1 2462
10	1 0575	27	1 1554	44	1 2522
11	1 0632	28	1 1612	45	1 2583
12	1 0690	29	1 1670	46	1 2644
13	1 0747	30	1 1724	47	1 2705
14	1 0805	31	1 1780	48	1 2766
15	1 0862	32	1 1836	49	1 2828
16	1 0920	33	1 1892	50	1 2890
17	1 0977	34	1 1948		

(Schiff, calculated by Gerlach, Z anal 8 280)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 15°					
% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr
5	1 0292	20	1 1160	31	1 1787
10	1 0381	30	1 1730		

(Kohlrausch, W Ann 1879 1)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 15°					
% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr
3	1 0181	10	1 0600	30	1 1773
6	1 0359	20	1 1190	40	1 2352

(Gerlach, Z anal 28 493)

Sp gr of sat solution = 1 248 (Gerlach)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$	
$\frac{1}{2}(\text{NH}_4)_2\text{SO}_4$ g mol in 1000 g of solution	Sp gr $16^\circ/16^\circ$
0	1 000000
0 5514	1 000347
1 1251	1 000704
2 3114	1 001436
4 5840	1 002823
10 0893	1 006093
20 0138	1 012023
40 5236	1 024117
56 8536	1 033690

(Dijken, Z phys Ch 1897, 24 107)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 20°		
Normality of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$	% $(\text{NH}_4)_2\text{SO}_4$	Sp gr
3 75	40 28	1 228
2 964	32 99	1 184
1 978	23 01	1 13
0 876	10 88	1 06
0 492	6 275	1 03

(Forchheimer, Z phys Ch 1900, 34 22)

Sp gr of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 20°			
Solution	Sp gr	weight of 10 ccm of the solution	(NH) ₂ SO ₄
sat	1 248	12 5062 g	5 2
$\frac{3}{4}$ "	1 196	11 9034 "	3 9
$\frac{1}{2}$ "	1 139	11 3377 "	2 6
$\frac{1}{4}$ "	1 077	10 7232 "	1 3
$\frac{1}{8}$ "	1 039		65

(Wiener, Z phys Chem 1911, 71 1)

B-pt of sat solution crust forms at 106.2° solution containing 88.2 pts $(\text{NH}_4)_2\text{SO}_4$ to 100 pts H_2O , highest mp observed, 108.2° (Gerlach, Z anal 26 126)

B-pt of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ containing pts $(\text{NH}_4)_2\text{SO}_4$ to 100 pts H_2O

B pt	Pts $(\text{NH}_4)_2\text{SO}_4$	B pt	Pts $(\text{NH}_4)_2\text{SO}_4$
100 5°	7 8	105 0°	71
101 0	15 4	105 5	78
101 5	22 8	106 0	85
102 0	30 1	106 5	92
102 5	37 2	107 0	99
103 0	44 2	107 5	105
103 5	51 1	108 0	112
104 0	58 0	108 2	115
104 5	64 9		

(Gerlach, Z anal 26 431)

Sol with decomp in $\text{HCl} + \text{Aq}$

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

100 g of the solution contain		Solid phase
Mol H_2SO_4	Mol $(\text{NH}_4)_2\text{SO}_4$	
0 00	2 28	$(\text{NH}_4)_2\text{SO}_4$
0 24	3 25	
0 47	3 19	
0 97	3 15	
1 19	3 15	
1 43	3 22	$(\text{NH}_4)_2\text{H}(\text{SO}_4)_2$
1 72	3 18	
2 20	3 02	
2 60	2 97	
2 71	3 00	
2 82	3 03	
2 96	3 10	
3 20	3 19	
3 32	3 25	
3 47	3 32	$(\text{NH}_4)\text{HSO}_4$
3 54	3 20	
3 76	2 84	
4 22	2 26	
5 09	1 44	

(D'Ans, Z anorg 1909, 65 229)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 30°

Composition of the solution			Solid phase
% by wt H_2SO_4	% by wt $(\text{NH}_4)_2\text{SO}_4$	% by wt H_2O	
10 63	43 59	45 79	$(\text{NH}_4)_2\text{SO}_4$
10 70	43 25	46 05	
13 18	44 10	42 72	
16 67	42 06	41 27	$(\text{NH}_4)_2\text{SO}_4 + 3(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$
25 82	41 15	33 03	
27 33	41 16	31 51	
32 32	44 63	22 26	$(\text{NH}_4)\text{HSO}_4$
33 12	45 50	21 83	
33 84	45 52	20 64	
33 96	45 31	20 73	
38 51	35 37	26 12	
42 12	30 10	27 78	
45 80	24 88	29 32	
45 77	24 30	29 93	
56 55	16 98	26 37	
62 43	20 41	17 16	
62 46	24 40	13 14	
63 12	24 20	12 68	
62 57	27 67	9 76	
62 83	29 75	8 42	
62 56	30 26	7 28	
62 67	31 86	5 47	
62 59	33 70	3 71	
61 63	36 75	1 72	
62 23	36 95	0 82	

(Van Dorp, Z phys Ch 1910, 73 285)

Solubility of $(\text{NH}_4)_2\text{SO}_4$ in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

In 1000 g of the solution		Solid phase
Mol SO_3	Mol $(\text{NH}_4)_2\text{SO}_4$	
4 29	2 17	$(\text{NH}_4)\text{HSO}_4$
4 57	1 83	
4 85	1 60	
5 25	1 36	
5 66	1 22	
6 16	1 26	$(\text{NH}_4)\text{HSO}_4$
6 47	1 55	
6 51	1 95	
6 50	2 37	
6 43	2 50	
7 28	1 64	$(\text{NH}_4)\text{HSO}_4 + (\text{NH}_4)\text{H}_2(\text{SO}_4)_2$
7 99	1 38	
(7 60)	(1 74)	
(8 00)	(1 42)	
9 02	0 96	
9 21	0 832	$(\text{NH}_4)\text{HS}_2\text{O}_7$
9 60	0 977	
9 68	1 00	
9 67	1 26	$(\text{NH}_4)\text{HS}_2\text{O}_7 + ?$
10 43	0 894	

(D'Ans, Z anorg 1913, 80 241)

Very easily sol, even in conc $\text{NH}_4\text{OH} + \text{Aq}$ (Girard, Bull Soc (2) 43 522)Solubility of $(\text{NH}_4)_2\text{SO}_4$ in $\text{NH}_4\text{OH} + \text{Aq}$ at 25°

In 1000 g of the solution	
Mol $(\text{NH}_4)_2\text{SO}_4$	Mol (NH_3)
3 28	0
2 60	1 02
2 13	1 95
1 59	3 44
1 16	5 35
0 78	7 13
0	9 47

(D'Ans and Schreiner Z anorg 1910, 67 438)

100 pts H_2O dissolve 46.5 pts $(\text{NH}_4)_2\text{SO}_4$ and 26.8 pts NH_4Cl at 21.5° Solubility of $(\text{NH}_4)_2\text{SO}_4$ in $\text{NH}_4\text{Cl} + \text{Aq}$ at 30°

% NH_4Cl	% $(\text{NH}_4)_2\text{SO}_4$	Solid phase
0	44	$(\text{NH}_4)_2\text{SO}_4$
6 86	36 15	$(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4\text{Cl}$
14 62	28 6	
17 60	25 69	
17 93	25 81	
19 07	23 22	
19 97	21 3	NH_4Cl
22 3	16 33	
24 06	12 72	
29 5	0	

(Schreinemakers, Arch Néer Sc 1910, (2) 15 92)

See also under NH_4Cl

$(\text{NH}_4)_2\text{SO}_4 + \text{CuSO}_4$
Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{CuSO}_4$ in H_2O at
 16°

Solution	% CuSO_4	% $(\text{NH}_4)_2\text{SO}_4$
Both salts in excess	8 55	7 12
15 cc sat sol + 3 g $(\text{NH}_4)_2\text{SO}_4$	1 77	18 16
15 cc sat sol + 3 g $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	15 85	5 65

(Rudorff, B 6 482)

Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{CuSO}_4$ in H_2O at
 30°

% $(\text{NH}_4)_2\text{SO}_4$	% CuSO_4	Solid phase
0	20 32	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
2 45	20 19	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O} + \text{CuSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
5 79	20 53	
6 98	16 77	
8 19	13 65	$\text{CuSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
9 33	11 03	
17 53	4 05	
29 27	1 57	$\text{CuSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O} + (\text{NH}_4)_2\text{SO}_4$
38 52	0 77	
43 29	0 49	
44	0	$(\text{NH}_4)_2\text{SO}_4$

(Schreinemakers, Arch Néer Sc 1910, 15 12)

See also under CuSO_4

$(\text{NH}_4)_2\text{SO}_4 + \text{FeSO}_4$

Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{FeSO}_4$ in H_2O at
 30°

Composition of the solution		Solid phase
by wt FeSO_4	by wt $(\text{NH}_4)_2\text{SO}_4$	
24 90	0	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
27 24	7 24	$\text{FeSO}_4 \cdot 7\text{H}_2\text{O} + \text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
27 22	7 95	
27 26	7 89	
23 39	6 44	$\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
17 64	8 90	
15 15	11 45	
7 95	16 29	$\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O} + (\text{NH}_4)_2\text{SO}_4$
7 70	19 64	
1 72	34 24	
0 79	43 86	$(\text{NH}_4)_2\text{SO}_4$
0 79	43 90	
0	44 27	

(Schreinemakers, Z phys Ch 1910, 71 111)

$(\text{NH}_4)_2\text{SO}_4 + \text{Li}_2\text{SO}_4$

Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{Li}_2\text{SO}_4$

Temp = 30°

% $(\text{NH}_4)_2\text{SO}_4$	% Li_2SO_4	Solid phase
44 1	0	$(\text{NH}_4)_2\text{SO}_4$
40 8	3	$(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4\text{LiSO}_4$
39 5	6 6	
30	10	
21 6	15	"
15	20	"
12 5	21 9	$\text{NH}_4\text{LiSO}_4 + \text{Li}_2\text{SO}_4$
8 9	23	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
0	25 1	"

Temp = 50°

45 7	1	$(\text{NH}_4)_2\text{SO}_4$
43 05	5 86	$(\text{NH}_4)_2\text{SO}_4 + \text{NH}_4\text{LiSO}_4$
19 65	16 35	NH_4LiSO_4
13 90	21 20	"
13 97	21 23	$\text{NH}_4\text{LiSO}_4 + \text{Li}_2\text{SO}_4$
11 45	21 75	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
9 63	22 79	"
8 58	23 09	"
7 56	23 86	"
0	24 3	"

(Schreinemakers and Cocheret, Che Weekbl 1905, 2 771)

$(\text{NH}_4)_2\text{SO}_4 + \text{MnSO}_4$

Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{MnSO}_4$ in 100 g per 100 g sat solution

Temp = 30°

MnSO_4	% $(\text{NH}_4)_2\text{SO}_4$	Solid phase
39 3	0	$\text{MnSO}_4 \cdot 5\text{H}_2\text{O}$
38 49	3 64	$\text{MnSO}_4 \cdot 5\text{H}_2\text{O} + \text{MnSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
33 44	4 91	"
22 06	9 65	"
9 02	20 36	"
2 91	37 42	"
1 75	42 58	$\text{MnSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O} + (\text{NH}_4)_2\text{SO}_4$
1 77	43 24	$(\text{NH}_4)_2\text{SO}_4$
0	43 4	"

Temp = 50°

36 26	0	$\text{MnSO}_4 \cdot \text{H}_2\text{O}$
35 35	2 95	$\text{MnSO}_4 \cdot \text{H}_2\text{O} + 2\text{MnSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
30 57	5 14	$2\text{MnSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$
16 86	17 62	"
6 92	35 98	"
6 29	39 71	"
5 70	43 24	$2\text{MnSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 + (\text{NH}_4)_2\text{SO}_4$
3 49	44 02	$(\text{NH}_4)_2\text{SO}_4$
0	45 7	"

(Schreinemakers, Chem Weekbl 1909, 131)

$(\text{NH}_4)_2\text{SO}_4 + \text{K}_2\text{SO}_4$
 100 pts $(\text{NH}_4)_2\text{SO}_4 + \text{K}_2\text{SO}_4 + \text{Aq}$ sat at
 17° contain 38.41 pts of the two salts,
 which 5.45 pts are K_2SO_4 , and 32.96 pts
 $(\text{NH}_4)_2\text{SO}_4$ (v Hauer, J pr 28 137)
 100 pts H_2O dissolve 50.6 pts $(\text{NH}_4)_2\text{SO}_4$
 and 7.2 pts K_2SO_4 at 11° (Mulder, J B
 66 67)
 $(\text{NH}_4)_2\text{SO}_4$ and K_2SO_4 replace each other in
 solution, so that by adding one of these
 salts to a seemingly saturated solution of the
 other, it is dissolved with precipitation of the other
 salt (Rudorff, B 6 485)

Solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{K}_2\text{SO}_4$ at 19.1°

Solution	% K_2SO_4	% $(\text{NH}_4)_2\text{SO}_4$
the salts in excess	39.3	37.97
cc sat sol + 4 g K_2SO_4	4.94	33.26
cc sat sol + 4 g $(\text{NH}_4)_2\text{SO}_4$	2.05	40.80

(Rudorff, B 6 482)

solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{K}_2\text{SO}_4$ in H_2O at
 25°

K_2SO_4 per l	g $(\text{NH}_4)_2\text{SO}_4$ per l	g K_2SO_4 per l	g $(\text{NH}_4)_2\text{SO}_4$ per l
127.9	0.0	59.28	355.0
135.7	115.7	40.27	482.7
84.2	281.1	0.0	542.3

Results are also given for 14°, 15°, 16°, 30°,
 and 47°

(Fock, Z Kryst Min 1897, 28 365)

$(\text{NH}_4)_2\text{SO}_4 + \text{Th}(\text{SO}_4)_2$

solubility of $(\text{NH}_4)_2\text{SO}_4 + \text{Th}(\text{SO}_4)_2$ at 16°

Pts per 100 pts H_2O

	$\text{Th}(\text{SO}_4)_2$	Solubility
13	3.361	$\text{Th}(\text{SO}_4)_2 \cdot 9\text{H}_2\text{O}$
10	5.269	"
12	8.947	"
13	13.330	$\text{Th}(\text{SO}_4)_2 \cdot 9\text{H}_2\text{O} + \text{Th}(\text{SO}_4)_2 \cdot$ $(\text{NH}_4)_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$
10	10.359	$\text{Th}(\text{SO}_4)_2 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$
9	9.821	" + $\text{Th}(\text{SO}_4)_2 \cdot 2(\text{NH}_4)_2\text{SO}_4 \cdot$ $2\text{H}_2\text{O}$
4	6.592	$\text{Th}(\text{SO}_4)_2 \cdot 2(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$
5	5.750	"
8	4.583	$\text{Th}(\text{SO}_4)_2 \cdot 3(\text{NH}_4)_2\text{SO}_4 \cdot 3\text{H}_2\text{O}$
4	1.653	"

(Barre, A ch 1911, (8) 24 239)

Insol in liquid NH_3 (Franklin, Am Ch
 J 1898, 20 826)

Insol in absolute alcohol Sol in 500 pts
 alcohol of 0.872 sp gr, and in 62.5 pts of
 0.905 sp gr (Anthon, J pr 14 125)

Sol in 217.4 pts of 66.8% alcohol (sp gr =
 0.88) at 24.3° (Pohl, J pr 56 219)

Tolerably sol in alcohol, the sp gr of which
 is greater than 0.860 Insol in alcohol of sp
 gr less than 0.850

Solubility in dil alcohol

When $(\text{NH}_4)_2\text{SO}_4$ is dissolved in dil alcohol,
 two layers are formed, the compositions of
 which are as follows

Sp gr	Lower layer 100 ccm contain in g		
	alcohol	water	salt
1.2240		71.43	74.16
1.1775	8.85	68.26	59.54
1.1661	10.62	67.70	56.56
1.1655	11.29	67.34	56.30
1.1735	11.42	66.54	59.20

Sp gr	Upper layer 100 ccm containing		
	alcohol	water	salt
0.9530	41.37	48.47	5.45
0.9512	44.20	45.95	4.97
0.9440	44.27	45.61	4.51
0.9098	52.64	36.78	1.56
0.8750	62.61	24.60	0.30
0.8549	67.04	18.36	0.09
0.8308	77.55	5.53	0.00

(Bodlander Z phys Ch 7 3 8)

Solubility in ethyl alcohol + Aq

Upper layer			
Temp	% H_2O	% alcohol	g salt
16.6°	52.80	40.21	6.99
33.0°	47.99	46.75	7.26
41.8°	47.34	47.67	4.99
55.7°	45.90	49.47	4.63
Lower layer			
16.6°	60.33	10.19	29.48
33.0°	61.02	9.80	29.18
41.8°	61.16	9.74	29.10
55.7°	61.59	9.46	28.95

(Traube, Z phys Ch 1887, 1 509)

Solubility of $(\text{NH}_4)_2\text{SO}_4$ in alcohol at 30°
Two liquid layers are formed between alcohol concentrations of 5.8 and 62%

Composition of layers

Upper layer			Lower layer		
% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O	% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O
2.2	56.6	41.2	37.1	5.8	57.1
2.6	54.5	42.9	35.7	6.3	58
3.4	52.3	44.3	33.8	7.4	58.8
13.2	31.8	55	21.7	18.4	59.9
17	25	58	17	25	58

At concentration of 62% alcohol, the liquid is homogeneous and contains 1.3% $(\text{NH}_4)_2\text{SO}_4$

(Wibaut, Chem Weekbl 1909, 6 401)

Solubility of $(\text{NH}_4)_2\text{SO}_4$ in alcohol at 60°

% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O
43.02	2.32	54.66
41.1	4.1	54.8
1.2	64.5	34.3
0.2	75.5	24.3

Between 41° and 64.5° , two liquid layers are formed

Composition of layers

Upper layer			Lower layer		
% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O	% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O
1.2	64.5	34.3	41.1	4.1	54.8
1.6	60	38.4	36.8	6	57.2
3.8	50	46.2	30.8	9	60.2
7.4	40	52.6	26.6	12	61.4
10	34.4	55.6	23.6	15	61.4

(Schreinemakers, Z phys Ch 1907, 59 641)

Solubility in alcohol + Aq at 0°

% $(\text{NH}_4)_2\text{SO}_4$	% alcohol	% H_2O
41.4	0	58.6
50.0	9.41	60.59
0.14	73.03	26.83

Two layers are formed between alcohol concentrations of 9.41 and 73.03%

(de Waal, Dissert 1910)

Solubility in propyl alcohol + Aq at 20°

% propyl alcohol	% $(\text{NH}_4)_2\text{SO}_4$
20	6.7
30	4.8
40	3.2
50	2.0
60	1.0
70	0.4

(Linebarger, Am Ch J 1892, 14 38)

100 g 95% formic acid dissolve 2 $(\text{NH}_4)_2\text{SO}_4$ at 16.5° (Aschan, Ch Ztg 37 1117)

Insol in acetone (Eidmann, C C 37 1117)

II 1014, Naumann, B 1904, 37 1117

Insol in methyl acetate (Naumann 1909, 42 3790), ethyl acetate (Naumann 1910, 43 314)

Insol in CS_2 (Arcetowski, Z anorg 8 6 257)

Ammonium hydrogen sulphate, NH_4HSO_4

Sl deliquescent Sol in 1 pt cold H₂O (Link)

Very sl sol in alcohol (Gerhardt, (3) 20 255)

Insol in acetone (Naumann, B 9 37 4329, Eidmann, C C 1899, II, 101)

$(\text{NH}_4)_2\text{H}(\text{SO}_4)_2$ Not deliquescent in H_2O (Mitscherlich, Pogg 39 198)

$(\text{NH}_4)_2\text{SO}_4 \cdot 3\text{H}_2\text{SO}_4$ D'Ans and Schreiner 1913, 80 241

Ammonium pyrosulphate, $(\text{NH}_4)_2\text{S}_2\text{O}_8$

Decomp by H_2O (Schulze)
 $\text{NH}_4\text{HS}_2\text{O}_8$ (D'Ans and Schreiner, anorg 1913, 80 241)

Ammonium octosulphate, $(\text{NH}_4)_8\text{S}_8\text{O}_{52}$

Decomp by H_2O (Weber, B 17 4)

Ammonium antimony sulphate, $(\text{NH}_4)_3\text{Sb}_2(\text{SO}_4)_3$

Behaves toward H_2O and abs alcohol a mixture of the components (Mitscherlich anorg 1905, 48 152)

Decomp very slowly by H_2O (Naumann, Arch Pharm 1898, 236 479)

Ammonium bismuth sulphate, $\text{NH}_4\text{Bi}_2\text{S}_2\text{O}_{12} \cdot 4\text{H}_2\text{O}$

Easily sol in HCl , and HNO_3 + sol in conc H_2SO_4 , and hot dil acids decomp by cold HCl , H_2O_2 , and dil H₂SO₄ (Luddecke, A 140 277)

Ammonium cadmium sulphate, $(\text{NH}_4)_2\text{CdSO}_4 \cdot 6\text{H}_2\text{O}$

Can be recrystallised from a little (v Hauer)
1 l H_2O dissolves 723 g anhydrous at 25° (Locke, Am Ch J 1902, 27 5)

$3(\text{NH}_4)_2\text{SO}_4, \text{CdSO}_4 + 10\text{H}_2\text{O}$ (André, C 104 987)

ammonium calcium sulphate,
 $(\text{NH}_4)_2\text{Ca}(\text{SO}_4)_2 + \text{H}_2\text{O}$

Decomp by H_2O (Fassbender, B 11 68)
Sol in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Rose, Pogg 0 292)

This double salt is stable between 0° and 0° in solutions containing an excess of $(\text{H}_4)_2\text{SO}_4$. It is not formed if the solution contains less than 35% $(\text{NH}_4)_2\text{SO}_4$ (Barre, R 1909, 148 1605)

$(\text{SO}_4)_2\text{Ca}_2(\text{NH}_4)_2$ Decomp by H_2O
D'Ans, B 1907, 40 192

This double salt is formed in the presence of an excess of CaSO_4 and at temp above 80° (Barre, C R 1909, 148 1605)

$\text{Ca}_2(\text{NH}_4)_2(\text{SO}_4)_4 + \text{H}_2\text{O}$ Decomp by H_2O
D'Ans, B 1907, 40 192

ammonium calcium cupric sulphate,
 $\text{Ca Cu}(\text{NH}_4)_2(\text{SO}_4)_4 + 2\text{H}_2\text{O}$

Very stable (D'Ans, B 1908, 41 1778)

ammonium calcium potassium sulphate,
 $\text{NH}_4\text{CaK}(\text{SO}_4)_2 + \text{H}_2\text{O}$

Decomp by cold H_2O (Fassbender, B 1968)

ammonium cerous sulphate, $(\text{NH}_4)_2\text{Ce}_2(\text{SO}_4)_4$
 $+ 8\text{H}_2\text{O}$

More sol in cold than in hot H_2O (Czudwicz)

100 g H_2O dissolve at

3° 22 35° 35 1° 45 2°

331 5 328 5 184 4 993 g anhydrous salt,

45° 55 3° 55 2°

2 994 2 240 2 187 g anhydrous salt

75 4° 85 2°

1 482 1 184 g anhydrous salt

(Wolff, Z anorg 1905, 45 102)

$5(\text{NH}_4)_2\text{SO}_4, \text{Cr}_2(\text{SO}_4)_3$ (Barre, C R 10, 151 873)

ammonium ceric sulphate, $3(\text{NH}_4)_2\text{SO}_4,$
 $\text{Ce}(\text{SO}_4)_3 + 4\text{H}_2\text{O}$

Slightly efflorescent. Easily sol in H_2O (Mendeleeff, A 168 50)

$3(\text{NH}_4)_2\text{SO}_4, 2\text{Ce}(\text{SO}_4)_3 + 3\text{H}_2\text{O}$ Sl sol
 H_2O (Mendeleeff)

ammonium chromous sulphate, $\text{NH}_4\text{Cr}(\text{SO}_4)_2$

0.407 g mol anhydrous salt is sol in 1 l O at 25° (Locke, Am Ch J 1901, 26 5)

$+6\text{H}_2\text{O}$ 100 cem of sat aqueous solution contain 55 g of the salt at 20° Insol in H_2O (Laurent, C R 1911, 131 112)

Ammonium chromic sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{Cr}_2(\text{SO}_4)_3$

Not attacked by boiling H_2O or conc HCl
 $+ \text{Aq}$ Very slowly attacked by boiling KOH
 $+ \text{Aq}$ (sp gr = 1.3) Insol in $\text{CrCl}_3 + \text{Aq}$ or
 $\text{SnCl}_2 + \text{Aq}$ (Klobb, Bull Soc (3) 9 664)
 $+ 5\text{H}_2\text{O}$ Is ammonium chromosulphate,
which see

$+ 24\text{H}_2\text{O}$ **Chrome Alum**

Violet modification Efflorescent Sol in cold H_2O , but solution is decomp on heating with formation of green modification. The dil solution of green modification is gradually converted into violet modification by standing. Alcohol ppts it from aqueous solution (Schrotter, Pogg 53 526)

100 cc H_2O dissolve 10.78 g anhydrous, or 21.21 g hydrated salt at 25° . Melts in crystal H_2O at 45° (Locke, Am Ch J 1901 26 174)

Solubility in H_2O

Saturation is very slowly reached owing to transition between violet and green modifications. If time of saturation is taken at $2\frac{1}{2}$ hours, 100 g of the solution contain at

0° 30° 40°

3.77 10.6 15.5 g $(\text{NH}_4)_2\text{Cr}_2(\text{SO}_4)_4$

This is assumed to be the solubility of the violet modification

In 300 hours, 15.96 g salt are dissolved at 30° , and 24.64 g in 250 hours at 40° (Koppel, B 1906, 39 3741)

Calc from electrical conductivity measurements, a solution containing 3.8 g of the sulphate in 100 g contains 48% of the green compound at 40° and 61% at 55° . With solutions of 6-7 times the above concentration equilibrium is reached at 40° with 30-40% green alum (Koppel)

Sp gr of aqueous solution of violet modification at 15° , containing

4 8 12% $(\text{NH}_4)_2\text{Cr}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
1.020 1.0405 1.0610

Sat solution at 15° has sp gr = 1.070 (Geilach)

Green modification Sol in H_2O and alcohol. When in aqueous solution, it gradually changes to violet modification

Sp gr of aqueous solution of green modification at 15° , containing

10 20 30% $(\text{NH}_4)_2\text{Cr}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$,
1.044 1.091 1.142

40 50 60% $(\text{NH}_4)_2\text{Cr}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$,
1.197 1.255 1.317

70 80 90% $(\text{NH}_4)_2\text{Cr}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
1.384 1.456 1.532

(Gerlach, Z anal 28 498)

Insol in acetone (Naumann, B 1904, 37 4329)

$3(\text{NH}_4)_2\text{SO}_4, \text{Cr}_2(\text{SO}_4)_3$ Only sl attacked by boiling H_2O . Not attacked by boiling conc $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Klobb, Bull Soc (3) 9 663)

Ammonium cobaltous sulphate,
 $(\text{NH}_4)_2\text{Co}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$ 100 pts H_2O dissolve at0° 10° 18° 23° 35°
89 116 152 171 196 pts anhydrous salt,40° 45° 50° 60° 75°
223 25 287 345 433 pts anhydrous salt
(Tobler, A 95 193)100 pts saturated solution contain at
20° 40° 60° 80°
149 208 256 33 pts anhydrous salt
(v Hauer, J pr 74 433)1 l H_2O dissolves 147.2 g anhydrous salt
at 25° Tobler's results are inaccurate
(Locke, Am Ch J 1902, 27 459)
Pptd from aqueous solution by alcohol**Ammonium cobaltic sulphate,**
 $(\text{NH}_4)_2\text{Co}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$ Sol in H_2O with decomp (Marshall,
Chem Soc 59 760)**Ammonium cobaltous cupric sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{CuSO}_4 + 12\text{H}_2\text{O}$ Quite easily sol in hot H_2O , but on long
boiling a basic salt is pptd (Vohl, A 94 58)**Ammonium cobaltous ferrous sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{FeSO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Vohl, A 94 57)**Ammonium cobaltous magnesium sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{MgSO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Vohl, A 94 57)**Ammonium cobaltous manganous sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{MnSO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Vohl, A 94 57)**Ammonium cobaltous nickel sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{NiSO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Vohl, A 94 57)**Ammonium cobaltous zinc sulphate,**
 $2(\text{NH}_4)_2\text{SO}_4, \text{CoSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Vohl, A 94 57)**Ammonium cupric sulphate, $(\text{NH}_4)_2\text{CuSO}_4$**

Efflorescent in warm air

Sol in 100 pt boiling H_2O and separates almost
wholly on cooling (Vohl, J pr 2 194)
Sol in 100 pts H_2O at 18° (Abl)100 pts H_2O at 19° dissolve 26.6 pts, and
sat solution has sp gr = 1.1337 (Schiff, A
109 426)100 g sat solution at 30° contain 30.36 g
anhydrous salt (Schreinemakers, Arch Néer
Sci 1910, (2) 15 92)Solubility of $(\text{NH}_4)_2\text{Cu}(\text{SO}_4)_2, 6\text{H}_2\text{O}$
 $(\text{NH}_4)_2\text{Ni}(\text{SO}_4)_2, 6\text{H}_2\text{O}$ in H_2O at 13-14°
Mols per 100 mols H_2O

Cu salt	Ni salt	% Cu salt solid pha
0	0 521	0
0 1476	0 295	10 29
0 2664	0 2089	30 59
0 4165	0 1449	52 23
0 4785	0 1202	78 80
1 0350	0	100

(Fock, Z Kryst Min 1897, 28 365)

Solubility of $(\text{NH}_4)_2\text{Cu}(\text{SO}_4)_2, 6\text{H}_2\text{O}$
 $\text{K}_2\text{Cu}(\text{SO}_4)_2, 6\text{H}_2\text{O}$ in H_2O at 13-14°
Mols per 100 mols H_2O

K salt	NH_4 salt	% K salt solid pha
0	1 035	0
0 897	0 8618	5 04
0 2289	0 6490	16 71
0 2570	0 5887	30 41
0 2946	0 5096	36 6
0 3339	0 3319	50 1
0 4560	0 1961	69 9
0 4374	0	100

(Fock)

Solubility of $(\text{NH}_4)_2\text{Cu}(\text{SO}_4)_2, 6\text{H}_2\text{O}$
 $(\text{NH}_4)_2\text{Zn}(\text{SO}_4)_2, 6\text{H}_2\text{O}$ in H_2O at 13-14°
Mols per 100 mols H_2O

Cu salt	Zn salt	% Cu salt solid ph
0 0422	0 8069	2 2
0 0666	0 5638	4 5
0 1218	0 5115	9 C
0 2130	0 4924	14 6
0 3216	0 4022	22 6
1 035	0	100

(Fock)

 $(\text{NH}_4)_2\text{SO}_4, 2\text{CuSO}_4$ Very sol in H_2O
(Klobb, C R 115 230)**Ammonium cupric ferrous sulphate**Sol in H_2O without decomposition
A 94 61)**Ammonium cupric magnesium sulphate** $2(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, \text{MgSO}_4 + 12\text{H}_2\text{O}$
Sol in H_2O (Vohl, A 94 57)**Ammonium cupric magnesium potassium sulphate,**
 $(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, \text{MgSO}_4, \text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Schiff)
 $2(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, 2\text{MgSO}_4, \text{K}_2\text{SO}_4$
 $18\text{H}_2\text{O}$ Sol in H_2O (Schiff)

ammonium cupric manganous sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, \text{MnSO}_4 + 12 \text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

ammonium cupric nickel sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, \text{NiSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl)

ammonium cupric potassium sulphate,
 $\text{NH}_4\text{KSO}_4, \text{CuSO}_4 + 6\text{H}_2\text{O}$
 Sol in H_2O (Schiff)

ammonium cupric zinc sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{CuSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl)

ammonium cupric sulphate ammonia,
 $(\text{NH}_4)_2\text{SO}_4, \text{CuO}, 2\text{NH}_3$
 Sol in 15 pts cold H_2O , but decomp on
 posure to air or dilution Insol in alcohol
 uhn)

ammonium didymium sulphate, $(\text{NH}_4)_2\text{SO}_4$,
 $\text{D}_{12}(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
 Sol in 18 pts H_2O , and less easily in
 $(\text{H}_4)_2\text{SO}_4 + \text{Aq}$ (Marignac)
 Moderately sol in H_2O (Cleve, Bull Soc
) 43 362)

ammonium erbium sulphate, $(\text{NH}_4)_2\text{SO}_4$,
 $\text{Er}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
 Sol in H_2O (Cleve)

ammonium gallium sulphate,
 $(\text{NH}_4)_2\text{Ga}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
 Sol in cold water and dilute alcohol Conc
 ution clouds up on boiling, but clears on
 cling Dil solution separates out a basic
 t, insol in hot or cold H_2O (Boisbaudran)

ammonium glucinum sulphate, $(\text{NH}_4)_2\text{SO}_4$,
 $\text{GISO}_4 + 2\text{H}_2\text{O}$
 Sol in H_2O (Atterberg)

ammonium indium sulphate,
 $(\text{NH}_4)_2\text{In}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
 100 pts H_2O dissolve 200 pts salt at 16° ,
 d 400 pts at 30°
 Insol in alcohol
 Melts in crystal H_2O at 36° (Rossler, J
 (2) 7 14)
 $+8\text{H}_2\text{O}$ (Rossler)

ammonium iridium sulphate, $(\text{NH}_4)_2\text{SO}_4$,
 $\text{Ir}_2(\text{SO}_4)_3 + 24\text{H}_2\text{O}$
 Easily sol in H_2O (Marino, Z anorg
 04, 42 221)

ammonium iron (ferrous) sulphate,
 $(\text{NH}_4)_2\text{Fe}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$
 Much less sol in H_2O than $\text{FeSO}_4 + 7\text{H}_2\text{O}$
 ogel, J pr 2 192)

100 pts H_2O dissolve at
 $0^\circ \quad 12^\circ \quad 20^\circ \quad 30^\circ \quad 36^\circ$
 12 2 17 5 21 6 28 1 31 8 pts anhydrous salt,
 $45^\circ \quad 55^\circ \quad 60^\circ \quad 65^\circ \quad 75^\circ$
 36 2 40 3 44 6 49 8 56 7 pts anhydrous salt
 (Tobler, A 95 193)

100 pts H_2O at 16.5° dissolve 35.9 pts
 hydrous salt
 1 l H_2O dissolves 351 pts or 1.044 g mol
 anhydrous salt at 25° (Locke, Am Ch J
 1902, 27 459)

Sol in H_2O without decomp Aq solution
 at 30° contains 13.13% FeSO_4 and 11.45%
 $(\text{NH}_4)_2\text{SO}_4$ (Schreinemakers, C C 1910, I
 801)

Sp gr of $(\text{NH}_4)_2\text{FeSO}_4 + \text{Aq}$ at 19°
 $\% = \%(\text{NH}_4)_2\text{FeSO}_4 + 6\text{H}_2\text{O}$

%	Sp gr	%	Sp gr	%	Sp gr
1	1.006	11	1.066	21	1.130
2	1.013	12	1.073	22	1.136
3	1.018	13	1.080	23	1.143
4	1.024	14	1.085	24	1.150
5	1.030	15	1.092	25	1.156
6	1.036	16	1.097	26	1.164
7	1.042	17	1.104	27	1.171
8	1.047	18	1.110	28	1.179
9	1.054	19	1.116	29	1.185
10	1.060	20	1.124	30	1.193

(Schiff calculated by Gerlach, Z anal 8
 280)

Insol in acetone

Ammonium ferric sulphate, basic

Extremely difficultly sol in $\text{HCl} + \text{Aq}$ Not
 decomp by $\text{KOH} + \text{Aq}$ (Berzelius)
 $5(\text{NH}_4)_2\text{O}, 3\text{Fe}_2\text{O}_3, 12\text{SO}_3 + 18\text{H}_2\text{O}$ or
 $2(\text{NH}_4)_3\text{O}, \text{Fe}_2\text{O}_3, 4\text{SO}_3 + 4\text{H}_2\text{O}$ Sol in 2.4
 pts cold H_2O (Maus, Pogg 11 79)

Ammonium iron (ferric) sulphate, $(\text{NH}_4)_2\text{SO}_4$,
 $\text{Fe}_2(\text{SO}_4)_3$

Attacked slowly by cold H_2O (Lachaud
 and Lepierre)

Nearly insol in H_2O (Weinland, Z anorg
 1913, 84 363)

$+24\text{H}_2\text{O}$ Iron alum Sol in 3 pts H_2O
 at 15° (Forchhammer, Ann Phil 5 406)

100 cc H_2O dissolve 44.15 g anhydrous, or
 124.40 g hydrated salt at 25° , or 1.659 g
 mols anhydrous salt are sol in 1 l H_2O at
 25° (Locke, Am Ch J 1901, 26 174)

Sp gr of aqueous solution at 15° contain-

ing
 5 10 15% $(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$,
 1.023 1.047 1.071

20 25 30% $(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$,
 1.096 1.122 1.148

35 40% $(\text{NH}_4)_2\text{Fe}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
 1.175 1.203

40% solution is sat at 15° (Gerlach, Z anal 28 496)
 Melts in crystal H₂O at 40° (Locke)
 3(NH₄)₂SO₄, Fe₂(SO₄)₃ Insol in cold H₂O (Lachaud and Lepierre)

Ammonium iron (ferroferri) sulphate,
 4(NH₄)₂SO₄, FeSO₄, Fe₂(SO₄)₃+3H₂O
 Sl sol in cold H₂O, decomp into basic salt by hot H₂O, insol in alcohol (Lachaud and Lepierre, C R 114 916)

Ammonium ferrous magnesium sulphate,
 4(NH₄)₂SO₄, 3FeSO₄, MgSO₄+24H₂O
 Sol in H₂O (Schiff, A 107 64)
 2(NH₄)₂SO₄, FeSO₄, MgSO₄+12H₂O Sol in H₂O (Vohl, A 94 57)

Ammonium ferrous manganous sulphate,
 2(NH₄)₂SO₄, FeSO₄, MnSO₄+12H₂O
 Sol in H₂O (Vohl, A 94 57)

Ammonium ferrous nickel sulphate,
 2(NH₄)₂SO₄, FeSO₄, NiSO₄+12H₂O
 Sol in H₂O (Vohl, A 94 57)

Ammonium ferrous zinc sulphate,
 2(NH₄)₂SO₄, FeSO₄, ZnSO₄+12H₂O
 Sol in H₂O (Bette, A 14 286)

Ammonium lanthanum sulphate, (NH₄)₂SO₄, La₂(SO₄)₃+8H₂O
 Sl sol in H₂O (Maignac)
 Quite sol in H₂O (Cleve)
 +2H₂O (Barre, C R 1910, 151 872)
 5(NH₄)₂SO₄, 2La₂(SO₄)₃ Sl sol in (NH₄)₂SO₄+Aq of concentrations above 60% (Barre, A ch 1911, (8) 24 246)
 5(NH₄)₂SO₄, La₂(SO₄)₃ (Barre)

Ammonium lead sulphate, (NH₄)₂SO₄, PbSO₄
 Decomp by H₂O into its constituents (Wohler and Litton, A 43 126)
 Decomp by H₂O Only stable in contact with solutions containing
 13 86 pts (NH₄)₂SO₄ per 100 pts H₂O at 20°
 19 25 pts (NH₄)₂SO₄ per 100 pts H₂O at 50°
 24 31 pts (NH₄)₂SO₄ per 100 pts H₂O at 75°
 29 42 pts (NH₄)₂SO₄ per 100 pts H₂O at 100°
 (Barre, C R 1909, 149 294)

Ammonium lithium sulphate, NH₄LiSO₄
 Solubility in H₂O=35 25% at -10°, and 36 18% at 70° (Schreinemakers, C C 1906, I 217)
 This is the only double salt which (NH₄)₂SO₄ forms with Li₂SO₄ below 100° (Spielrein, C R 1913, 157 48)

Ammonium magnesium sulphate,
 (NH₄)₂Mg(SO₄)₂+6H₂O
 100 pts H₂O dissolve 15 9 pts anhydrous double salt at 13° (Mulder)
 100 pts H₂O dissolve at
 0° 10° 15° 20° 30°
 9 0 14 2 15 7 17 9 19 1 pts anhydrous salt,
 45° 50° 55° 60° 75°
 25 6 30 0 31 9 36 1 45 3 pts anhydrous salt
 (Tobler, A 96 193)

More sol in H₂O than (NH₄)₂SO₄ or MgSO₄ (Graham)
 1 1 H₂O dissolves 199 pts anhydrous salt at 25° Tobler's results are inaccurate (Locke, Am Ch J 1902, 27 459)
 100 g H₂O dissolve at
 34° 41° F
 18 22 20 72 g (NH₄)₂SO₄, MgSO₄, 6H₂O
 50° 59° F
 22 48 24 08 g (NH₄)₂SO₄, MgSO₄, 6H₂O,
 60° 70° F
 24 81 28 26 g (NH₄)₂SO₄, MgSO₄, 6H₂O,
 81° F
 33 33 g (NH₄)₂SO₄, MgSO₄, 6H₂O
 (Lothian, Pharm J 1910, (4) 30 546)

Lothian's results for solubility in H₂O probably incorrect because of inaccuracy of experimental method (Seidell, Pharm J 1911, (4) 33 846)

Solubility of (NH₄)₂Mg(SO₄)₂ in H₂O at t°

t	g anhydrous salt p r 100 g	
	solution	H O
0	10 58	11 83
10	12 75	14 61
20	15 23	17 96
25	16 45	19 69
30	17 84	21 71
40	20 51	25 56
50	23 18	30 17
60	26 02	35 17
80	32 58	48 32
100	39 66	65 72

(Porlezza, Att Acc Inc 1914 (5) 23 II, 509)

Min *Cerbohite*

Ammonium magnesium nickel sulphate,
 2(NH₄)₂SO₄, MgSO₄, NiSO₄+12H₂O
 Sol in H₂O (Vohl, A 94 57)

Ammonium magnesium potassium zinc sulphate, 2(NH₄)₂SO₄, 3MgSO₄, 3K₂SO₄, 2ZnSO₄+30H₂O
 Sol in H₂O (Schiff, A 107 64)
 (NH₄)₂SO₄, 2MgSO₄, 2K₂SO₄, ZnSO₄+18H₂O Sol in H₂O (Schiff)
 (NH₄)₂SO₄, MgSO₄, K₂SO₄, ZnSO₄+12H₂O Sol in H₂O (Schiff)

Ammonium magnesium zinc sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{MgSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

Ammonium manganous sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{MnSO}_4 + 6\text{H}_2\text{O}$
 Deliquescent Easily sol in H_2O (Jahn)
 1 l H_2O dissolves 372 g anhydrous salt
 at 25° (Looke, Am Ch J 1902, 27 459)
 $(\text{NH}_4)_2\text{SO}_4, 2\text{MnSO}_4$ Readily decomp by
 H_2O (Lepierre, C R 1895, 120 924)

Ammonium manganic sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{Mn}_2(\text{SO}_4)_3$
 Decomp by H_2O Insol in ether, C_6H_6 , and
 conc H_2SO_4 Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Le-
 pierre, Bull Soc 1895, (3) 13 596)
 $+ 24\text{H}_2\text{O}$ Decomp by H_2O (Mitscher-
 lich)

Ammonium manganous nickel sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{MnSO}_4, \text{NiSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

Ammonium manganous zinc sulphate,
 $2(\text{NH}_4)_2\text{SO}_4, \text{MnSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl)

Ammonium mercuric sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $3\text{HgSO}_4 + 2\text{H}_2\text{O}$
 (Hirzel, J B 1850 333)
 $(\text{NH}_4)_2\text{SO}_4, \text{HgSO}_4$ Difficultly sol in
 H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$

Ammonium mercurous sulphate ammonia,
 $3\text{Hg}_2\text{O}, 2(\text{NH}_4)_2\text{HgSO}_4, 2\text{NH}_3$
 Insol in hot or cold, dil or conc H_2SO_4
 and HNO_3 Sol in HCl (Tarugi, Gazz
 ch it 1903, 33 (1) 131)

Ammonium nickel sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{NiSO}_4 + 6\text{H}_2\text{O}$
 Sol in 4 pts cold H_2O (Link 1796)
 100 pts H_2O dissolve at
 35° 10° 16° 20° 30°
 18 3.2 5.8 5.9 8.3 pts anhydrous salt,
 40° 50° 59° 68° 85°
 11.5 14.4 16.7 18.5 28.6 pts anhydrous salt
 (Lohrer, A 95 193)

100 pts sat solution contain at 20° , 9.4,
 at 40° , 13.2, at 60° , 18.6, at 80° , 23.1 pts
 anhydrous salt (v Huur, J pr 74 433)
 1 l H_2O dissolves 75.7 g anhydrous salt
 at 25° (Locke, Am Ch J 1902, 27 459)
 Nearly insol in a weak acid solution of
 $(\text{NH}_4)_2\text{SO}_4$ (Thompson, C C 1863 957)

Ammonium nickel zinc sulphate, $2(\text{NH}_4)_2\text{SO}_4,$
 $\text{NiSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

Ammonium nickel sulphate ammonia,
 $(\text{NH}_4)_2\text{SO}_4, \text{NiSO}_4, 6\text{NH}_3 + 3\text{H}_2\text{O}$
 (André, C R 106 936)

Ammonium platonic sulphate, $2(\text{NH}_4)_2\text{SO}_4,$
 $\text{Pt}_2(\text{SO}_4)_3 + 25\text{H}_2\text{O}$
 Sol in H_2O (Prost, Bull Soc (2) 46 156)

Ammonium potassium sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{K}_2\text{SO}_4 + 4\text{H}_2\text{O}$
 Soluble in H_2O 100 pts H_2O at 16° dis-
 solve 13.68 pts salt (Thomson, 1831)
 Min Taylorite

Ammonium praseodymium sulphate,
 $(\text{NH}_4)_2\text{SO}_4, \text{Pr}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
 Sl sol in H_2O (von Scheele, Z anorg
 1898, 18 359)

Ammonium rhodium sulphate,
 $(\text{NH}_4)_2\text{SO}_4, \text{Rh}_2(\text{SO}_4)_3 + 24\text{H}_2\text{O}$
 Very sol H_2O , melts in crystal H_2O at
 $102-103^\circ$ (Piccini, Z anorg 1901, 27 67)

Ammonium samarium sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{Sm}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
 Sl sol in H_2O (Cleve, Bull Soc (2) 43
 166)

Ammonium scandium sulphate, $(\text{NH}_4)_2\text{SO}_4,$
 $\text{Sc}_2(\text{SO}_4)_3$
 Sol in H_2O (Cleve)
 Sol in H_2O and in dil $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$
 (R J Meyer, Z anorg 1914, 86 279)

Ammonium sodium sulphate, $\text{NH}_4\text{NaSO}_4 +$
 $2\text{H}_2\text{O}$
 100 pts H_2O dissolve 46.6 pts of cryst salt
 at 15° , and the solution has a sp gr of 1.1749
 Sp gr of aqueous solution containing
 31.8 24.44 15.9% $\text{NH}_4\text{NaSO}_4 + 2\text{H}_2\text{O}$,
 1.1749 1.1380 1.0849
 12.72 6.36 $\%$ $\text{NH}_4\text{NaSO}_4 + 2\text{H}_2\text{O}$
 1.0679 1.0337
 (Schiff, A 114 68)

Ammonium strontium sulphate
 Insol in excess of $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Rose,
 Pogg 110 296)
 $(\text{NH}_4)_2\text{SO}_4, \text{SrSO}_4$ This double salt is
 only stable in contact with nearly sat solu-
 tions of $(\text{NH}_4)_2\text{SO}_4$ (Barre, C R 1909, 149
 293)

Ammonium tellurium sulphate,
 $(\text{NH}_4)\text{HSO}_4, 2\text{TeO}_2, \text{SO}_3 + 2\text{H}_2\text{O}$
 As K salt (Metzner, A ch 1898, (7)
 15 203)

Ammonium thallic sulphate, $\text{NH}_4\text{Ti}(\text{SO}_4)_2$
 (Marshall, C C 1902, II 1089)
 $+ 4\text{H}_2\text{O}$ Decomp by H_2O Easily sol
 in dil acids (Fortini, Gazz ch it 1905, 35
 (2) 450)

Ammonium thorium sulphate, $2(\text{NH}_4)_2\text{SO}_4 \cdot \text{Th}(\text{SO}_4)_2$

Easily sol in H_2O and sat $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ (Cleve)
 $+2\text{H}_2\text{O}$ (Barre)
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$ (Barre, A ch 1911, (8) 24 240)
 $3(\text{NH}_4)_2\text{SO}_4 \cdot \text{Th}(\text{SO}_4)_2 + 3\text{H}_2\text{O}$ (B)

Ammonium titanium sulphate,
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{TiO}_2 \cdot \text{SO}_4 + \text{H}_2\text{O}$

Very sol in H_2O with decomp
 Insol in conc H_2SO_4 (Rosenheim, Z anorg 1901, 26 252)
 $(\text{NH}_4)_2\text{O} \cdot 2\text{TiO}_2 \cdot 2\text{SO}_3 + 3\text{H}_2\text{O}$ Slowly decomp by H_2O (Blondel, Bull Soc 1899, (3) 21 262)

Ammonium titanium sesquisulphate,
 $(\text{NH}_4)_2\text{SO}_4 \cdot 3\text{Ti}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$

Insol in H_2O , sol in HCl
 Insol in H_2SO_4 Decomp by boiling with conc H_2SO_4 (Stahler, B 1905, 38 2623)

Ammonium uranic sulphate, $2(\text{NH}_4)_2\text{SO}_4 \cdot \text{U}(\text{SO}_4)_2$

Easily sol in H_2O (Rammelsberg)
 Sol in H_2O but solution rapidly decomp (Kohlschutter, B 1901, 34 3630)

Ammonium uranyl sulphate, $(\text{NH}_4)_2\text{SO}_4 \cdot (\text{UO}_2)\text{SO}_4 + 2\text{H}_2\text{O}$

Quite difficultly sol in H_2O (Arfvedson)

Ammonium vanadous sulphate,
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{VSO}_4 + 6\text{H}_2\text{O}$

Decomp in the air
 Sol in H_2O (Piccini, Z anorg 1899, 19 205)

Less sol in H_2O than $\text{VSO}_4 + 7\text{H}_2\text{O}$ (Piccini and Marino, Z anorg 1902, 32 60)

Ammonium vanadic sulphate,
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{V}_2(\text{SO}_4)_3 + 12\text{H}_2\text{O}$

Insol in H_2O
 Insol in H_2SO_4 Decomp by boiling with conc H_2SO_4

Sol in HCl (Stahler, B 1905, 38 3980)
 $+24\text{H}_2\text{O}$ Very sol in H_2O , decomp in the air (Piccini, Z anorg 1896, 11 108)
 100 pts H_2O dissolve 39.76 pts salt at 10°
 Sp gr of sat solution at $4^\circ/20^\circ = 1.687$ (Piccini, Z anorg 1897, 13 446)

1 l H_2O dissolves 31.69 g anhydrous or 78.51 g hydrated salt at 25° , or 1.210 g mols anhydrous salt are sol in 1 l H_2O at 25°

Mpt of crystals $= 45^\circ$ (Locke, Am Ch J 1901, 26 175)

Ammonium vanadyl sulphate,
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{VO}(\text{SO}_4) + 3\frac{1}{2}\text{H}_2\text{O}$

Easily sol in H_2O and in a mixture of a lcohol and conc H_2SO_4 , but cannot be recryst therefrom (Koppel and Behrendt, Z anorg 1903, 35 176)

$(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{VO}(\text{SO}_4) + \text{H}_2\text{O}$ Deliquescent
 Slowly but abundantly sol in H_2O , but cannot be recryst from it except by addition of H_2SO_4 (Koppel and Behrendt, Z anorg 1903, 35 172)

Ammonium yttrium sulphate, $2(\text{NH}_4)_2\text{SO}_4 \cdot \text{Y}_2(\text{SO}_4)_3 + 9\text{H}_2\text{O}$

Sol in H_2O (Cleve)

Ammonium zinc sulphate, $(\text{NH}_4)_2\text{SO}_4 \cdot \text{ZnSO}_4 + 6\text{H}_2\text{O}$

100 pts H_2O dissolve pts $(\text{NH}_4)_2\text{SO}_4 \cdot \text{ZnSO}_4$ at

0°	10°	13°	15°	20°
7 3	8 8	10 0	12 5	12 6 pts salt,
30°	45°	60°	75°	85°
16 5	21 7	29 7	37 8	46 2 pts salt

(Tobler, A 95 193)

1 l H_2O dissolves 140.8 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)
 $+7\text{H}_2\text{O}$ (André, C R 104 987)

Ammonium zirconium sulphate

Sol in cold or hot H_2O or in acids (Berzelius)

Ammonium sulphate antimony fluoride,
 $(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{SbF}_3$

Very sol in H_2O (Mayer, B 1894, 27 R 922)

Ammonium sulphate chromic chloride,
 $2(\text{NH}_4)_2\text{SO}_4 \cdot \text{CrCl}_3 + 6\text{H}_2\text{O}$

Sol in H_2O (Weinland, B 1907, 40 3768)

Ammonium sulphate hydrogen peroxide,
 $(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{O}_2$

Efflorescent in air
 Easily sol in H_2O (Willstätter, B 1903, 36 1829)

Antimony sulphate basic, $7\text{Sb}_2\text{O}_3 \cdot 2\text{SO}_3 + 3\text{H}_2\text{O}$

Insol in, and not decomp by hot or cold H_2O (Adie, Chem Soc 57 540)

$5\text{Sb}_2\text{O}_3 \cdot 2\text{SO}_3 + 7\text{H}_2\text{O}$ Insol in H_2O (Hensgen, R t c 4 401)

$2\text{Sb}_2\text{O}_3 \cdot \text{SO}_3 + r\text{H}_2\text{O}$ Not decomp by cold H_2O (Adie)

$\text{Sb}_2\text{O}_3 \cdot \text{SO}_3 = (\text{SbO})_2\text{SO}_4$ Decomp by hot H_2O (Peligot, J B 1847 426)

$+ \text{H}_2\text{O}$ As above (Adie)
 $\text{Sb}_2\text{O}_3 \cdot 2\text{SO}_3$, and $+ \text{H}_2\text{O}$, and $+ 2\text{H}_2\text{O}$
 Scarcely decomp by cold, slowly by boiling H_2O Slowly sol in dil $\text{HCl} + \text{Aq}$ (Adie)

Antimony sulphate, $\text{Sb}_2(\text{SO}_4)_3$

Very deliquescent Combines with H_2O to a hard mass with evolution of heat, with more H_2O it becomes liquid, and by repeated treat-

ment with much boiling H_2O it is wholly decomp into H_2SO_4 and Sb_2O_3 (Hensgen, R t c 4 401)

Antimony sulphate, acid, $\text{Sb}_2\text{O}_3, 4\text{SO}_3$,

Decomp by H_2O (Adie)
 $\text{Sb}_2\text{O}_3 + 8$, or 9SO_3 Decomp by H_2O (Adie)

Antimony barium sulphate,
 $\text{Sb}_2(\text{SO}_4)_3, \text{BaSO}_4 + 6\text{H}_2\text{O}$

As Ca comp (Kuhl, Z anorg 1907, 54 257)

Antimony caesium sulphate, $\text{SbCs}(\text{SO}_4)_2$

Slowly decomp by cold H_2O (Gutman, Arch Pharm 1908, 246 188)

Antimony calcium sulphate,
 $\text{Sb}_2(\text{SO}_4)_3, \text{CaSO}_4 + 6\text{H}_2\text{O}$

Decomp by H_2O (Kuhl, Z anorg 1907, 54 257)

Antimony lithium sulphate, $\text{SbLi}(\text{SO}_4)_2$

Decomp by H_2O (Gutman, Arch Pharm 1908, 246 187)

Antimony potassium sulphate, $\text{KSb}(\text{SO}_4)_2$

Decomp by H_2O (Gutmann, Arch Pharm 1898, 236 478)

Antimony rubidium sulphate, $\text{SbRb}(\text{SO}_4)_2$

Slowly decomp by cold H_2O (Gutman)

Antimony silver sulphate, $\text{SbAg}(\text{SO}_4)$

Slowly decomp by H_2O (Kuhl, Z anorg 1907, 54 258)

Slowly decomp by cold H_2O (Gutman Arch Pharm 1908 246 189)

Antimony sodium sulphate, $\text{NaSb}(\text{SO}_4)_2$

Slowly decomp by H_2O (Gutmann, Arch Pharm 1898 236 178)

Antimony strontium sulphate, $\text{Sb}(\text{SO}_4)_2, \text{SrSO}_4 + 6\text{H}_2\text{O}$

As Ca comp (Kuhl, Z anorg 1907, 54 257)

Antimony thallium sulphate, $\text{SbTl}(\text{SO}_4)_2$

Slowly decomp by cold H_2O Decomp by conc H_2SO_4 (Gutman Arch Pharm 1908, 246 189)

Arsenic sulphate

See Arsenic sulphur dioxide

Barium sulphate, BaSO_4

Sol in 4,000 pt H_2O (Kierwan) in 200,000 pts H_2O (Marquardt, C k 38 08)
 100 pts H_2O dissolves 0.002 pt BaSO_4 (Ure's Dict)

$\text{BaCl}_2 + \text{Aq}$ containing 1 pt BaO to 71,000 pts H_2O when treated with H_2SO_4 becomes turbid in $\frac{1}{2}$ hour (Harting, J pr 22 52)

$\text{Ba}(\text{NO}_3)_2 + \text{Aq}$ containing 1 pt BaO to 25,000 pts H_2O gives a distinct cloud with H_2SO_4 or $\text{Na}_2\text{SO}_4 + \text{Aq}$ with 50,000–100,000 pts H_2O a slight turbidity is produced with 200,000–400,000 pts H_2O the mixture becomes turbid in a few minutes while with 800,000 pts H_2O no action is visible (Lassaigne, J Chim Méd 8 526)

Sol in 800,000 pts H_2O (Calvert), in 400,000 pts cold or hot H_2O (Fresenius)

Calculated from the electrical conductivity of the solution, BaSO_4 is sol in 429,700 pts H_2O at 18.4° , and 320,000 pts at 37.7° (Holleman, Z phys Ch 12 131)

1 l H_2O dissolves 1.72 mg at 2° , 1.97 mg at 10° , 2.29 mg at 19.0° , 2.60 mg at 26° , 2.91 mg at 34° (Kohlrausch and Rose, Z phys Ch 12 241)

Calculated from the electrical conductivity of the solution, BaSO_4 is sol in 425,000 pts H_2O at 18.3° Results of Fresenius and Hintz (Z anal 1896, 35 170) are incorrect (Kuster, Z anorg 1896, 12 267)

Sat aq solution contains 2.29 mg BaSO_4 per liter at 25° when particles of salt are not less than 1.8μ in diameter

Sat aq solution contains 4.15 mg BaSO_4 per liter at 25° when particles of salt are 0.1μ in diameter ($\mu = 0.0001 \text{ cm}$) (Hulett, Z phys Ch 1901, 37 398–9)

In general the influence of the size of the grain on the solubility of the substance is negligible when the solubility exceeds 2%. The increase of normal solubility by using finely divided solids, amounts to 80% in the case of BaSO_4 (Hulett, Z phys Ch 1904, 47 366)

1 l H_2O dissolves 2.3 mg BaSO_4 at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

Calculated from electrical conductivity of $\text{BaSO}_4 + \text{Aq}$

0.0190 milli-equivalents are sol in 1 liter H_2O at 15° , 0.0212 at 25° , 0.0255 at 50° , 0.0334 at 100°

(McLeher, J Am Chem Soc 1910, 32 55)

Not attacked by cold HCl or $\text{HNO}_3 + \text{Aq}$ after several hours, and only in traces after several days. On boiling, traces of BaSO_4 dissolve, and the liquid after cooling can be precipitated by BaCl_2 or $\text{H}_2\text{SO}_4 + \text{Aq}$, but not by H_2O alone (Rose, Pogg 95 108)

By washing BaSO_4 with H_2O or HCl or HNO_3 or H_2O (Siegler), it can be precipitated by H_2SO_4 or BaCl_2 (Perrin, J B 1856 334)

1000 pts 3% $\text{HCl} + \text{Aq}$ dissolve 0.06 pt BaSO_4 in the cold, and still more on boiling

230 ccm $\text{HCl} + \text{Aq}$ of 1.02 sp gr dissolve 0.048 g BaSO_4 from 0.679 g BaSO_4 when boiled $\frac{1}{4}$ hour

165 ccm $\text{HCl} + \text{Aq}$ of 1.03 sp gr dissolve 0.0075 g BaSO_4 from 0.577 g BaSO_4 when boiled 5 minutes (Siegler, J pr 69 142)

Solubility of BaSO_4 in $\text{HCl} + \text{Aq}$

No cc $\text{HCl} + \text{Aq}$ containing 1 mg equiv HCl	Mg BaSO_4 per 1 mg equiv of HCl	g per 100 cc solution	
		HCl	BaSO_4
2 0	0 133	1 82	0 0067
1 0	0 089	3 65	0 0089
0 5	0 056	7 29	0 0101
0 2	0 017	18 23	0 0086

(Banthusch, J pr 1884, 29 54)

100,000 pts H_2O dissolve 0 124 pt BaSO_4 ,
1000 pts $\text{HNO}_3 + \text{Aq}$ of 1 167 sp gr dissolve
2 pts BaSO_4 , 1000 pts $\text{HNO}_3 + \text{Aq}$ of 1 032
sp gr dissolve 0 062 pt BaSO_4 (Calvert,
Chem Gaz 1856 55)

When 0 4 g BaSO_4 is heated $\frac{1}{4}$ hour with
150 ccm $\text{HNO}_3 + \text{Aq}$ of 1 02 sp gr, 0 165 g
is dissolved (Siegle, J pr 69 142)

Solubility of BaSO_4 in $\text{HNO}_3 + \text{Aq}$

No cc $\text{HNO}_3 + \text{Aq}$ containing 1 mg equiv HNO_3	Mg BaSO_4 per 1 mg equiv of BaSO_4	G per 100 cc solution	
		HNO_3	BaSO_4
2 0	0 140	3 15	0 0070
1 0	0 107	6 31	0 0107
0 5	0 085	12 61	0 0170
0 2	0 048	31 52	0 0241

1884, 29 54)

ac acid has less solvent power than
the acids 80 ccm $\text{HCl} + \text{H}_2\text{O} + \text{Aq}$ of 1 02
sp gr boiled with 0 4 g BaSO_4 $\frac{1}{4}$ hour dis-
solve 0 002 g (Siegle, J pr 69 142)

Sol in boiling conc H_2SO_4 (See
 $\text{BaH}_2(\text{SO}_4)_2$)

Sol in fuming H_2SO_4 (See BaS_2O_7)

Sol in 2500 pts boiling 40% $\text{HBr} + \text{Aq}$, in
6000 pts boiling 40% $\text{HI} + \text{Aq}$ (Haslam,
C N 53 87)

Sol in considerable amount in metaphos-
phoric acid + Aq (Scheerer and Drechsel,
J pr (2) 7 68)

Not attacked by boiling conc $\text{KOH} + \text{Aq}$ if
 CO_2 is not present (Rose, Pogg 95 104)

Very sl decomp by standing a long time
with cold conc alkali carbonates + Aq

Decomp by boiling Na_2CO_3 or $\text{K}_2\text{CO}_3 +$
 Aq , not by $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (See Storer's
Dict for analytical data)

Very sl sol in $\text{NH}_4\text{Cl} + \text{Aq}$, 1 pt dissolv-
ing in 230,000 pts sat $\text{NH}_4\text{Cl} + \text{Aq}$

500 ccm sat $\text{NH}_4\text{NO}_3 + \text{Aq}$ with 50 ccm
sat $\text{NH}_4\text{Cl} + \text{Aq}$ dissolve 2 g BaSO_4 , 100
ccm sat $\text{NH}_4\text{NO}_3 + \text{Aq}$ with 100 ccm sat
 $\text{NH}_4\text{Cl} + \text{Aq}$ dissolve only 0 08 g BaSO_4 ,
therefore above solubility is due to free
chlorine (Mittentzwey, J pr 75 214)

BaSO_4 cannot be precipitated from solu-
tions containing free Cl_2 (Erdmann, J pr
75 215)

Pptn is retarded sl by tartaric and racemic
acids (Spiller)

Na metaphosphate prevents pptn of BaSO_4 ,
but not ortho- or pyrophosphate (Scheerer,
J pr 75 114)

Not precipitated in presence of alkali ci-
trates (Spiller)

Much less sol in $\text{NH}_4\text{Cl} + \text{Aq}$ than in
 $\text{NH}_4\text{NO}_3 + \text{Aq}$ Insol in warm conc $\text{Na}_2\text{S}_2\text{O}_3$
+ Aq (Diehl, J pr 79 431)

Not appreciably sol in H_2O containing
ammonium or sodium chloride (Brett, Witt-
stein, Wackenroder)

Not appreciably sol in H_2O at 250° , or in
 H_2O containing Na_2S (Senarmont)

Solubility is increased by alkali nitrates,
but not appreciably by NaCl , KClO_3 , or
 $\text{Ba}(\text{NO}_3)_2$ (Fresenius, Z anal 9 52)
Scarcely sol in boiling conc $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$
(Fresenius)

Solubility in H_2O increased by presence of
 MgCl_2 (Fresenius), cerium salts (Marignac)

Sol in $\text{Fe}_2\text{Cl}_6 + \text{Aq}$ (Lunge, Z anal 19
141)

Solubility in various salts + Aq at $20-25^\circ$

g salt per l	Mg BaSO_4 dissolved per l in		
	FeCl_3	AlCl_3	MgCl_2
1	58	33	30
2 5	72	43	30
5	115	60	33
10	123	64	33
25	150	116	50
50	160	170	50
100	170	175	50

(Fraps, Am Ch J 1902 27 290)

Solubility in sat solution of various salts +
 Aq

Salt	C BaSO_4 sol in 1 l of the solvent
NaNO_3	0 2940
NaCl	0 00753
NH_4Cl	0 00827

(Ehlert, Z Elektrochem 1912 18 725)

Conc $\text{CrCl}_3 + \text{Aq}$ dissolves 40-120 times
as much BaSO_4 as H_2O , when boiled there-
with for 5 days, conc $\text{CrCl}_3 + \text{Aq}$ acidified
with HCl 450 times as much in 10 days
(Kuster, Z anorg 1905, 43 345)

Insol in liquid NH_3 (Franklin, Am Ch
J 1898, 20 827)

Sol in $\text{H}_2\text{O}_2 + \text{Aq}$ (Grawalowski, C C
1906, II 7)

100 cc 95% formic acid dissolve 0 01 g
 BaSO_4 at 18.5° (Aschun Ch Ztg 1913 37
1117)

Insol in methyl acetate (Naumann, B
1909, 42 3790), in ethyl acetate (Naumann,
B 1904, 37 3601)

Min Barite

Barium hydrogen sulphate, $\text{BaH}_2(\text{SO}_4)_2$

100 pts H_2SO_4 dissolve 222 pts BaSO_4 (Lies-Bodart and Jacquemin, C R 46 1206), 569 pts BaSO_4 (Struve, Z anal 9 31)

Boiling H_2SO_4 dissolves 10–12% freshly precipitated BaSO_4 without separating crystals on cooling H_2SO_4 at 100° dissolves more than boiling H_2SO_4 , and becomes cloudy if heated to boiling (Schultz, Pogg 133 146)

1 g BaSO_4 pptd from BaCl_2 is sol in 3153 g 91% H_2SO_4 , from $\text{Ba}(\text{NO}_3)_2$ is sol in 1519 g 91% H_2SO_4 (Varenne and Pauleau, C R 93 1016)

100 pts hot conc H_2SO_4 dissolve approx 6 pts BaSO_4 (Rohland, Z anorg 1910, 66 206)

10 ccm of sat BaSO_4 +absolute H_2SO_4 contain approx 2851 g BaSO_4 (Bergius, Z phys Ch 1910, 72 355)

Equilibrium in the system $\text{BaSO}_4+\text{H}_2\text{SO}_4+\text{H}_2\text{O}$ at 25°

Composition of the solution		
% H_2SO_4	g BaSO_4 per l	Solid phase
73.83	0.030	BaSO_4
78.04	0.135	"
80.54	0.285	"
83.10	0.800	"
85.78	3.215	$\text{BaSO}_4, 2\text{H}_2\text{SO}_4, \text{H}_2\text{O}$
88.08	12.200	"
93.17	49.665	$\text{BaSO}_4, \text{H}_2\text{SO}_4$

Volkhonski, C C 1910, I 1954, C A 1911 617)

Decomp by H_2O , alcohol, or ether

+2 H_2O (Schultz)

$\text{BaSO}_4, 2\text{H}_2\text{SO}_4+\text{H}_2\text{O}$ (Volkhonski)

Barium pyrosulphate, $\text{Ba}_2\text{S}_2\text{O}_7$

100 pts fuming H_2SO_4 dissolve 1589 pts $\text{Ba}_2\text{S}_2\text{O}_7$ (Struve, Z anal 9 34)

Very deliquescent

Decomp with H_2O with hissing (Schultz-Hack, B 4 111)

Barium calcium sulphate, $3\text{BaSO}_4, \text{CaSO}_4$

Min *Draculite*

Barium platonic sulphate (?)

Insol in H_2O , boiling HCl or HNO_3 ; Al Sol in conc H_2SO_4 (Jacquemin, D Davy)

Barium tin (stannic) sulphate, $\text{Ba}_2\text{SnO}_4, \text{Sn}(\text{SO}_4)_2+3\text{H}_2\text{O}$

Decomp by H_2O Insol in HCl (Weinland and Kuhl, Z anorg 1907, 54 249)

Barium titanium sulphate, $2\text{BaSO}_4, 3\text{Ti}(\text{SO}_4)_2$

Ppt Decomp by H_2O , giving titanic acid (Weinland, Z anorg 1907, 54 255)

Barium sulphate potassium chloride, $3\text{BaSO}_4, \text{KCl}$

Ppt (Silberberger, M 1904, 25 233)

Bismuth sulphate, basic, $(\text{BiO})_2\text{SO}_4$

Insol in H_2O Sol in HNO_3 or $\text{H}_2\text{SO}_4+\text{Aq}$

+2 H_2O (Heintz, Pogg 63 55)

4 $\text{Bi}_2\text{O}_3, 3\text{SO}_3+15\text{H}_2\text{O}$ Insol in H_2O (Leist)

$(\text{BiO})\text{HSO}_4+\text{H}_2\text{O}$ Insol in H_2O Sol in dil $\text{H}_2\text{SO}_4+\text{Aq}$

+2 H_2O Decomp by H_2O with separation of $(\text{BiO})_2\text{SO}_4+2\text{H}_2\text{O}$ (Heintz)

3 $\text{Bi}_2\text{O}_3, 2\text{SO}_3+2\text{H}_2\text{O}$ Insol in H_2O (Athanasesco, C R 103 271)

5 $\text{Bi}_2\text{O}_3, 11\text{SO}_3+17\text{H}_2\text{O}$ This sulphate crystallizes out from sulphuric acid of any strength between $\text{H}_2\text{SO}_4, 6\text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4, 12\text{H}_2\text{O}$ (Adie, Proc Chem Soc 1899, 15 226)

$\text{Bi}_2\text{O}_3, 2\text{SO}_3, 2\frac{1}{2}\text{H}_2\text{O}$ is in equilibrium at 50° with 54–51.4% $\text{H}_2\text{SO}_4+\text{Aq}$

$\text{Bi}_2\text{O}_3, \text{SO}_3$ is in equilibrium at 50° with acid solutions weaker than 5.4% H_2SO_4

(Allan, Am Ch J 1902, 27 287)

Bismuth sulphate, $\text{Bi}_2(\text{SO}_4)_3$

Very hygroscopic. Takes up H_2O with strong evolution of heat to form $2\text{Bi}_2(\text{SO}_4)_3+7\text{H}_2\text{O}$, which becomes $\text{Bi}_2(\text{SO}_4)_3+3\text{H}_2\text{O}$ at 100° Decomp by boiling H_2O into $\text{Bi}_2\text{O}_3, \text{SO}_3+\text{H}_2\text{O}$ (Hensgen, J B 1885 552)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Bismuth sulphate, acid, $\text{Bi}_2\text{O}_3, 4\text{SO}_3$

$\text{Bi}_2\text{O}_3, 4\text{SO}_3$ is in equilibrium at 50° with 51.4–90% $\text{H}_2\text{SO}_4+\text{Aq}$ (Allan, Am Ch J 1902, 27 287)

+11 H_2O Crystallizes out from sulphuric acid at temp above 170° (Adie, Proc Chem Soc 1899, 15 226)

+3 H_2O Crystallizes from sulphuric acid of any strength between $\text{H}_2\text{SO}_4, \text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4, 2\text{H}_2\text{O}$ (Adie)

+7, or 9 H_2O = $\text{BiH}(\text{SO}_4)_2+3\text{H}_2\text{O}$ Insol in H_2O Easily sol in acids, especially HCl , and HNO_3+Aq (Leist A 160 29)

+7 H_2O Crystallizes out from sulphuric acid of any strength between $\text{H}_2\text{SO}_4, 3\text{H}_2\text{O}$ and $\text{H}_2\text{SO}_4, 5\text{H}_2\text{O}$

+10 H_2O Crystallizes out from sulphuric acid at temp below 170° (Adie)

Bismuth potassium sulphate, $\text{Bi}(\text{SO}_4)_3, 3\text{K}_2\text{SO}_4$ (?)

Decomp by H_2O , insol in sat $\text{K}_2\text{SO}_4+\text{Aq}$ (Heintz)

$\text{Bi}_2(\text{SO}_4)_3, 2\text{K}_2\text{SO}_4$

$\text{BiK}(\text{SO}_4)_2=\text{Bi}_2(\text{SO}_4)_3, \text{K}_2\text{SO}_4$ Insol in cold H_2O , decomp by boiling (Brighun, Am Ch J 14 170)

Bismuth sodium sulphate, $\text{Bi}_4\text{Na}_6(\text{SO}_4)_9$
(Ludecke, A 140 277)

Boron sulphate

See Borosulphuric acid

Bromomolybdenum sulphate

See under Bromomolybdenum compounds

Cadmium sulphate, basic, 2CdO , SO_3 , and $+\text{H}_2\text{O}$

Difficultly sol in H_2O (Stromeyer) SI
sol in hot H_2O (Habermann, M 5 432)
 4CdO , SO_3 (Pickering, Chem Soc 1907,
91 1987)

Cadmium sulphate, CdSO_4

Sat $\text{CdSO}_4 + \text{Aq}$ contains at

0°	10°	24°	30°	65°
35.9	37.5	41.5	42.0	49.7% CdSO_4
86°	94°	130°	165°	188° 200°
43.5	91.6	27.7	14.7	7.1 2.3% CdSO_4

CdSO_4 easily forms supersat solutions
(Etard, A ch 1894, (7) 2 552)

Solubility in H_2O

t°	Per cent CdSO_4 in sat solution	Solid phase
-18	43.35	Ice
-10	43.27	
0	43.01	
+10	43.18	$\text{CdSO}_4 \cdot \frac{8}{3}\text{H}_2\text{O}$
15	43.20	
20	43.37	
30	43.75	"
40	43.99	
60	44.99	
62	45.06	"
72	46.2	
73.5	46.6	
74.5	46.7	"
75	46.5	
77	42.2	
78.5	41.5	$\text{CdSO}_4 \cdot \text{H}_2\text{O}$
85	39.6	
90	38.7	
95	38.1	"
100	37.8	

(Mylius and Funk, B 1897, 30 825)

See also under $\text{CdSO}_4 + 2\frac{2}{3}\text{H}_2\text{O}$, and $7\text{H}_2\text{O}$

Sp gr at $0^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
14.0 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.0122$

Sp gr at $12^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
14.0 g CdSO_4 in 100 g $\text{H}_2\text{O} = 1.0121$

Sp gr at $12^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
57.2 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.0514$

Sp gr at $0^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
183.1 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.1552$

Sp gr at $13^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
183.1 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.1529$

(Fouqué, Ann Observ 1868, 9 172)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at 18°

% CdSO_4	1	5	10	15
Sp gr	1.0084	1.0486	1.1026	1.1607
% CdSO_4	20	25	30	35
Sp gr	1.2245	1.295	1.3725	1.4575
% CdSO_4	36			
Sp gr	1.4743			

(Grottrian, W Ann 1883, 18 193)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at room temp containing

7.14	14.66	22.011% CdSO_4
1.0681	1.1591	1.2681

(Wagner, W Ann 1883, 18 268)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{CdSO}_4 + \text{Aq}$	Sp gr
1-normal	1.0973
$\frac{1}{2}$ -"	1.0487
$\frac{1}{4}$ -"	1.0244
$\frac{1}{8}$ -"	1.0120

(Wagner, Z phys Ch 1890, 5 36)

Sp gr of $\text{CdSO}_4 + \text{Aq}$

% CdSO_4	t°	Sp gr at t°	Sp gr at 18
0.0289	17.29	0.99905	0.99893
	23.65	0.99776	
0.0498	18.00		0.99915
0.0999	18.00		0.99961
0.495	18.00		1.0034
0.981	18.00		1.0084

(Wershofen, Z phys Ch 1890, 5 194)

Sp gr at $16^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
29.4654% $\text{CdSO}_4 = 1.36280$, containing
21.3671% $\text{CdSO}_4 = 1.24211$ (Schonrock, Z
phys Ch 1893, 11 781)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at $18^\circ/4^\circ$

% CdSO_4	25.121	18.172
Sp gr	1.297	1.200

% CdSO_4	9.952	5.639
Sp gr	1.101	1.055

(de Muynck, W Ann 1894, 53 561)

$\text{CdSO}_4 + \text{Aq}$ containing 13.40% CdSO_4 has
sp gr $20^\circ/20^\circ = 1.1429$

$\text{CdSO}_4 + \text{Aq}$ containing 16.79% CdSO_4 has
sp gr $20^\circ/20^\circ = 1.1847$

(Le Blanc and Rohland, Z phys Ch 1896,
19 282)

Sp gr of CdSO_4 at 18° , when p =per cent strength of solution, d =observed density, w =volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
39 86	1 5639	0 6231
31 53	1 4080	0 4439
26 85	1 3310	0 3574
24 17	1 2901	0 3118
18 35	1 2084	0 2217
13 27	1 1437	0 1518
9 97	1 1045	0 1102
7 46	1 0764	0 0803
6 12	0 0619	0 0650
2 52	0 0242	0 0259
1 45	0 0132	0 0147
0 464	0 0033	0 0046

(Barnes, J phys Ch 1898, 2 543)

Sp gr of CdSO_4 +Aq sat at 25° and 1 atm = 1 617 (Sinnige, Z phys Ch 1909, 67 518)

See also under $\text{CdSO}_4+2\frac{2}{3}\text{H}_2\text{O}$, and $+4\text{H}_2\text{O}$

Insol in liquid NH_3 (Franklin, Am Ch 1898, 20 827)

Insol in acetone (Naumann, B 1904, 37 329), methyl acetate (Naumann, B 1909, 2 3790), ethyl acetate (Naumann, B 1910, 43 314)

+ H_2O See Mylius and Funk, under CdSO_4

+ $1\frac{1}{2}\text{H}_2\text{O}$ (Worobieff, Bull Soc 1896, 3) 16 1754)

+ $2\text{H}_2\text{O}$ 1 pt H_2O dissolves 0 59 pt anhydrous salt at 23° , and not much more on heating. Sat solution boils at 102° . Precipitated by alcohol (v Hauer)

100 g H_2O dissolve g CdSO_4 at t

t	C CdSO_4
0	75 52
3	75 65
7	65 73
9	75 85
11	75 91
12	76 01
13	76 11
16	76 16
17	76 15
18	76 11
19	76 18
20	76 79

(v Hauer and Cohen, W Ann 1898 65 352)

100 pts H_2O dissolves at

13° 14° 18° 15° 16°

76 06 76 09 76 14 76 18 pts anhydrous salt,

16° 18° 19° 25°

76 26 76 32 76 39 76 81 pts anhydrous salt

(Steinwehr, W Ann 1902, (4) 9 1050)

100 g H_2O dissolve 76 02 g CdSO_4 at 25°

(Stortenbecker, Z phys Ch 1900, 34 109)

Solubility of $\text{CdSO}_4+2\frac{2}{3}\text{H}_2\text{O}$ at 25° and varying pressures

Pressure in atmospheres	G CdSO_4 in 100 g H_2O
1	76 80
500	77 85
500	78 08
1000	78 77
1000	78 68

Det by another method

Pressure in atmospheres	G CdSO_4 in 100 g H_2O
250	77 53
500	78 02
750	78 60
1000	78 96

(Cohen and Sinnige Trans Farad Soc 1910, 5 269)

Sp gr at $21\frac{6}{10}^\circ$ of CdSO_4 +Aq containing 11 47% $\text{CdSO}_4+\frac{2}{3}\text{H}_2\text{O}=1 0944$ (Kannnikoff, J pr 1885, (2) 31 346)

100 g H_2O dissolve 57 61 g $\text{CdSO}_4+10 63$ g FeSO_4 at 25° (Stortenbecker, Z phys Ch 1900, 34 109)

+ $4\text{H}_2\text{O}$ (Lescour, A ch 1895, (7) 4 222)

Sp gr at 15° of CdSO_4 +Aq containing 10 g $\text{CdSO}_4+4\text{H}_2\text{O}$ in 100 cc of solution = 1 0790, containing 20 g $\text{CdSO}_4+4\text{H}_2\text{O}$ in 100 cc of solution = 1 1522 (Lutten, J pr 1885, (2) 31 207)

Could not be obtained (Mylius and Funk)

+ $7\text{H}_2\text{O}$

Solubility in H_2O

t	C CdSO_4
17	11 15
16	11 5
12	15 3
10	16 1
7	17 5
5	18 5
1 5	18 7

(Mylius and Funk B 1897 30 828)

Cadmium caesium sulphate, CdSO_4 , $\text{Cs}_2\text{SO}_4+6\text{H}_2\text{O}$

Sol in H_2O (Lutton, Chem Soc 63 337)

1 l H_2O dissolves 1399 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)

Bismuth sodium sulphate, $\text{Bi}_4\text{Na}_6(\text{SO}_4)_3$
(Ludecke, A 140 277)

Boron sulphate

See Borosulphuric acid

Bromomolybdenum sulphate

See under Bromomolybdenum compounds

Cadmium sulphate, basic, 2CdO , SO_3 , and $+\text{H}_2\text{O}$

Difficultly sol in H_2O (Stromeyer) SI
sol in hot H_2O (Habermann, M 5 432)
 4CdO , SO_3 (Pickering, Chem Soc 1907,
91 1987)

Cadmium sulphate, CdSO_4

Sat $\text{CdSO}_4 + \text{Aq}$ contains at

0°	10°	24°	30°	65°
35.9	37.5	41.5	42.0	49.7% CdSO_4
86°	94°	130°	165°	188° 200°
43.5	91.6	27.7	14.7	7.1 2.3% CdSO_4

CdSO_4 easily forms supersat solutions
(Étard, A ch 1894, (7) 2 552)

Solubility in H_2O

t°	Per cent CdSO_4 in sat solution	Solid phase
-18	43.35	Ice " " " $\text{CdSO}_4 \cdot \frac{8}{3}\text{H}_2\text{O}$
-10	43.27	
0	43.01	
+10	43.18	
15	43.20	"
20	43.37	"
30	43.75	"
40	43.99	"
60	44.99	"
62	45.06	"
72	46.2	"
73.5	46.6	"
74.5	46.7	"
75	46.5	$\text{CdSO}_4 \cdot \text{H}_2\text{O}$ " " " " " "
77	42.2	
78.5	41.5	
85	39.6	
90	38.7	
95	38.1	
100	37.8	

(Mylus and Funk, B 1897, 30 825)

See also under $\text{CdSO}_4 + 2 \frac{1}{3}\text{H}_2\text{O}$, and $7\text{H}_2\text{O}$

Sp gr at $0^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
14.0 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.0122$

Sp gr at $12^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
14.0 g CdSO_4 in 100 g $\text{H}_2\text{O} = 1.0121$

Sp gr at $12^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
57.2 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.0514$

Sp gr at $0^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
183.1 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.1552$

Sp gr at $13^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
183.1 g CdSO_4 in 1000 g $\text{H}_2\text{O} = 1.1529$

(Fouqué, Ann Observ 1868, 9 172)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at 18°

% CdSO_4	1	5	10	15
Sp gr	1.0084	1.0486	1.1026	1.1607

% CdSO_4	20	25	30	35
Sp gr	1.2245	1.295	1.3725	1.4575

% CdSO_4	36
Sp gr	1.4743

(Grotian, W Ann 1883, 18 193)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at room temp containing

7.14	14.66	22.011% CdSO_4
1.0681	1.1591	1.2681

(Wagner, W Ann 1883, 18 268)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at 25°

Concentration of CdSO_4 +Aq	Sp gr
1-normal	1.0973
$\frac{1}{2}$ " "	1.0487
$\frac{1}{5}$ " "	1.0244
$\frac{1}{8}$ " "	1.0120

(Wagner, Z phys Ch 1890, 5 36)

Sp gr of $\text{CdSO}_4 + \text{Aq}$

% CdSO_4	t°	Sp gr at t°	Sp gr at 18°
0.0289	17.29	0.99908	0.99593
	23.65	0.99776	
0.0498	18.00		0.99915
0.0999	18.00		0.99961
0.495	18.00		1.0034
0.981	18.00		1.0084

(Wershofen, Z phys Ch 1890, 5 494)

Sp gr at $16^\circ/4^\circ$ of $\text{CdSO}_4 + \text{Aq}$ containing
29.4654% $\text{CdSO}_4 = 1.36289$, containing
21.3671% $\text{CdSO}_4 = 1.24211$ (Schonrock, Z
phys Ch 1893, 11 781)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ at $15^\circ/4^\circ$

% CdSO_4	25.121	15.172
Sp gr	1.297	1.200

% CdSO_4	9.952	5.639
Sp gr	1.101	1.055

(de Muynck, W Ann 1894, 53 561)

$\text{CdSO}_4 + \text{Aq}$ containing 1.40% CdSO_4 has
sp gr $20^\circ/20^\circ = 1.1429$

$\text{CdSO}_4 + \text{Aq}$ containing 16.79% CdSO_4 has
sp gr $20^\circ/20^\circ = 1.1847$

(Le Blanc and Rohland, Z phys Ch 1896,
19 282)

Sp gr of CdSO_4 at 18 $^{\circ}$, when p = per cent strength of solution, d = observed density, w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
39 86	1 5639	0 6231
31 53	1 4080	0 4439
26 85	1 3310	0 3574
24 17	1 2901	0 3118
18 35	1 2084	0 2217
13 27	1 1437	0 1518
9 97	1 1045	0 1102
7 46	1 0764	0 0803
6 12	0 0619	0 0650
2 52	0 0242	0 0259
1 45	0 0132	0 0147
0 464	0 0033	0 0046

(Barnes, J phys Ch 1898, 2 543)

Sp gr of $\text{CdSO}_4 + \text{Aq}$ sat at 25 $^{\circ}$ and 1 atm = 317 (Sinnige, Z phys Ch 1909, 67 518)

also under $\text{CdSO}_4 + 2\frac{1}{3}\text{H}_2\text{O}$, and I_2O sol in liquid NH_3 (Franklin, Am Ch J 98, 20 827)
sol in acetone (Naumann, B 1904, 37 432), methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1911, 43 314)

H_2O See Mylius and Funk, under Cd
 $\frac{11}{13}\text{H}_2\text{O}$ (Worobieff, Bull Soc 1896, (3) 6 1754)
 $2\frac{2}{3}\text{H}_2\text{O}$ 1 pt H_2O dissolves 0.59 pt anhydrous salt at 23 $^{\circ}$, and not much more on heating. Sat solution boils at 102 $^{\circ}$. Prepared by alcohol (v Hauer)

100 g H_2O dissolve g CdSO_4 at t $^{\circ}$

t $^{\circ}$	C CdSO_4
0	75 52
5	75 65
7	65 73
9	75 85
11 5	75 94
13	76 04
15	76 11
16	76 16
17	76 13
18	76 14
19	76 18
25	76 79

(Königsmann and Cohen, W Ann 1898, 65 352)

100 pts H_2O dissolves at
13 7 $^{\circ}$ 14 98 $^{\circ}$ 15 0 $^{\circ}$ 16 0 $^{\circ}$
76 06 76 09 76 14 76 18 pts anhydrous salt,
16 96 $^{\circ}$ 18 0 $^{\circ}$ 19 0 $^{\circ}$ 25 0 $^{\circ}$
76 26 76 32 76 39 76 81 pts anhydrous salt
(Steinwehr, W Ann 1902, (4) 9 1050)

100 g H_2O dissolve 76.02 g CdSO_4 at 25 $^{\circ}$ (Stortenbecker, Z phys Ch 1900, 34 109)

Solubility of $\text{CdSO}_4 + 2\frac{1}{3}\text{H}_2\text{O}$ at 25 $^{\circ}$ and varying pressures

Pressure in atmospheres	G CdSO_4 in 100 g H_2O
1	76 80
500	77 85
500	78 08
1000	78 77
1000	78 68

Det by another method

Pressure in atmospheres	G CdSO_4 in 100 g H_2O
250	77 53
500	78 02
750	78 60
1000	78 96

(Cohen and Sinnige Trans Farad Soc 1910, 5 269)

Sp gr at 21 6 $^{\circ}$ 0 $^{\circ}$ of $\text{CdSO}_4 + \text{Aq}$ containing 11.47% $\text{CdSO}_4 + \frac{8}{3}\text{H}_2\text{O} = 1.0944$ (Kanonnikoff, J pr 1885, (2) 31 346)

100 g H_2O dissolve 57.61 g $\text{CdSO}_4 + 10.63$ g FeSO_4 at 25 $^{\circ}$ (Stortenbecker, Z phys Ch 1900, 34 109)
 $+4\text{H}_2\text{O}$ (Lescœur, A ch 1895, (7) 4 222)

Sp gr at 15 $^{\circ}$ of $\text{CdSO}_4 + \text{Aq}$ containing 10 g $\text{CdSO}_4 + 4\text{H}_2\text{O}$ in 100 cc of solution = 1.0790, containing 20 g $\text{CdSO}_4 + 4\text{H}_2\text{O}$ in 100 cc of solution = 1.1522 (Traube, J pr 1885, (2) 31 207)

Could not be obtained (Mylius and Funk)
 $+7\text{H}_2\text{O}$

Solubility in H_2O

t $^{\circ}$	% CdSO_4
-17	44 15
-16	44 5
-12	45 3
-10	46 1
-7	47 5
-5	48 5
-4 5	48 7

(Mylius and Funk, B 1897, 30 828)

Cadmium cæsium sulphate, $\text{CdSO}_4, \text{Cs}_2\text{SO}_4 + 6\text{H}_2\text{O}$

Sol in H_2O (Tutton, Chem Soc 63 337)
1 l H_2O dissolves 1399 g anhydrous salt at 25 $^{\circ}$ (Locke, Am Ch J 1902, 27 459)

Cadmium calcium potassium sulphate,
 $\text{Ca}_2\text{CdK}_2(\text{SO}_4)_4 + 2\text{H}_2\text{O}$
 (D'Ans, B 1908, 41 1778)

Cadmium cerium sulphate, $\text{CdSO}_4, \text{Ce}_2(\text{SO}_4)_3 + 6\text{H}_2\text{O}$
 Sol in H_2O (Wyruboff)

Cadmium hydrazine sulphate,
 $\text{CdH}_2(\text{SO}_4)_2, 2\text{N}_2\text{H}_4$
 1 pt is sol in 202.5 pts H_2O at 12°
 Not attacked by dil acids Easily sol in
 $\text{NH}_4\text{OH} + \text{Aq}$ (Curtius, J pr 1894, (2) 50
 331)

Cadmium magnesium sulphate, $\text{CdSO}_4, \text{MgSO}_4 + 14\text{H}_2\text{O}$
 Very efflorescent Sol in H_2O (Schiff, A
 104 325)

Cadmium potassium sulphate, $\text{K}_2\text{SO}_4, \text{CdSO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$
 Sol in H_2O (v Hauer, Pogg 133 176)
 100 pts H_2O dissolve 42.50 pts anhydrous
 salt at 26°
 100 pts H_2O dissolves 42.80 pts anhydrous
 salt at 31°
 100 pts H_2O dissolve 43.45 pts anhydrous
 salt at 40°
 100 pts H_2O dissolve 44.90 pts anhydrous
 (Wyruboff, Bull Soc Min

00 pts H_2O dissolve 42.89 pts
 us salt at 16° , 46.82 pts at 31° ,
 47.40 pts at 40° (Wyruboff)
 $+4\text{H}_2\text{O}$ Efflorescent (Wyruboff, Bull
 Soc Min 1891, 14 235)
 $+6\text{H}_2\text{O}$ Very efflorescent, and easily
 decomp (Schiff)
 Does not exist (Wyruboff)

Cadmium rubidium sulphate, $\text{CdSO}_4, \text{Rb}_2\text{SO}_4 + 6\text{H}_2\text{O}$
 Efflorescent Sol in H_2O (Tutton)
 1 l H_2O dissolves 767 g anhydrous salt
 at 25° (Locke, Am Ch J 1902, 27 459)

Cadmium sodium sulphate, $\text{CdSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
 Sol in H_2O (v Hauer)
 Solubility of $\text{CdNa}_2(\text{SO}_4)_2 + 2\text{H}_2\text{O}$ in 100 g
 H_2O at t°

t	Grams CdSO_4	Grams Na_2SO_4
24	35.49	24.04
25	35.88	24.46
30	36.28	24.605
35	36.69	24.99
40	37.24	25.455

(Koppel, Z phys Ch 1905, 52 413)
 Decomp by H_2O below 20.5°

Solubility of $\text{CdNa}_2(\text{SO}_4)_2, 2\text{H}_2\text{O} + \text{CdSO}_4$,
 $\frac{8}{3}\text{H}_2\text{O}$ in 100 g H_2O at t°

t°	Grams CdSO_4	Grams Na_2SO_4	t°	Grams CdSO_4	Grams Na_2SO_4
0	73.54	8.80	15	73.76	9.425
5	73.38	8.67	20	73.81	9.450
10	72.78	8.55	25	73.71	10.48
			40	75.385	13.75

(Koppel)

Solubility of $\text{CdNa}_2(\text{SO}_4)_2, 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$,
 $10\text{H}_2\text{O}$ in 100 g H_2O at t°

t°	Grams CdSO_4	Grams Na_2SO_4
-14.8	72.68	8.32
0	66.325	11.625
5	61.78	12.97
10	55.34	14.785
12	51.615	15.95
15	46.60	17.99
19.8	36.13	22.16
20	36.25	23.52
24	27.82	29.17
25	25.59	31.06
30	14.62	44.145

(Koppel)

Solubility of $\text{CdNa}_2(\text{SO}_4)_2, 2\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
 (anhydrous) in 100 g H_2O at t°

t°	Grams CdSO_4	Grams Na_2SO_4
35	13.26	47.06
40	16.25	46.27

(Koppel)

Cadmium sulphate ammonia, $\text{CdSO}_4, 6\text{NH}_3$
 Sol in H_2O with separation of CdO (Rose,
 Pogg 20 152)
 $\text{CdSO}_4, 4\text{NH}_3 + 4\text{H}_2\text{O}$ Decomp by H_2O
 (Malaguti and Sarzeau, A ch (3) 9 431)
 $+2\text{H}_2\text{O}$ Ppt (Andre, C R 104 987)
 $+2\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O with separation of
 basic sulphate (Muller, A 149 70)
 $\text{CdSO}_4, 3\text{NH}_3$ (Isambert, C R 1870, 70
 457)

Cadmium sulphate cupric oxide, $\text{CdSO}_4, 3\text{CuO} + x\text{H}_2\text{O}$
 (Recoura, C R 1901, 132 1415)
 $2\text{CdSO}_4, 3\text{CuO} + 8\text{H}_2\text{O}$ (Mulhe, A ch
 1902, (7) 27 383)
 $+12\text{H}_2\text{O}$ (Mailhe)
 $6\text{CdSO}_4, 20\text{CuO} + x\text{H}_2\text{O}$ (Recoura, C R
 1901, 132 1415)

Cadmium sulphate hydrazine, $\text{CdSO}_4, 2\text{N}_2\text{H}_4$

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ but cannot be
 cryst therefrom (Franzen, Z anorg 1908,
 60 282)

Cadmium sulphate hydrogen chloride,
 $3\text{CdSO}_4, 4\text{HCl} + 4\text{H}_2\text{O}$

Very deliquescent (Baskerville and Harris,
J Am Chem Soc 1901, **23** 896)
 $3\text{CdSO}_4, 8\text{HCl}$ Very deliquescent (Bas-
kerville and Harris)

Cæsium sulphate, Cs_2SO_4

Not deliquescent
100 pts H_2O dissolve 158.7 pts Cs_2SO_4 at
—2°
100 cc H_2O at 17–18° dissolve 163.5 g
 Cs_2SO_4 (Tutton, Chem Soc 1894, **65**
632)

Solubility in H_2O

t°	G Cs_2SO_4 per 100 g		G mols Cs_2SO_4 per l	t°	G Cs_2SO_4 per 100 g		G mols Cs_2SO_4 per l
	Solu- tion	H_2O			Solu- tion	H_2O	
0	62.6	167.1	3.42	60	66.7	199.9	3.78
10	63.4	173.1	3.49	70	67.2	205.0	3.83
20	64.1	178.7	3.56	80	67.8	210.3	3.88
30	64.8	184.1	3.62	90	68.3	214.9	3.92
40	65.5	189.9	3.68	100	68.8	220.3	3.97
50	66.1	194.9	3.73	108.6	69.2	224.5	4.00

(Berkeley, Trans Roy Soc 1904, **203** A
210)

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$

Sat solution contains 54.7% $\text{Cs}_2\text{SO}_4 +$
11.45% Na_2SO_4 at 25° (Foote, J Am
Chem Soc 1911, **33** 467)

Insol in alcohol (Bunsen)

Insol in methyl acetate (Naumann, B
1909, **42** 3790)

Insol in acetone (Naumann, B 1904, **37**
4329; (Eidmann, C C 1899, II 1014)

Solubility in glycol at ord temp = 3.0–
3.2% (de Coninck, Belg Acad Bull
1905 359)

Cæsium hydrogen sulphate, CsHSO_4

Sol in H_2O

Cæsium pyrosulphate, $\text{Cs}_2\text{S}_2\text{O}_7$

Decomp by H_2O

Cæsium osulphate, $\text{Cs}_2\text{S}_8\text{O}_{25}$

Decomp by H_2O (Weber, B 17 2497)

Cæsium calcium sulphate, $\text{Ca}_2\text{Cs}_2(\text{SO}_4)_3$

Very stable, (D'Ans, B 1908, **41** 1776)

**Cæsium chromium sulphate, $\text{Cs}_2\text{Cr}_2(\text{SO}_4)_4$
+ $24\text{H}_2\text{O}$**

Melts in crystal H_2O at 116° (Locke)

Solubility in H_2O

Temp	G per litre	G mols anhydrous salt per l
25°	5.7	0.015
30°	9.6	0.025
35°	12.06	0.032
40°	15.3	0.0405

(Locke, Am Ch J 1901, **26** 180)

**Cæsium cobaltous sulphate, $\text{Cs}_2\text{SO}_4, \text{CoSO}_4 +$
 $6\text{H}_2\text{O}$**

Sol in H_2O (Tutton, Chem Soc **63**
337)

1 l H_2O dissolves 418.8 g anhydrous
salt at 25° (Locke, Am Ch J 1902, **27**
459)

**Cæsium cobaltic sulphate, $\text{Cs}_2\text{Co}_2(\text{SO}_4)_4 +$
 $24\text{H}_2\text{O}$**

Melts in crystal H_2O at 116° (Locke,
Am Ch J 1901, **26** 183)

**Cæsium copper sulphate, $\text{Cs}_2\text{SO}_4, \text{CuSO}_4 +$
 $6\text{H}_2\text{O}$**

Sol in H_2O (Tutton)
1 l H_2O dissolves 460 g anhydrous salt
at 25° (Locke, Am Ch J 1902, **27** 459)

**Cæsium gallium sulphate, $\text{Cs}_2\text{Ga}_2(\text{SO}_4)_4 +$
 $24\text{H}_2\text{O}$**

(Soret, Arch sc phys nat 1888, (3) **20**
531)

**Cæsium indium sulphate, $\text{Cs}_2\text{In}_2(\text{SO}_4)_4 +$
 $24\text{H}_2\text{O}$**

75.7 g anhydrous (117.39 hydrated) salt
or 0.172 g mols of anhydrous salt are sol
in 1 l H_2O at 25° (Locke, Am Ch J 1901,
26 175)

100 pts H_2O dissolve 3.04 pts at 16.5°
(Chabrie and Rengade, C R 1900, **131** 1301)

**Cæsium iridium sulphate, $\text{Cs}_2\text{SO}_4,$
 $\text{Ir}_2(\text{SO}_4)_3 + 24\text{H}_2\text{O}$**

Mpt 109–110°

Very sl sol in cold More easily sol in
hot H_2O (Marino, Z anorg 1904, **42** 218)

**Cæsium iron (ferrous) sulphate, $\text{Cs}_2\text{SO}_4,$
 $\text{FeSO}_4 + 6\text{H}_2\text{O}$**

Sol in H_2O (Tutton)

1 l H_2O dissolves 1011 g anhydrous salt
at 25° (Locke, Am Ch J 1902, **27** 459)

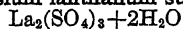
**Cæsium iron (ferric) sulphate, $\text{Cs}_2\text{Fe}_2(\text{SO}_4)_4$
+ $24\text{H}_2\text{O}$**

Melts in crystal H_2O at 71° (Locke)

Solubility in H₂O

t°	G per litre	G mols anhydrous salt per litre
25	17 1	0 045
30	25 2	0 066
35	37 5	0 099
40	60 4	0 156

(Locke, Am Ch J 1901, 26 180)

Cæsium lanthanum sulphate, Cs₂SO₄,

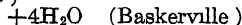
(Baskerville, J Am Chem Soc 1904, 26 67)

**Cæsium magnesium sulphate**, Cs₂SO₄,
MgSO₄+6H₂OSol in H₂O (Tutton)1 l H₂O dissolves 533 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)**Cæsium manganous sulphate**, Cs₂SO₄,
MnSO₄+8H₂OSol in H₂O (Tutton)Sol in H₂O and acids with decomp (Piccini, Z anorg 1899, 20 14)1 l H₂O dissolves 804 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 45)**Cæsium manganic sulphate**, Cs₂SO₄,
Mn₂(SO₄)₃+24H₂ODecomp by H₂O and dil acids with separation of MnO₂. Sol in 1 3 H₂SO₄+Aq and in conc HNO₃. Insol in acetic acid. Sol in oxalic acid+Aq (Christensen, Z anorg 1901, 27 332)**Cæsium neodymium sulphate**, Cs₂SO₄,
Nd₂(SO₄)₃+3H₂O

(Baskerville, J Am Chem Soc 1904, 26 74)

Cæsium nickel sulphate, Cs₂SO₄, NiSO₄+
6H₂OSol in H₂O (Tutton)1 l H₂O dissolves 255 8 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)**Cæsium praseodymium sulphate**, Cs₂SO₄,
Pr₂(SO₄)₃+2H₂O

(Baskerville, J Am Chem Soc 1904, 26 73)

**Cæsium rhodium sulphate**, Cs₂SO₄, Rh₂(SO₄)₃+
24H₂OSl sol in cold, sol in warm H₂O, mpt 110–111° (Piccini, Z anorg 1901, 27 64)**Cæsium thallic sulphate**, CsTl(SO₄)₄+
1½H₂O

Hygroscopic (Locke, Am Ch J 1902, 27 283)

+3H₂O Very sl sol in cold, easily sol in hot H₂O. Can be recryst from H₂SO₄+Aq. The recryst salt is at once decomp by H₂O or 95% alcohol (Locke)**Cæsium thorium sulphate**, Cs₂SO₄, Th(SO₄)₂+
2H₂OSl sol in H₂O (Manuelli, Gazz ch it 1903, 32 (2) 523)**Cæsium titanium sulphate**, Cs₂SO₄, Ti₂(SO₄)₃+
24H₂O

Deliquesces in the air and is decomp

Sl sol in cold H₂O, decomp by hot H₂O (Piccini, Gazz ch it 1895, 25 542)Sl sol in cold H₂O, more sol in hot H₂O acidified with H₂SO₄

Decomp in neutral aq solution (Piccini, Z anorg 1898, 17 356)

Cæsium uranyl sulphate, Cs₂(UO₂)(SO₄)₂+
2H₂O

As Na salt (de Coninck, C C 1905, I 1306)

Cæsium vanadium sulphate, Cs₂V₂(SO₄)₄+
24H₂O771 g anhydrous (13 1 g hydrated) salt, or 0 0204 gr mols of the anhydrous salt are sol in 1 l H₂O at 25° (Locke, Am Ch J 1901, 26 175)Sl sol in cold, easily sol in hot H₂O (Piccini, Z anorg 1896, 11 114)100 pts H₂O dissolve 0 464 pts of the salt at 10° and sp gr of the solution at 4°/20° = 2 033. More sol in hot H₂O than in cold (Piccini, Z anorg 1897, 13 446)**Cæsium zinc sulphate**, Cs₂SO₄, ZnSO₄+
6H₂OSol in H₂O (Bunsen and Kopp, Pogg 113 337)1 l H₂O dissolves 386 3 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)**Cæsium zirconium sulphate**, Zr O₃.(Cs₂SO₄)₂+
11H₂O

Ppt (Rosenheim, B 1905, 38 515)

Calsium sulphate, CaSO₄, and +2H₂OThe older determinations of the solubility of CaSO₄ in H₂O have little, but historical, value, as the solutions were usually either non-saturated or supersaturated. They may be tabulated as follows

A = pts H_2O required for dissolving 1 pt CaSO_4 , and B for 1 pt $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at t°

t°	A	B	Authority
Hot or cold	500		Fourcroy
Cold	500		Bergmann
Boiling	450		"
All temp	322		Lassaigne
(?)	438		Anthou
(?)	250-300		Dumas
Hot or cold	578.5	461.5	Bucholz
Cold	480	380	Geise
Hot	491	388	"
15-20°	492	388	Tipp
12 5°	503	397	Lecoq

100 pts H_2O at t° dissolve pts CaSO_4

t°	Pts CaSO_4	t°	Pts CaSO_4	t°	Pts CaSO_4
0	0 205	35	0 254	70	0 244
5	0 219	40	0 252	80	0 239
12	0 233	50	0 251	90	0 231
20	0 241	60	0 248	100	0 217
30	0 249				

(Poggiale, A ch (3) 8 469)

Poggiale worked with supersat solutions (Droeze, B 10 330)

H_2O dissolves CaSO_4 most abundantly at 35° (Poggiale), at 32-41° (Marignac)

1 pt $\text{CaSO}_4 + 2\text{H}_2\text{O}$ dissolves at					
0°	18°	24°	32°	38°	
in 415	386	378	371	368 pts H_2O ,	
41°	53°	72°	86°	99°	
in 370	375	391	417	451 pts H_2O ,	

or (by calculation) 1 pt anhydrous CaSO_4 dissolves at

0°	18°	24°	32°	38°
in 525	488	479	470	466 pts H_2O ,
41°	53°	72°	86°	99°
in 468	474	495	528	571 pts H_2O

The above nonsat solutions are obtained by using a large excess of $\text{CaSO}_4 + 2\text{H}_2\text{O}$. The undissolved part retains its water of crystallisation (CaSO_4 , dehydrated at 130-140°, forms a supersaturated solution with H_2O in 10 minutes, containing 1 pt CaSO_4 to 110 pts H_2O , which soon deposits crystals. The undissolved part takes up its water of crystallisation. Ignited CaSO_4 dissolves very slowly in H_2O , so that in 24 hours the solution contains $1/13$ to $1/18$ anhydrous CaSO_4 . By longer contact solution continues with formation of supersaturated solutions, which contain after 10-30 days $1/37$ to $1/33$ CaSO_4 , but these become normal as the water of crystallisation takes up its water of crystallisation. The mineral anhydrite behaves similarly water taking up $1/582$ CaSO_4 in 1 day, $1/861$ in 40 days, and $1/467$ in 8 months.

Supersaturated solutions are also obtained

by evaporation of a saturated solution. By evaporation with heat, solutions are obtained containing $1/308$ CaSO_4 , and in the cold with $1/112$ CaSO_4 , in the solution over the separated $\text{CaSO}_4 + 2\text{H}_2\text{O}$. Neutralising dil $\text{H}_2\text{SO}_4 + \text{Aq}$ with CaCO_3 gives a solution containing $1/114$ CaSO_4 , which crystallises out partly in 24 hours, leaving $1/313$ CaSO_4 dissolved.

Supersaturated solutions containing $1/110$ to $1/180$ CaSO_4 deposit crystals rapidly, those under $1/350$ do not crystallise spontaneously. A solution containing $1/283$ shows crystals in 14 days, and contains $1/312$ in 1 month, $1/414$ in 2 months, $1/446$ in 3 months, in spite of repeated shaking.

Boiling diminishes the supersaturation without however removing it entirely (Marignac, A ch (5) 1 274).

1 pt $\text{CaSO}_4 + 2\text{H}_2\text{O}$ is sol in 443 pts H_2O at 13 7°, in 447 pts H_2O at 14 2°, in 421 pts H_2O at 20 2°, in 419 pts H_2O at 21 2°, and in 445 pts $\text{H}_2\text{CO}_3 + \text{Aq}$ sat at 18 7° (Church, J B 1867 192).

Church's solutions were not sat (Droeze, B 10 330).

1000 pts H_2O dissolve 2 19 pts $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at 16 5°, 2 352 pts $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at 22° (Cossa, Gazz ch it 1873 135).

Cossa's solutions were not saturated (Droeze).

$\text{CaSO}_4 + 2\text{H}_2\text{O}$ is sol in 415 pts H_2O at 0°, in 412 pts H_2O at 5°, in 407 pts H_2O at 10°, in 398 pts H_2O at 15°, in 371 pts H_2O at 20°, in 365 pts H_2O at 25°, in 361 pts H_2O at 30°, in 359 pts H_2O at 35° (Droeze, B 10 330).

Sol in 500 pts H_2O at 12 5° (From Marignac's and his own results, de Boisbaudran, A ch (5) 3 477).

CaSO_4 is sol in 564.5 pts H_2O at 0.8°, 506.27 pts at 14°, 472.3 pts at 32.5-38.8°, 498.73 pts at 64°, 533.92 pts at 79.6° (Raupenstrauch, M 6 563).

According to Goldammer (C C 1888 708) H_2O is fully saturated with CaSO_4 by shaking the finely-powdered substance 5 minutes therewith.

The following results were obtained. Figures denote pts H_2O in which 1 pt CaSO_4 was dissolved at t° (a) from pptd CaSO_4 "ipse fact," (b) from pptd CaSO_4 "gehe," (c) from "glacies mariae pulv," (d) from "glacies Mariae pulv," containing less than $2\text{H}_2\text{O}$.

t	a	b	c	t	d
0	561.5	558	557.5	0	476.5
7.5	526	526	520		
15	497.5	497.5	493	20	436
22.5	481	481.5	479		
30	475	475	470		
37.5	463	469	465.5	40	450
45	473.5	474.5	470.5		
60	484	486.5	482	60	476
75	507.5	508	503	80	502.5
90	533.5	530	534		
100	556	557	534.5	100	547

Burnt gypsum easily forms supersat solutions containing nearly 1% CaSO_4 . It forms supersat solutions more readily at 0° , and that tendency decreases with increase of temp, hence figures in (d) which contained burnt gypsum (Goldammer, C C 1888 708)

Calculated from electrical conductivity of $\text{CaSO}_4 + \text{Aq}$, 1 l H_2O dissolves 2.07 g CaSO_4 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

The anhydrous salt varies in solubility. Solubility depends (1) upon temp and time of drying, (2) upon the relative amount of salt, (3) upon time of shaking. Possibly a and b modifications (Potilizin, C C 1894, II 515)

2.04 gr are dissolved in 1 liter of sat solution at 20° (Böttger, Z phys Ch 1903, 46 603)

At 15° and after 5 minutes shaking, the highest degree of supersaturation which can be obtained with pure sol calcium sulphate = 9.47 g of the anhydrous salt or 11.976 g $\text{CaSO}_4 + 2\text{H}_2\text{O}$ in 1 l of H_2O (Cavazzi, C C 1905, I 1694)

Solubility of CaSO_4 in 100 pts H_2O at high temp

t°	Pts	t°	Pts CaSO_4	t°	Pts CaSO_4
0	78	175-185	0.027	250	0.016
0	056	240	0.018		

Landen and Shenstone, Phil Trans 1884 31)

Pptn of CaSO_4 which has been started by heating solution to 140 - 150° continues even after solution has cooled (Storer)

CaSO_4 is completely insol in sea water or pure H_2O at temperatures between 140° and 150° (Cousté)

Solubility of CaSO_4 in sea water at temperatures over 100° $t^\circ = \text{temp}$, $P = \text{pressure}$ in atmospheres, % = per cent CaSO_4 in sat solution

t°	P	%	t	P	%
103	1	0.500	118.5	1.50	0.226
103.8	1	0.477	121.2	1.5	0.183
105.15	1	0.432	124	2	0.140
108.6	1.25	0.395	127.9	2	0.097
111	1.25	0.355	130	2.5	0.060
113.2	1.25	0.310	133.3	2.5	0.023
115.8	1.50	0.267			

(Cousté, Ann Min (5) 5 80)

Solubility of CaSO_4 in H_2O at various pressures

100 g sat $\text{CaSO}_4 + \text{Aq}$ at 1 atmos pressure and 15° contain 0.206 g CaSO_4 , at 20 atmos pressure and 15° contain 0.227 g CaSO_4 , at 1 atmos pressure and 16.2° contain 0.213 g CaSO_4 (Moller, Pogg 117 386)

Soluble anhydrite

1 l H_2O dissolves 22.8 milliequivalents at 100°

1 l H_2O dissolves 6.4 milliequivalents at 156°

Anhydrite

1 l H_2O dissolves 9.2 milliequivalents at 100°

1 l H_2O dissolves 2.7 milliequivalents at 156°

1 l H_2O dissolves 0.7 milliequivalents at 218°

(Melcher, J Am Chem Soc 1910, 32 63)

See also under gypsum, p 953

Maximum solubility is at 37.5° (Cameron, J phys Chem 1901, 5 572)

Sp gr of sat $\text{CaSO}_4 + \text{Aq}$ at $15^\circ = 1.0022$ (Stolba, J pr 97 503)

Sp gr of sat $\text{CaSO}_4 + \text{Aq}$ at $31^\circ = 1.0031$

1 pt CaSO_4 is sol in 218 pts H_2O containing CO_2 (Beyer, Arch Pharm (2) 150 193)

Sl sol in cold $\text{HCl} + \text{Aq}$, completely sol in boiling dil HCl or $\text{HNO}_3 + \text{Aq}$ (Rose, Pogg 95 108)

Solubility of CaSO_4 in $\text{HCl} + \text{Aq}$

t°	% HCl	100 ccm dissolve g of CaSO_4	t°	% HCl	100 ccm dissolve g of CaSO_4
25	0.77	0.6405	25	6.12	1.6539
25	1.56	0.8821	101	0.77	1.1209
25	3.06	1.2639	102	3.06	3.1780
25	4.70	1.5342	103	6.12	4.6902

(Lunge, J Soc Chem Ind 4 31)

Solubility in $\text{HNO}_3 + \text{Aq}$ at 25°

g HNO_3 per 100 cc	g CaSO_4 per 100 cc solution	g HNO_3 per 100 cc	g CaSO_4 per 100 cc solution
0	0.208	6	1.48
1	0.56	8	1.70
2	0.82	10	1.84
3	1.02	12	1.98
4	1.20		

(Banthisch, J pr 1884, 29 52)

For solubility in H_2SO_4 see $\text{CaH}_2(\text{SO}_4)_2$

Solubility in $\text{H}_3\text{PO}_4 + \text{Aq}$ at 25°

G P_2O_5 per l	G CaSO_4 per l	Sp gr $25^\circ/25^\circ$
0.0	2.126	
5.0	3.138	1.002
10.5	3.734	1.007
21.4	4.456	1.016
46.3	5.760	1.035
105.3	7.318	1.075
145.1	7.920	1.106
204.9	8.383	1.145
312.0	7.965	1.221
395.7	6.848	1.230
494.6	5.573	1.344

(Taber, J phys Chem 1906, 10 628)

Solubility in formic acid at 25°

100 cc of solution of acid containing 4%

dissolve 0.24 g CaSO_4 (Banthusch, J pr 1884, 29 52)

Solubility of CaSO_4 in chloroacetic acid at 25° 100 cc of solution of acid containing 4% dissolve 0.22 g CaSO_4 , 10%, 0.25 g (Banthusch, J pr 1884, 29 52)

Solubility in H_2O is increased by presence of NH_4Cl (Vogel, J pr 1 196), ammonium succinate (Wittstein, Repert 57 18), $(\text{NH}_4)_2\text{SO}_4$, $(\text{NH}_4)_2\text{B}_4\text{O}_7$ (Popp, A Suppl 8 11), also KNO_3 (Vogel, Jun.), Na_2SO_4 (Henry, J Pharm 12 31), NaCl (Trommsdorf, N J Pharm 18, 1 234)

Decomp by alkali carbonates + Aq (See Storer's Dict)

1 g CaSO_4 is sol in 162 ccm sat KCl + Aq at 8°, in 147 ccm sat NaCl + Aq at 8.5°, in 93 ccm sat NH_4Cl + Aq at 12.5°, in 94 ccm sat KNO_3 + Aq, in 92 ccm sat NaNO_3 + Aq, in 320 ccm sat NH_4NO_3 + Aq, in 54 ccm $\frac{1}{2}$ sat NH_4NO_3 + Aq, in about 2000 ccm sat K_2SO_4 + Aq (Droeze)

More sol in Fe_2Cl_6 , Cr_2Cl_6 , CuCl_2 , ZnCl_2 + Aq than in H_2O , but not more sol in CaCl_2 + Aq (Gladstone)

NH_4Cl + Aq

1 g CaSO_4 is sol in 92 ccm sat NH_4Cl + Aq at 13.5°, in 94 ccm $\frac{1}{2}$ sat NH_4Cl + Aq at 13.5–15.5°, in 200 ccm $\frac{1}{8}$ sat NH_4Cl + Aq at 13.5°, in 183 ccm $\frac{1}{8}$ sat NH_4Cl + Aq at 100° (Fassbender, B 9 1360)

Solubility of CaSO_4 in 25% NH_4Cl + Aq

t°	% CaSO_4	t°	% CaSO_4
8	1 030	60	1 333
9	1 023	80	1 026
25	1 096	120	1 000
39	1 126		

(Tilden and Shenstone, Roy Soc Proc 38 335)

Solubility in NH_4Cl + Aq increases with percentage of NH_4Cl , but if solution contains more than 60 g NH_4Cl per l more CaO dissolves than SO_3 . With 333 g NH_4Cl per l, the solution contains 4.9 g SO_3 and 4.4 g CaO , while the SO_3 content requires only 3.4 g CaO (Ditte, C R 1898, 126 694)

Solubility of CaSO_4 in NH_4Cl + Aq at 25°

Grams NH_4Cl per liter	Grams CaSO_4 per liter
10 8	3 90
24 4	5 38
46 7	7 07
94 5	8 80
149 7	10 30
198 6	10 85
210 0	10 88
275 0	10 60
325 0	9 40
375 3 (saturated)	7 38

(Cameron and Brown, J phys Chem 1905, 9 211)

CaCl_2 + Aq

Solubility of CaSO_4 in CaCl_2 + Aq at t°

t°	% CaCl_2	100 ccm dissolve g of CaSO_4	t°	% CaCl_2	100 ccm dissolve g of CaSO_4
23	3 54	0 1225	25	16 91	0 0702
24	6 94	0 0963	101 0	3 54	0 1370
25	10 36	0 0886	102 5	10 36	0 1426
25	15 90	0 0734	103 5	16 91	0 1301

(Lunge, l c)

Solubility of CaSO_4 in H_2O containing various amts of CaCl_2 at 20° 100 pts H_2O containing pts CaCl_2 dissolve pts CaSO_4

Pts CaCl_2	Pts CaSO_4	Pts CaCl_2	Pts CaSO_4
0 00	0 225	19 80	0 041
11 50	0 078	51 00	0 000
14 39	0 063	67 05	0 000

(Tilden and Shenstone)

Solubility of CaSO_4 in CaCl_2 + Aq at t°

t	% CaCl_2	% CaSO_4	t	% CaCl_2	% CaSO_4
15	15 00	0 063	94	15 16	0 110
21	14 70	0 068	138	14 70	0 071
39	15 00	0 091	170	14 82	0 031
72	14 90	0 100	195	14 70	0 022

(Tilden and Shenstone, l c)

Solubility in CaCl_2 + Aq at 25°

g per l of solution		g per l of solution	
CaCl_2	CaSO_4	CaCl_2	CaSO_4
0 00	2 06	51 53	1 02
7 49	1 24	97 02	0 84
11 96	1 18	192 71	0 47
25 77	1 10	280 30	0 20
32 05	1 08	367 85	0 03

(Cameron and Seidell, J phys Ch 1901, 5 643)

1000 pts of 1% CaCl_2 + Aq dissolve 1 1414 pts CaSO_4 , 40% CaCl_2 , 0 2130 pts CaSO_4 (Orloff, Chem Soc 1903, 84, (2) 211)

Solubility in $\text{CaO}_2\text{H}_2 + \text{Aq}$ at 25°

G CaSO_4 per l	G CaO per l	Solid phase
0 0	1 166	$\text{Ca}(\text{OH})_2$
0 391	1 141	"
0 666	1 150	"
0 955	1 215	"
1 214	1 242	"
1 588	1 222	$\text{Ca}(\text{OH})_2$ and $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
1 634	0 939	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
1 722	0 611	"
1 853	0 349	"
1 918	0 176	"
2 030	0 062	"
2 126	0 0	"

(Cameron and Bell, J Am Chem Soc 1906,
28 1221)

Solubility of CaSO_4 in $\text{NH}_4\text{NO}_3 + \text{Aq}$ at 25°

G NH_4NO_3 per l	G CaSO_4 per l
10	3 18
25	3 93
55	5 80
100	7 65
150	8 88
200	9 85
300	10 80
400	11 40
550	12 02
750	12 20
1000	11 81
1200	11 10
1400	10 02
saturated	7 55

(Cameron and Brown, J phys Chem 1905,
9 213)

 $\text{MgCl}_2 + \text{Aq}$

Sol in 324 pts $\text{MgCl}_2 + \text{Aq}$ (34 1% MgCl_2)
at 19° (Karsten)
1 g CaSO_4 is sol in 146 ccm $\frac{1}{2}$ sat MgCl_2
+ Aq at 13.5° (Fassbender)
1 l $\frac{1}{2}$ sat $\text{MgCl}_2 + \text{Aq}$ dissolves 6 83 g
 $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at 13.5° (Droeze)

Solubility of CaSO_4 in $\text{MgCl}_2 + \text{Aq}$

t	% MgCl_2	% CaSO_4
9	19 7	0 765
39	11 1	2 744
80	9 99	1 038

(Tilden and Shenstone, l c)

Solubility in $\text{MgCl}_2 + \text{Aq}$ at 26°

g per l of solution			g per l of solution		
MgCl_2	CaSO_4	H_2O	MgCl_2	CaSO_4	H_2O
0 0	2 08	997 9	121 38	8 62	972 2
8 50	4 26	996 5	206 98	6 57	949 9
19 18	5 69	994 5	337 0	2 77	908 7
46 64	7 59	989 1	441 0	1 39	878 6

(Cameron and Seidell, J phys Ch 1901,
5 645)

1 l sat $\text{MgCl}_2 + \text{Aq}$ at 25° containing 476 5
g MgCl_2 dissolves 1 09 g CaSO_4 (Cameron
and Brown, J phys Ch 1905, 9 214)

$\text{NH}_4\text{NO}_3 + \text{Aq}$
1 g CaSO_4 is sol in 320 ccm sat NH_4NO_3
+ Aq at $8-9^\circ$, in 54 ccm $\frac{2}{3}$ sat NH_4NO_3 +
Aq at 13.5° , in 103 ccm $\frac{2}{27}$ sat NH_4NO_3 + Aq
at 13.5° (Fassbender)

 $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$

Solubility of CaSO_4 in $\text{Ca}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Weight of 1000 cc of solution	G $\text{Ca}(\text{NO}_3)_2$ per l	G CaSO_4 per l
998 1	0	2 084
1013 8	25	1 238
1031 7	50	1 196
1067 3	100	1 134
1136 9	200	0 929
1203 5	300	0 759
1265 6	400	0 569
1328 1	500	0 403
1352 0	544	0 346

(Seidell and Smith, J phys Chem 1904, 8
498)

 $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$

Solubility of CaSO_4 in $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 25°

Weight of 1000 cc of solution grams	G $\text{Mg}(\text{NO}_3)_2$ per l	G CaSO_4 per l
998 1	0	2 084
1020 5	25	5 772
1039 8	50	7 884
1078 6	100	9 920
1149 8	200	1 340
1219 0	300	14 000
1282 1	400	14 683
1355 3	514	15 040

(Seidell and Smith, J phys Chem 1904 8
497)

1 l sat $\text{Mg}(\text{NO}_3)_2 + \text{Aq}$ at 25° containing
615 1 g $\text{Mg}(\text{NO}_3)_2$ dissolves 15 26 g CaSO_4
(Cameron and Brown, J phys Ch 1905, 9
214)

KNO₃+Aq
 1 g CaSO₄ is sol in 94 ccm sat KNO₃+Aq at 13 5°, in 82 ccm sat KNO₃+Aq at 15 5°, in 68 ccm nearly sat KNO₃+Aq at 20° (Fassbender)

Solubility in KNO₃+Aq at 25°

Wt of 1000 ccm of solution grams	G KNO ₃ per l	G CaSO ₄ per l
998 1	0 0	2 084
1008 1	12 5	3 284
1015 4	25 0	4 080
1032 1	50 0	5 255
1062 5	100 0	6 855
1092 4	150 0	7 907
1122 4	200 0	8 688
1153 9	260 0	a { 6 278 12 112

^a Probably due to formation of double salt of calcium and potassium sulphates, CaK₂(SO₄)₂+H₂O

(Seidell and Smith, J phys Chem 1908 8 496)

NaNO₃+Aq
 1 g CaSO₄ is sol in 92 ccm sat NaNO₃+Aq at 8 5°, in 318 ccm 1/3 sat NaNO₃+Aq at 13 5° (Fassbender)
 100 ccm sat NaNO₃+Aq dissolve 1 086 g CaSO₄+2H₂O, 100 ccm 1/3 sat NaNO₃+Aq dissolve 0 314 g CaSO₄+2H₂O (Droeze, B 10 338)

Solubility in NaNO₃+Aq at 25°

Wt of 1000 ccm of solution grams	G NaNO ₃ per l	G CaSO ₄ per l
998 1	0	2 084
1016 3	25	4 252
1034 0	50	5 500
1058 4	100	7 100
1133 6	200	8 790
1191 6	300	9 282
1363 9	600	7 886
1390 4	655	7 238

(Seidell and Smith, J phys Chem 1904, 8 495)

1 l sat NaNO₃+Aq at 25°, containing 668 4 g NaNO₃, dissolves 5 52 g CaSO₄ (Cameron and Brown, J phys Ch 1905, 9 214)

Solubility in KBr+Aq at 21°

G KBr per l	G CaSO ₄ per l	G KBr per l	G CaSO ₄ per l
0	2 05	100	6 3
10	3 1	125	6 7
20	3 6	150	7 0
40	4 5	200	7 3
60	5 2	250	Double salt
80	5 9		

(Ditte, A ch 1898, (7) 14 294)

KCl+Aq
 1 g CaSO₄ is sol in 162 ccm sat KCl+Aq at 8°, in 295 ccm 1/3 sat KCl+Aq at 9°

Solubility in KCl+Aq at 21°

g per l		g per l	
KCl	CaSO ₄	KCl	CaSO ₄
0	2 05	60	6 6
10	3 6	80	7 2
20	4 5	100	7 5
40	5 8	125	Double Salt

(Ditte, A ch 1898, (7) 14 294)

Solubility in KI+Aq at 21°

G KI per l	G CaSO ₄ per l	G KI per l	G CaSO ₄ per l
0	2 05	100	5 1
10	2 8	125	5 45
20	3 2	150	5 8
40	3 9	200	5 95
60	4 5	250	6 00
80	4 85	300	Double salt

(Ditte, l c)

NaCl+Aq

Sol in 122 pts sat NaCl+Aq (Anthon)
 Insol in sat NaCl+Aq, but more sol in dil NaCl+Aq than in H₂O Maximum solubility in NaCl+Aq is when the sp gr is 1 033

1 g CaSO₄ is sol in 147 ccm of sat NaCl+Aq at 8 5°, in 150 ccm of sat NaCl+Aq at 13 5°, in 149 ccm of 1/3 sat NaCl+Aq at 13 5°, in 244 ccm of 1/5 sat NaCl+Aq at 13 5° (Fassbender)

100 ccm sat NaCl+Aq dissolve 0 6785 g CaSO₄+2H₂O at 8 5°, 0 6665 g CaSO₄+2H₂O at 13 5° 100 ccm 1/3 sat NaCl+Aq dissolve 0 671 g CaSO₄+2H₂O at 13 5°, 1/5 sat NaCl+Aq dissolve 0 4085 g CaSO₄+2H₂O at 13 5° (Droeze)

Solubility of CaSO₄ in NaCl+Aq at t°

t	NaCl	CaSO ₄	t	NaCl	CaSO ₄
20	19 90	0 825	130	19 92	0 392
44	19 93	0 850	165	20 04	0 250
67	19 95	0 832	169	20 05	0 244
85	19 90	0 825	179	20 10	0 229
101	20 08	0 682	225	21 00	0 178

(Tilden and Shenstone, Roy Soc Proc 38 331)

Solubility of CaSO_4 in $\text{NaCl} + \text{Aq}$ at t°

t°	% NaCl	100 cc dissolve g of CaSO_4	t°	% NaCl	100 cc dissolve g of CaSO_4
21 5	3 53	0 5115	17 5	17 46	0 7369
19 5	7 35	0 6429	101 0	3 53	0 4891
21	11 12	0 7215	102 5	14 18	0 6248
18	14 18	0 7340	103	17 46	0 6299

(Lunge, J Soc Chem Ind 4 31)

100 pts H_2O containing pts NaCl dissolve
pts CaSO_4 at 20°

Pts NaCl	Pts CaSO_4	Pts NaCl	Pts CaSO_4	Pts NaCl	Pts CaSO_4
0 00	0 225	5 05	6 34	24 40	0 820
0 52	0 301	10 00	7 38	35 10	0 734
2 03	0 441	20 00	0 823	35 86	0 709
5 02	6 15				

(Tilden and Shenstone)

Solubility in $\text{NaCl} + \text{Aq}$ at 26°

g per l		wt of 1 cc solution	g per l		wt of 1 cc solution
NaCl	CaSO_4		NaCl	CaSO_4	
0 00	2 12	0 9998	176 50	7 12	1 1196
9 11	6 66	1 0644	228 76	6 79	1 1488
143 99	7 18	1 0981	264 17	6 50	1 1707
148 34	7 16	1 012	320 49	5 72	1 2034

(Cameron, J phys Ch 1901, 5 556)

Solubility in $\text{NaCl} + \text{Aq}$ at 15°

G CaSO_4 per l		G NaCl per l	
2 3		0 6	
2 5		1 1	
3 1		5 1	
3 7		10 6	
4 8		31 1	
5 6		51 4	
7 4		139 9	

(Cameron, J phys Ch 1901, 5 559)

Solubility in $\text{NaCl} + \text{Aq}$ at 26°

NaCl in 100 g H_2O	CaSO_4 in 100 g H_2O
0 0000	0 2126
9 4307	0 6886
15 2056	0 7581
15 6859	0 7575
18 8570	0 7605
25 0478	0 7439
29 3509	0 7219
36 5343	0 6515

(Cameron, J phys Ch 1901, 5 564)

Solubility in $\text{NaCl} + \text{Aq}$

30°		52°		70°		82°	
G NaCl per l	G CaSO_4 per l	G NaCl per l	G CaSO_4 per l	G NaCl per l	G CaSO_4 per l	G NaCl per l	G CaSO_4 per l
0 5	2 5	0 5	2 3	0 5	2 2	0 0	2 07
10 3	3 6	1 1	2 4	10 0	3 4	1 0	2 18
30 3	5 0	5 0	2 9	29 6	4 9	5 0	2 65
47 3	6 1	10 1	3 5	48 8	5 8	10 1	3 30
73 4	6 9	29 6	5 0	132 7	7 4	29 5	4 68
126 9	7 3	48 3	5 8	195 0	7 6	48 8	5 54
192 4	7 7	75 7	6 6			74 9	6 23
		131 6	7 1			128 7	7 00
		195 9	7 4			195 1	7 15

(Cameron, J phys Ch 1901, 5 562)

1 l sat $\text{NaCl} + \text{Aq}$ at 25° containing 318 3
g NaCl dissolves 5 52 g CaSO_4 (Cameron
and Brown, J phys Ch 1905, 9 214)Solubility in $\text{NaCl} + \text{Aq}$

G NaCl per l of $\text{NaCl} + \text{Aq}$	G anhydrous CaSO_4 dissolved per litre	
	at 14°	at 20°
0 0	1 70	2 10
2 925	2 32	2 70
5 850	2 79	3 15
11 70	3 41	3 75
14 62	3 68	4 00
29 25	4 40	4 70
58 50	5 72	6 00
87 75	6 58	6 85
102 3	6 90	7 15
117 0	7 10	7 30
131 6	7 20	7 30
146 2	7 10	7 13
160 8	7 00	7 05
175 6	6 80	6 50
204 7	6 30	6 30
234 0	5 90	5 90
263 2	5 50	5 52
292 6	5 30	5 30

(d'Anselme, Bull Soc 1903, (3) 29 373)

Solubility in $\text{NaCl} + \text{Aq}$

G NaCl in 100 cc solution	G $\text{CaSO}_4 + 2\text{H}_2\text{O}$
0 00	0 200 g
2 44 g	0 635 g
4 77 g	0 826 g
9 50 g	1 056 g
14 22 g	1 193 g
23 15 g	1 275 g
31 30 g	1 583 g

(Cloe, Bull Soc 1903, (3) 29 167)

Solubility in NaCl+Aq at t°

When a sat solution of NaCl is shaken with a mixture of solid NaCl and CaSO₄·2H₂O, the calcium sulphate dissolved, calculated from the amount of CaO in solution, is always greater than that calculated from the sulphuric acid in solution. Similar results are obtained when solid calcium sulphate alone is shaken with a sat solution of NaCl.

t°	In 100 g of the solution		
	Cl	CaSO ₄ calc from CaO	CaSO ₄ calc from SO ₃
0	15 253	0 4464	0 4334
10	15 920	0 4477	0 4426
25	15 967	0 4609	0 4542
40	16 123	0 4938	0 4730
50	16 270	0 5093	0 4832
60	16 324	0 5305	0 5047
62 5	16 361	0 5091	0 5091
65	16 459	0 5435	0 3749
71	16 486	0 5578	0 3631
75	16 524	0 5603	0 3587
85	16 670	0 5399	0 3519
99	17 128	0 4066	0 3414

(Arth, Bull Soc 1906, (3) 35 780)

Within a temp range from 25°–80° CaSO₄ forms no double salt in solutions of NaCl. At any concentration with respect to the latter maximum solubility occurs with 155 g NaCl per l and amounts to 7.3 g CaSO₄ at 80° (Cameron, J phys Chem 1907, 11 496).

See also under Gypsum, p 653

Solubility of CaSO₄ in NaCl+Aq in contact with solid Ca(HCO₃)₂

CaSO ₄ per l	Ca(HCO ₃) ₂ per l	G NaCl per l
1 9298	0 0603	0 000
2 7200	0 0724	3 628
3 4460	0 0845	11 490
5 1560	0 1006	39 620
6 1240	0 0603	79 520
5 2720	0 0563	121 900
4 7860	0 0482	193 800
4 1620	0 0402	267 600

(Cameron and Suddell, J phys Chem 1901, 5 653)

(NH₄)₂SO₄+Aq

Sol in 287 pts (NH₄)₂SO₄+Aq (1.4) (Freeman, Z anal 30 593)

1 lb CaSO₄ is sol in 327 ccm (NH₄)₂SO₄+Aq at 9° in 369 ccm 1/7 sat (NH₄)₂SO₄+Aq at 13.5° (Kassbender)

Solubility in sat (NH₄)₂SO₄, or Na₂SO₄ is the same as in H₂O (Droezee, B 10 330)

Solubility in (NH₄)₂SO₄+Aq at 25°

g per l solution			g per l		
(NH ₄) ₂ SO ₄	CaSO ₄	wt of 100 cc solution	(NH ₄) ₂ SO ₄	CaSO ₄	wt of 100 cc solution
0 00	0 208	99 91	6 575	0 144	100 36
0 129	0 204	99 91	13 15	0 146	100 82
0 258	0 199	99 92	26 30	0 162	101 76
0 821	0 181	99 95	84 9	0 233	105 34
1 643	0 166	99 99	169 8	0 333	110 32
3 287	0 154	100 10	339 6	0 450	119 15

(Sullivan, J Am Chem Soc 1905, 27 529)

Solubility in (NH₄)₂SO₄+Aq at 50°

Sp gr	(NH ₄) ₂ SO ₄ per l	CaSO ₄ per l	Solid phase
	0	2 168	CaSO ₄ +2H ₂ O
1 0026	15 65	1 609	
1 0113	30 67	1 750	
1 0440	91 6	2 542	
1 0819	160 4	3 402	
1 1108	221 6	4 068	
1 1385	280 6	4 690	
1 1653	340 6	5 084	
1 1972	415 6	5 336	
1 1964	416 5	5 354	
1 2043	428 4	4 632	CaSO ₄ (NH ₄) ₂ SO ₄ +2H ₂ O
1 2187	479 4	3 524	
1 2437	530 8	2 152	(NH ₄) ₂ SO ₄
1 2480	558 0	1 986	
1 2502	564 7	1 98	
1 2508	566 0	1 08	
1 2510	566 7	0	

(Bell and Taber, J phys Chem 1906, 10 120)

Solubility of CaSO₄ in (NH₄)₂SO₄+Aq at t°

Excess of (NH ₄) ₂ SO ₄			Excess of CaSO ₄		
t°	CaSO ₄	(NH ₄) ₂ SO ₄	t	CaSO ₄	(NH ₄) ₂ SO ₄
6	0 1529	41 82	3	0 3782	36 62
40 5	0 1569	44 55	31	0 4070	35 50
58	0 1662	46 07	60	0 5083	34 97
78	0 1968	47 51	75	0 5898	34 86
100	0 2546	49 45	80	0 6108	34 88
			84	0 5725	32 40
			100	0 4895	25 97

(Barre, C R 1909, 148 1605)

The solubility of CaSO₄ in H₂O is considerably increased by the presence of (NH₄)₂SO₄.

but decreased by the presence of K_2SO_4
(Barre, C R 1909, 148 1606)

$CuSO_4 + Aq$

Solubility in $CuSO_4 + Aq$ at 25°

Sp gr of the solution $25^\circ/25$	g $CuSO_4$ per l	g $CaSO_4$ per l
1 002	1 144	2 068
1 005	3 564	1 986
1 007	6 048	1 944
1 009	7 279	1 858
1 016	14 814	1 760
1 021	19 729	1 736
1 030	29 543	1 688
1 041	39 407	1 718
1 051	49 382	1 744
1 061	58 880	1 782
1 098	97 950	1 931
1 146	146 725	2 048
1 192	196 021	2 076
1 218	224 916	2 088

(Bell and Taber, J phys Ch 1907, 11 637)

$MgSO_4 + Aq$

Insol in sat $MgSO_4 + Aq$

1 g $CaSO_4$ is sol in 1162 ccm $1/10$ sat $MgSO_4 + Aq$ at 13.5° (Fassbender, B 9 1360)

Sol in 635 pts sat $MgSO_4 + Aq$ at 19° (Karsten)

Absolutely insol in sat $MgSO_4 + Aq$, and pptd from aqueous solution by the addition of $MgSO_4$ (Droeze, B 10 340)

1 l $1/10$ sat $MgSO_4 + Aq$ dissolves 0.86 g $CaSO_4 + 2H_2O$ (Droeze)

Solubility in $MgSO_4 + Aq$ at 25°

g per l		Sp gr at $25^\circ/25^\circ$	g per l		Sp gr at $25^\circ/25^\circ$
$MgSO_4$	$CaSO_4$		$MgSO_4$	$CaSO_4$	
0 0	2 046	1 0032	149 67	1 597	1 1377
3 20	1 620	1 0055	165 7	1 549	1 1479
6 39	1 507	1 0090	171 2	1 474	1 1537
10 64	1 471	1 0118	198 8	1 422	1 1813
21 36	1 478	1 0226	232 1	1 254	1 2095
42 68	1 558	1 0419	265 6	1 070	1 2382
64 14	1 608	1 0626	298 0	1 860	1 2624
85 67	1 617	1 0833	330 6	0 647	1 2877
128 28	1 627	1 1190	355 0	0 501	1 3023

(Cameron and Bell, J phys Ch 1906, 10 210)

$K_2SO_4 + Aq$

1 g $CaSO_4$ is sol in 2325 ccm sat $K_2SO_4 + Aq$ at 13.5° , in 664 ccm $1/5$ sat $K_2SO_4 + Aq$ at 13.5°

Solubility in $K_2SO_4 + Aq$ at 25°

g per l		wt of 1 cc of solution
K_2SO_4	$CaSO_4$	
0 0	2 08	0 9981
4 88	1 60	1 0036
5 09	1 56	1 0038
9 85	1 45	1 0075
19 57	1 49	0 151
28 35	1 55	1 0229
30 66	1 57	1 0236
32 47*	1 58	

*Solid phase syngenite
(Cameron and Breazeale, J phys Ch 1904, 8 335)

Solubility in $K_2SO_4 + Aq$ at 25°

In 1000 g of the solution

mole K_2SO_4 mole $CaSO_4$
3 223 0 223

(D'Ans, Z anorg 1909, 62 151)

Solubility of $CaSO_4$ in $K_2SO_4 + Aq$ at t°

Excess of K_2SO_4			Excess of $CaSO_4$	
t°	% $CaSO_4$	% K_2SO_4	% $CaSO_4$	% K_2SO_4
0	0 1296	2 00	0 0229	6 99
18	0 1531	2 79	0 0271	9 81
51	0 1754	4 21	0 0300	14 18
80	0 1922	5 00	0 0349	17 55
99	0 1980	5 39	0 0371	19 70

(Barre, C R 1909, 148 1606)

$Ag_2SO_4 + Aq$

1 l of the solution contains 2.31 g $CaSO_4$ + 7.23 g Ag_2SO_4 = 9.54 g mixed salts at 17°
Sp gr = 1.0083

1 l of the solution contains 2.61 g $CaSO_4$ + 8.11 g Ag_2SO_4 = 10.72 g mixed salts at 25°
Sp gr = 1.010 (Euler, Z phys Ch 1904, 49 313)

$Na_2SO_4 + Aq$

1 g $CaSO_4$ is sol in 398 ccm sat $Na_2SO_4 + Aq$ at 10.5°

Solubility of $CaSO_4$ in $Na_2SO_4 + Aq$ at 22°

G $CaSO_4$ per l	C Na_2SO_4 per l
2 084	0 000
1 583	2 771
1 433	13 520
1 408	16 360
1 569	39 510
1 841	77 520
2 185	133 00
2 414	193 800
*2 578	*222 580

*Both $CaSO_4$ and Na_2SO_4 as solid phases in contact with the solution
(Cameron and Seidell, J phys Chm 1901, 5 650)

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 25°

wt of 1000 ccm of solution grams	g Na_2SO_4 per l	g CaSO_4 per l
1001 26	2 390	1 650
1007 59	9 535	1 457
1011 45	14 132	1 388
1020 46	24 369	1 471
1031 48	36 979	1 563
1039 12	46 150	1 650
1079 47	94 220	1 980
1096 47	115 084	2 096
1142 66	146 612	2 234
1176 47	205 105	2 503
1212 00	257 100	2 650

(Cameron and Breazeale, J phys Chem 1904, 8 340)

1 l sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 25° containing 254.09, Na_2SO_4 dissolves 2.58 g CaSO_4 (Cameron and Brown, J phys Ch 1905, 9 214)

Hydration is retarded by dil solutions and accelerated by conc solution of sodium, potassium, ammonium and magnesium sulphates (Rohland, Z Elektrochem 1908, 14 422)

More than 10 times as much CaSO_4 dissolves in sat $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ as in H_2O (Diehl Insol in alcohol of 0.905 sp gr or less (Anthon, J pr 14 125))

Solubility in 10% alcohol = 0.0970 g CaSO_4 per 100 g solution (Magnanini, Gazz Ch it 1901, 31 (2) 544)

Sol in dil alcoholic solutions of NH_4NO_3 , KNO_3 , NaNO_3 , NH_4Cl , KCl , and NaCl (Margueritte, C R 38 308)

Sol to considerable extent in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$, especially if freshly pptd. More sol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ than in $\text{NH}_4\text{Cl} + \text{Aq}$ (Weppen, J pr 11 182)

More sol in $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ than in other NH_4 salts (Cohn, J pr (2) 35 43)

More sol in $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$ or $\text{KCl} + \text{Aq}$ than in H_2O (Mulder)

Solubility in N/200 potassium hydrogen tartrate + Aq = 0.2323 g CaSO_4 per 100 g solution (Magnanini, Gazz ch it 1901, 31 (2) 544)

72.61 millimols per l of $\text{CaSO}_4 + 2\text{H}_2\text{O}$ are sol at 25° in ammonium citrate + Aq (concentration = 0.5 millimols per l)

36.39 millimols per l of $\text{CaSO}_4 + 2\text{H}_2\text{O}$ are sol at 25° in sodium citrate + Aq (Concentration = 0.25 millimols per l (Rundell, Z phys Ch 1910, 70 452))

100 pts glycerine dissolve 0.957 pt $\text{CaSO}_4 + 2\text{H}_2\text{O}$, and solubility increases with the temp (Asselin, C R 76 884)

100 g glycerine (sp gr 1.256) dissolve 5.17 g CuSO_4 at $15-16^\circ$ (Ossendowski, Pharm J 1907, 79 575)

Solubility in 10% alcoholic N/200 $\text{KHC}_2\text{H}_4\text{O}_6 + \text{Aq}$ = 0.0866 g CaSO_4 per 100 g solution

Solubility in N/200 $\text{KHC}_2\text{H}_4\text{O}_6 + \text{Aq}$ + 5% tartaric acid = 0.2556 g CaSO_4 per 100 g solution

Solubility in 10% alcoholic N/400 $\text{KHC}_2\text{H}_4\text{O}_6 + 5\%$ tartaric acid = 0.1086 g CaSO_4 in 100 g solution (Magnanini)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethylacetate (Naumann, B 1910, 43 314)

Solubility in sugar + Aq at t°

% sugar	G CaSO_4 dissolved in 1 l sugar solutions					
	30°	40°	50°	60°	70°	80°
0		2 157	1 730	1 730	1 652	1 710
10	2 041	1 730	1 730	1 574	1 574	1 613
20	1 808	1 652	1 419	1 380	1 419	1 263
27	1 550	1 438	1 361	1 283	1 283	0 972
35	1 263	1 050	1 088	1 108	0 914	
42	1 030		0 777	0 816	0 855	0 729
49		0 564	0 739	0 564	0 603	0 486
55		0 486	0 505	0 486	0 369	0 330

(Stolle, Z Ver Zuckerind, 1900, 50 331)

Min Anhydrite

+ $2\text{H}_2\text{O}$ Min Gypsum

Gypsum A sat aq solution of gypsum of particles not less than 2μ contains 2.085 g CaSO_4 per litre at 25°

A sat aq solution of gypsum of particles not smaller than 0.3μ contains 2.476 g CaSO_4 per liter at 25° ($\mu = 0.0001 \text{ cm}$) (Hulett and Allen, Z phys Ch 1901, 37 391 and 393)

Solubility in H_2O at t°

t°	g CaSO_4 in 100 ccm of the solution	Densitv of the solution at t°
0	0 17590	1 001970
10	0 19255	1 001727
18	0 20160	1 000590
25	0 20805	0 999109
30	0 20905	0 997891
35	0 20960	0 996122
40	0 20970	0 994390
45	0 20835	0 992370
55	0 20095	0 987960
65	0 19320	0 982560
75	0 18475	0 977724
100	0 16195	

(Hulett and Allen, J Am Chem Soc 1902, 24 674)

1 l H_2O dissolves 2.13 g $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at 25° (Fulcr, Z phys Ch 1904, 49 314)

2023 mg are dissolved in 1 l of sat solution at 18° (Kohh usch, Z phys Ch 1908, 64 168)

1 l H_2O dissolves 2.267 g $\text{CaSO}_4 + 2\text{H}_2\text{O}$ at 0° , 2.684 g at 35° , 2.662 g at 50° , and 2.155 g at 100° (Cavazzi, C C 1905, I 1693)

1 l H₂O dissolves 29.5 milliequivalents at 18°, 30 at 50°, 23.3 at 100° (Melcher, J Am Chem Soc 1910, 32 63)

See also under CaSO₄

Solubility of pulverized gypsum in NaCl + Aq at 23°

Grams gypsum	G NaCl per l	G CaSO ₄ per l
2 99	0 99	2 37
3 82	4 95	3 02
4 48	10 40	3 54
6 31	30 19	4 97
7 51	49 17	5 94
8 53	75 58	6 74
9 42	129 50	7 50
9 17	197 20	7 25
8 88	229 70	7 03
7 19	306 40	5 68
6 79	315 55	5 37

(Cameron, J phys Chem 1901, 5 559)

See also under CaSO₄

+ 1/2 H₂O Plaster of Paris contains 1/2 H₂O according to Chatelier (C C 1889, 1 203)

Calcium hydrogen sulphate, CaH₂(SO₄)₂

100 pts H₂SO₄ of 1.82 sp gr dissolve about 2 pts CaSO₄, 100 pts fuming H₂SO₄ dissolve 10.17 pts CaSO₄ (Struve, Z anal 9 34), 100 pts H₂SO₄ dissolve 2.5 pts CaSO₄ (Lies-Bodart and Jacquemin, C R 46 1206), CaSO₄ is precipitated by H₂O from H₂SO₄ solution

100 pts boiling H₂SO₄ dissolve 10 pts CaSO₄ (Schultz, Pogg 133 137)

Solubility of CaSO₄ in H₂SO₄ + Aq

wt of 1000 ccm of solution at 25°	g H ₂ SO ₄ per l	g CaSO ₄ per l at		
		25°	35°	43
999 1067	0 00	2 126		2 145
1002 493	0 48	2 128	2 209	2 236
1002 553	4 87	2 144	2 451	2 456
1005 091	8 11	2 203		2 760
1009 787	16 22	2 382		3 116
1030 151	48 67	2 727	3 397	3 843
1043 470	75 00	2 841		4 146
1075 613	97 35	2 779	3 606	
	146 01	2 571	3 150	4 139
1113 392	194 70	2 313		3 551
1141 755	243 35	1 901		2 959
1168 143	292 02	1 541		2 481

(Cameron and Breazeale, J phys Chem 1903, 7 574)

100 pts hot conc H₂SO₄ dissolve approx 10 pts CaSO₄ (Rohland, Z anorg 1910, 66 206)

Decomp by H₂O

Calcium hexahydrogen sulphate, CaH₆(SO₄)₄
Decomp by H₂O (Schultz, Pogg 133 137)

Calcium cupric potassium sulphate,
Ca₂K₂Cu(SO₄)₄ + 2H₂O
(D'Ans, B 1908, 41 1778)

Calcium magnesium potassium sulphate,
2CaSO₄, MgSO₄, K₂SO₄ + 2H₂O
Min *Polyhalite* Sol in H₂O with residue of CaSO₄
4CaSO₄, MgSO₄, K₂SO₄ + 2H₂O Min *Krugite* Decomp by H₂O

Calcium potassium sulphate, CaK₂(SO₄)₂ + H₂O

Min *Syngenite* Sol in 400 pts H₂O (Zepharovitch) Less sol than K₂SO₄
Decomp by heating with separation of CaSO₄
Decomp by H₂O until 25 g K₂SO₄ are dissolved in a litre, after which there is no decomposition (Ditte, C R 84 86)

Easily sol in dil acids (Phillips)

Solubility of syngenite, CaK₂(SO₄)₂ + H₂O in K₂SO₄ + Aq at 25°

Wt of 1000 ccm of solution grams	g K ₂ SO ₄ per l	g CaSO ₄ per l
1013 08	16 31	*1 495
1015 78	19 87	1 529
1020 01	25 01	1 537
1024 54	30 83	1 565
1036 82	46 99	0 810
1058 10	75 45	0 451
1085 91	112 87	0 330

*In first four determinations syngenite completely decomposed
(Cameron and Breazeale, J phys Chem 1904, 8 339)

This double salt is stable between 0° and 99° in the presence of an excess of either CaSO₄ or K₂SO₄. In this temp interval the double sulphate, 2CaSO₄, K₂SO₄, 3H₂O described by Ditte (C R 84 867) does not exist (Barre, C R 1909, 148 1607)

Ca₂K₂(SO₄)₃ + 3H₂O Decomp by cold H₂O (Ditte, C R 84 867)

5CaSO₄, K₂SO₄ + H₂O Slowly decomp by H₂O (van't Hoff and Geiger, B A B 1904 935)

Calcium potassium zinc sulphate,
Ca₂K₂Zn(SO₄)₄ + 2H₂O
(D'Ans, B 1908, 41 1778)

Calcium rubidium sulphate, Ca₂Rb₂(SO₄)₄
(D'Ans, B 1907, 40 4913)

+ 3H₂O Decomp by H₂O (Ditte, C R 84 86)

CaRb₂(SO₄)₂ + H₂O (D'Ans)

Calcium sodium sulphate, $\text{CaNa}_2(\text{SO}_4)_2$

Min *Glauberite* Gradually sol in H_2O , but crystals of $\text{CaSO}_4 + 2\text{H}_2\text{O}$ soon separate out (Fritzsche)

Insol in alcohol, and conc $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$, decomp by H_2O (Folkhard, C N 43 6)

$\text{CaNa}_4(\text{SO}_4)_3 + 2\text{H}_2\text{O}$ Decomp by H_2O (Fritzsche)

Calcium titanium sulphate, $\text{CaSO}_4, \text{Ti}(\text{SO}_4)_2$

Ppt, decomp by H_2O giving titanic acid (Weinland, Z anorg 1907, 54 254)

Calcium uranium sulphate

Min *Uranochalcite*

Min *Medysite* Easily sol in dil $\text{HCl} + \text{Aq}$

Cerous sulphate, $\text{Ce}_2(\text{SO}_4)_3$

Anhydrous cerous sulphate is much more sol in H_2O than the hydrated salt

Easily sol in cold H_2O if added thereto in small amounts. If large amount of $\text{Ce}_2(\text{SO}_4)_3$ is treated with a little H_2O it hardens with evolution of heat, and becomes very difficultly soluble. 100 pts H_2O dissolve 161 pts $\text{Ce}_2(\text{SO}_4)_3$ at 0° and 17 86 pts at 19°

$\text{Ce}_2(\text{SO}_4)_3 + \text{Aq}$ sat in cold deposits $\text{Ce}_2(\text{SO}_4)_3$ at 75° , and only 2 25 pts remain in solution at 100° (Jolin, Bull Soc (2) 21 536)

100 pts H_2O dissolve 8 31 pts $\text{Ce}_2(\text{SO}_4)_3$ at 20° , 8 08 pts at 45° , 4 95 pts at 60° , 0 504 pt at 100° (Buhrig, J pr (2) 12 240)

60 pts anhydrous salt dissolve quickly at $0-3^\circ$ in 100 pts H_2O

At 15° the solution solidifies, and the mother liquor contains only 27 88% $\text{Ce}_2(\text{SO}_4)_3$. At 15° the maximum attainable strength is 31 62% $\text{Ce}_2(\text{SO}_4)_3$ (Brauner, Chem Soc 53 357)

100 pts H_2O dissolve 10 747 pts $\text{Ce}_2(\text{SO}_4)_3$ at 16° , 9 648 pts at 19° , 6 949 pts at 33°

The solubility of $\text{Ce}_2(\text{SO}_4)_3$ in H_2O is diminished by the addition of $(\text{NH}_4)_2\text{SO}_4$, K_2SO_4 or Na_2SO_4 (Barre, C R 1910, 151 872)

Sp gr of $\text{Ce}_2(\text{SO}_4)_3 + \text{Aq}$ was found to be constant whether $\text{Ce}_2(\text{SO}_4)_3$ or $\text{Ce}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ was used. The following results were obtained at 15°

Pts $\text{Ce}_2(\text{SO}_4)_3$ to 100 pts H_2O	Sp gr	Pts $\text{Ce}_2(\text{SO}_4)_3$ to 100 pts H_2O	Sp gr
3 17	1 03005	12 66	1 11917
6 11	1 05812	14 56	1 13665
8 35	1 07910	15 64	1 14623
9 61	1 09085	21 19	1 19640
10 55	1 09939	31 62	1 28778
11 66	1 10987		

(Brauner, Chem Soc 53 357)

4 5 pts $\text{Ce}_2(\text{SO}_4)_3$ dissolve in 100 pts H_2SO_4 (Wyrouboff, Bull Soc (3) 2 745)

Solubility in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 16°

Per 100 pts H_2O

$(\text{NH}_4)_2\text{SO}_4$	$\text{Ce}_2(\text{SO}_4)_3$
0 00	10 747
3 464	1 026
9 323	0 782
19 240	0 748
29 552	0 701
45 616	0 497
55 083	0 194
63 920	0 090
72 838	0 035

(Barre, A ch 1911, (8) 24 252)

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ at $19^\circ-20^\circ$

Per 100 pts H_2O

Na_2SO_4	$\text{Ce}_2(\text{SO}_4)_3$
0 00	9 64
0 328	0 637
0 684	0 259
1 091	0 0937
1 392	0 057
1 699	0 0303
2 640	0 012
3 589	0 0065
5 660	0 0046
7 710	0 0037

(Barre, A ch 1911, (8) 24 251)

Solubility in $\text{K}_2\text{SO}_4 + \text{Aq}$ at 16°

Per 100 pts H_2O

K_2SO_4	$\text{Ce}_2(\text{SO}_4)_3$
0 00	10 747
0 178	0 956
0 510	0 432
0 726	0 250
1 290	0 0419

(Barre, A ch 1911, (8) 24 248)

$+4\text{H}_2\text{O}$ 100 g H_2O dissolve at

35° 40° 50° 57°
8 5 6 04 3 43 2 34 g $\text{Ce}_2(\text{SO}_4)_3$

65° 70° 82° 100 5° bpt of sat solution
1 883 1 38 1 01 0 43 g $\text{Ce}_2(\text{SO}_4)_3$

(Koppel, Z anorg 1904, 41 399)

+5H ₂ O	
100 pts H ₂ O dissolve pts Ce ₂ (SO ₄) ₃ at t°	
t°	Pts Ce ₂ (SO ₄) ₃
100	0 775
80	1 70
60	3 45
50	5 56
40	8 20

(Muthmann and Rolig, Z anorg 1898, **16** 456)

100 g H ₂ O dissolve at		
45°	60°	70°
8 833	3 247	1 929 g Ce ₂ (SO ₄) ₃
80°	90°	100 5° bpt of sat solution
1 207	0 8355	0 469 g Ce ₂ (SO ₄) ₃

Muthmann and Rolig's determinations are inaccurate (Koppel)

+8H₂O 100 pts H₂O dissolve 14 92 pts Ce₂(SO₄)₃ at 20° from Ce₂(SO₄)₃+8H₂O₃ (Jolin)

100 pts H ₂ O dissolve pts Ce ₂ (SO ₄) ₃ at t°			
t°	Pts Ce ₂ (SO ₄) ₃	t°	Pts Ce ₂ (SO ₄) ₃
0	19 10	50	12 48
18	17 32	60	9 40
30	16 13	70	4 24

(Muthmann and Rolig)

100 g H ₂ O dissolve at			
0°	15°	20 ½°	
10 09	11 06	9 525 g Ce ₂ (SO ₄) ₃	
30°	40°	50°	60°
7 388	5 947	4 785	4 064 g Ce ₂ (SO ₄) ₃

Previous determinations are inaccurate (Koppel, Z anorg 1904, **41** 395)

100 g sat solution at 25° contain 7 60 g anhydrous salt (Wirth, Z anorg **76** 174)

Solubility in H₂SO₄+Aq at 25° Solid phase
Ce₂(SO₄)₃+8H₂O

Normality H ₂ SO ₄	In 100 g of the liquid are dissolved	
	g Ce O ₃	g Ce (SO ₄) ₃
0	4 604	7 60
0 1	4 615	7 618
1 1	3 64	6 00
2 16	3 04	5 018
4 32	2 0	3 301
6 685	0 9115	1 505
9 68	0 4339	0 733
15 15	0 145	0 239

(Wirth, Z anorg 1912, **76** 191)

+9H₂O 100 pts H₂O dissolve 17 52 pts Ce₂(SO₄)₃ from Ce₂(SO₄)₃+9H₂O (Brauner

100 g H ₂ O dissolve at					
0°	15°	21°	30°	31 2°	
20 98	11 87	9 725	7 353	7 185 g Ce ₂ (SO ₄) ₃	
31 6°	45°	50°	60°	65°	
7 164	5 13	4 673	3 88	3 595 g Ce ₂ (SO ₄) ₃	

(Koppel)

+12H ₂ O	
100 pts H ₂ O dissolve pts Ce ₂ (SO ₄) ₃ at t°	
t°	Pts Ce ₂ (SO ₄) ₃
0	21 40
18	18 44
25	16 22

(Muthmann and Rolig, Z anorg 1898, **16** 457)

100 g H ₂ O dissolve at		
0°	18 8°	19 2°
16 56	17 52	17 70 g Ce ₂ (SO ₄) ₃

Previous determinations are inaccurate (Koppel)

Ceroceric sulphate, Ce₂(SO₄)₃, 2Ce(SO₄)₂+24H₂O

Decomp by H₂O Sol in HCl+Aq with decomp (Mendelejeff, A **168** 45)

Ce₂(SO₄)₃, 3Ce(SO₄)₂+31H₂O (Jolin)

Ceric sulphate, basic, CeO₂, SO₃+2H₂O

Very sl sol in H₂O

Sol in 2500 pts H₂O (Mosander)

Boiling H₂O gradually dissolves out H₂SO₄ (Erk)

Sol in acids

8CeO₂, 7SO₃+12H₂O, 8CeO₂, 7SO₃+15H₂O, 6CeO₂, 5SO₃+5H₂O, 4CeO₂, 3SO₃+7H₂O, and 3Ce(SO₄)₂, 5Ce(OH)₄ All are insol ppts

Ceric sulphate, Ce(SO₄)₂

Anhydrous Very slowly sol in cold, more rapidly in hot H₂O When solution has once begun, almost unlimited quantities may be dissolved Insol in conc H₂SO₄ (Meyer, B 1904, **37** 144)

+4H₂O Sol in H₂O with immediate decomp (Rammelsberg)

Decomp by H₂O (Muthmann, B 1900, **33** 1764)

Cerous hydrogen sulphate, Ce₂(SO₄)₃, 3H₂SO₄

Decomp by H₂O (Wyrouboff, Bull Soc (3) **2** 745, Brauner, Z anorg 1904, **38** 329)

Ceroceric hydrogen sulphate, Ce₂H(SO₄)₄+13H₂O

Sol in H₂O Forms very supersat solutions

Solubility in H₂SO₄ decreases with increase in concentration of the acid (Meyer, B 1904, **37** 146)

Cerous potassium sulphate, $\text{Ce}_2(\text{SO}_4)_3$, $\text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Sl sol in H_2O , insol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$ (Czudnowicz, J pr 80 26)

$2\text{Ce}_2(\text{SO}_4)_3$, $3\text{K}_2\text{SO}_4$ As above (Hermann, J pr 30 188)

$+8\text{H}_2\text{O}$ (Barre, A ch 1911, (8) 24 249)
 $\text{Ce}_2(\text{SO}_4)_3$, $2\text{K}_2\text{SO}_4 + 3\text{H}_2\text{O}$ As above (Jolin)

$\text{Ce}_2(\text{SO}_4)_3$, $3\text{K}_2\text{SO}_4$ Sol in about 56 pts H_2O at $9-20^\circ$ Easily sol in acidified H_2O

Nearly insol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$ (Jolin)
 $\text{Ce}_2(\text{SO}_4)_3$, $5\text{K}_2\text{SO}_4$ Insol in $\text{K}_2\text{SO}_4 + \text{Aq}$ (Barre, l c)

Ceric potassium sulphate, $\text{Ce}(\text{SO}_4)_2$, $2\text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Sl sol in H_2O with decomp Insol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$

Ceric silver sulphate, $10\text{Ce}(\text{SO}_4)_2$, $6\text{Ag}_2\text{SO}_4$

Only sl sol in cold H_2O , decomp by hot H_2O in which it is readily sol (Pozzi-Escot, C R 1913, 156 1074)

Cerous sodium sulphate, $\text{Ce}_2(\text{SO}_4)_3$, $\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Very sl sol in H_2O , and still less in $\text{Na}_2\text{SO}_4 + \text{Aq}$ 100 ccm sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ dissolve an amount corresponding to 62 mg Ce_2O_3 (Jolin)

Sl sol in $\text{HCl} + \text{Aq}$ (Czudnowicz)

Cerous thallous sulphate, $\text{Ce}_2(\text{SO}_4)_3$, $3\text{Tl}_2\text{SO}_4$

Ppt
 $\text{Ce}_2(\text{SO}_4)_3$, $\text{Tl}_2\text{SO}_4 + 2\text{H}_2\text{O}$ Sol in H_2O (Zschiesche, J pr 107 98)

$+4\text{H}_2\text{O}$ Very sl sol in cold, somewhat more in warm H_2O (Wyruboff, Bull Soc Min 14 83)

Cerous tin (stannic) hydrogen sulphate, $\text{CeHSn}(\text{SO}_4)_4$

Decomp by H_2O Sol in very dil HCl (Weinland, Z anorg 1907, 54 251)

Chromous sulphate, $\text{CrSO}_4 + 7\text{H}_2\text{O}$

100 pts H_2O dissolve 12 35 pts $\text{CrSO}_4 + 7\text{H}_2\text{O}$ Aqueous solution can be boiled without decomp Sl sol in alcohol

$+ \text{H}_2\text{O}$ (Moissan, Bull Soc 37 296)

Chromic sulphate, basic, $3\text{Cr}_2\text{O}_3$, $2\text{SO}_3 + 12\text{H}_2\text{O} = 2\text{Cr}_2(\text{SO}_4)(\text{OH})_4$, $\text{Cr}_2(\text{OH})_6 + 5\text{H}_2\text{O}$

Insol in H_2O Sol in acids Slowly decomp by $\text{KOH} + \text{Aq}$ or $\text{K}_2\text{CO}_3 + \text{Aq}$

$5\text{Cr}_2\text{O}_3$, 3SO_3 Sol in H_2O (Recoura, C R 112 1439)

Cr_2O_3 , $\text{SO}_3 = \text{Cr}_2\text{O}_2(\text{SO}_4)$ Ppt (Schiff, A 124 167)

$+10\text{H}_2\text{O}$ or $[\text{Cr}(\text{OH})_2(\text{OH})_4]_2\text{SO}_4$ Nearly insol in H_2O (Werner, B 1908, 41 3451)

$5\text{Cr}_2\text{O}_3$, 8SO_3 (?) (Siewert, A 126 97)

Cr_2O_3 , $2\text{SO}_3 = \text{Cr}_2\text{O}(\text{SO}_4)_2$ Easily sol in a little H_2O , but a precipitate is thrown down

by further addition of H_2O , which redissolves on evaporation

$5\text{Cr}_2\text{O}_3$, 12SO_3 (?) (Siewert)

$2\text{Cr}_2\text{O}_3$, $5\text{SO}_3 + 15\text{H}_2\text{O}$ Sol in H_2O insol in alcohol and acetone by which it is ppt from aqueous solution (Nicolardot, C R 1907, 145 1338)

Chromic sulphate, $\text{Cr}_2(\text{SO}_4)_3$

Anhydrous Insol in H_2O , HNO_3 , HCl , H_2SO_4 , aqua regia, and $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by boiling caustic alkalis, and slowly by alkali carbonates $+ \text{Aq}$ (Schrotter) According to Traube (A 71 92) and Siewert (A 126 94), Schrotter's salt is an acid sulphate, $\text{Cr}_4(\text{SO}_4)_5(\text{OSO}_3\text{OH})_2 = 2\text{Cr}_2(\text{SO}_4)_3$, H_2SO_4 According to Etard (Bull Soc (2) 31 200) both salts exist, and formula of above salt is $\text{Cr}_2(\text{SO}_4)_3\text{Cr}_2$ Formula is $2[(\text{Cr}_2\text{O}_3)_2, (\text{SO}_3)_3]$, $17\text{H}_2\text{SO}_4$ (?) (Cross and Higgins, Chem Soc 41 113)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

$+6\text{H}_2\text{O}$ (?) *Green modification* Readily sol in H_2O or alcohol Sol in conc H_2SO_4 H_2O solution is converted into the violet modification by standing 3-4 weeks (Schrotter)
 $+11\text{H}_2\text{O}$ (?) Extremely deliquescent, becomes liquid in moist air in 2 minutes Not pptd by $\text{BaCl}_2 + \text{Aq}$ (Recoura, C R 113 857)

$+18\text{H}_2\text{O}$ *Violet modification* Sol in 0 833 pt H_2O at 20° When the H_2O solution is heated to $65-70^\circ$ it begins to be converted into the green modification This conversion is also brought about by cold HNO_3 , H_2SO_4 , PCl_3 (Etard, C R 84 1090)

Sp gr of aqueous solution of violet modification of $\text{Cr}_2(\text{SO}_4)_3$ containing

5	10	20%	$\text{Cr}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
1 0275	1 0560	1 1150	
30	40	50%	$\text{Cr}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
1 1785	1 2480	1 3250	

Sp gr of aqueous solution of green modification of $\text{Cr}_2(\text{SO}_4)_3$ containing

10	20	30%	$\text{Cr}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
1 0510	1 1070	1 1680	
40	50	60%	$\text{Cr}(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
1 2340	1 3055	1 3825	

70 80% $\text{Cr}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$
1 4650 1 5535

(Gerlach, Z anal 28 494)

See also **Chromosulphuric acid**

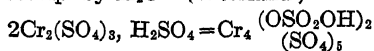
Chromic hydrogen sulphate, $\text{Cr}_2(\text{SO}_4)_3$, $\text{H}_2\text{SO}_4 + 16\text{H}_2\text{O}$

Two modifications

a *Violet* Decomp by H_2O

b *Green* Obtained from violet modification on heating Sol in H_2O (Weinland, Z anorg 1906, 49 157)

+24H₂O Decomp by alcohol, giving the normal sulphate (Weinland)
 $\text{Cr}_2(\text{SO}_4)_3, 2\text{H}_2\text{SO}_4 + 18\text{H}_2\text{O}$ Hygroscopic
 Decomp by H₂O (Weinland)

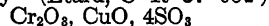


Correct composition of $\text{Cr}_2(\text{SO}_4)_3$ (Traube), which see

See also Chromosulphuric acid

Chromic cupric sulphate, $\text{Cr}_2(\text{SO}_4)_3, 2\text{CuSO}_4, \text{H}_2\text{SO}_4$

Insol in H₂O, but gradually decomp thereby (Étard, C R 87 602)



Insol in H₂O (Recoura, C R 1893, 117 39)

Chromous hydrazine sulphate, $\text{CrSO}_4, 2\text{N}_2\text{H}_4, \text{H}_2\text{SO}_4$

Only sl sol in H₂O Sol in acids (Traube B 1913, 46 1507)

Chromic hydroxylamine sulphate, $\text{Cr}_2(\text{SO}_4)_3, (\text{NH}_2\text{OH})_2\text{SO}_4 + 24\text{H}_2\text{O}$

Sol in H₂O (Meyerinhg)

Chromic iron (ferrous) sulphate, $\text{Cr}_2(\text{SO}_4)_3, 2\text{FeSO}_4, \text{H}_2\text{SO}_4 + 2\text{H}_2\text{O}$

As above (Étard, l c)

Chromic iron (ferric) sulphate, $\text{Cr}_2(\text{SO}_4)_3, \text{Fe}_2(\text{SO}_4)_3$

Insol in H₂O (Étard, C R 86 1399)

$\text{Cr}_2(\text{SO}_4)_3, \text{Fe}_2(\text{SO}_4)_3, \text{H}_2\text{SO}_4$ Insol in H₂O (Étard)

Chromic lithium sulphate, $\text{Cr}_2(\text{SO}_4)_3, 3\text{Li}_2\text{SO}_4$

Resembles the corresponding K salt (Wernicke)

Chromic manganous sulphate, $\text{Cr}_2(\text{SO}_4)_3, 3\text{MnSO}_4$

(Étard, C R 86 1402)

Chromic manganic sulphate, $\text{Cr}_2(\text{SO}_4)_3, \text{Mn}_2(\text{SO}_4)_3$

Insol in H₂O (Étard, C R 86 1399)

$\text{Cr}_2(\text{SO}_4)_3, \text{Mn}_2(\text{SO}_4)_3, 2\text{H}_2\text{SO}_4$ Sl deliquescent Sol in H₂O with decomp (Étard)

Chromic nickel sulphate, $\text{Cr}_2(\text{SO}_4)_3, \text{NiSO}_4, 2\text{H}_2\text{SO}_4 + 3\text{H}_2\text{O}$

Insol in H₂O, but gradually decomp thereby (Étard, C R 87 602)

Chromous potassium sulphate, $\text{CrSO}_4, \text{K}_2\text{SO}_4 + 6\text{H}_2\text{O}$

Sol in H₂O, less sol in alcohol (Peligot, A ch (3) 12 546)

Chromic potassium sulphate, $\text{K}_2\text{Cr}_2(\text{SO}_4)_4$

Anhydrous a Sol in H₂O when not heated over 350°

β Insol in cold H₂O and cold acids When ignited is insol in hot H₂O and acids, except slightly in boiling conc H₂SO₄ (Fischer)

+2H₂O (?) Insol in cold H₂O or dil acids Sol by long boiling with H₂O, and more quickly when HCl is added (Hertwig)

+4H₂O Is potassium chromosulphate, which see

+24H₂O *Chrome-alum* Violet modification Efflorescent at 29° Sol in 6-7 pts cold H₂O When the H₂O solution is heated to 60-70° it is partially decomp into a green modification, which is more sol in H₂O The green modification on standing in H₂O solution is very slowly converted back into violet modification The green modification may also be formed by heating dry salt to 100°, at which temp it melts in its crystal H₂O When all crystal H₂O has been expelled at 300-350°, it still dissolves in hot H₂O, but when heated above 350° it becomes insol in H₂O (Lowel, A ch (3) 44 313)

125.1 g anhydrous, or 243.9 g hydrated salt, or 0.441 g mols anhydrous salt are sol in 1.1 H₂O at 25° (Locke, Am Ch J 1901, 26 175)

Melts in crystal H₂O at 89° (Tilden, Chem Soc 45 409)

Sp gr of aqueous solution of violet modification at 15° containing

5	10	15%
102725	105500	108350

Sp gr of sat solution at 15° = 1.0985

Sp gr of aqueous solution of green modification at 15° containing

10	20	30%
1050	1103	1161

40	50	60%
1225	1295	1371

70	80	90%
1453	1541	1635

(Gerlach, Z anal 28 497)

Sp gr of chrome-alum solutions at 15° containing

5	10	15	20	25	% salt,
10174	10342	10524	10746	11004	

30	35	40	45	50	% salt,
11274	11572	11896	12352	12894	

55	60	65	70	% salt
13704	14566	15462	16362	

(Franz, J pr (2) 5 298)

Insol in alcohol

$3\text{K}_2\text{SO}_4, \text{Cr}_2(\text{SO}_4)_3$ Insol in H₂O, acids, or dil alkalies Decomp by boiling with conc KOH + Aq (Wernicke, Pogg 159 576)

Chromic rubidium sulphate, $\text{Rb}_2\text{Cr}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

Sol in H₂O (Petersson)

Solubility in H₂O

Temp	G anhydrous salt per l	G mols of anhy drous salt per l
25°	25 7	0 079
30°	31 7	0 096
35°	41 1	0 128
40°	59 7	0 181

Melts in crystal H₂O at 107°

(Locke, Am Ch J 1901, 26 180)

Chromic sodium sulphate, Na₂Cr₂(SO₄)₄+10H₂O

Is sodium chromosulphate, which see +24H₂O More efflorescent than K or NH₄ salt Sol in H₂O, and properties resemble the corresponding K salt

Cr₂(SO₄)₃, 3Na₂SO₄ Resembles the corresponding K salt

Chromic thalious sulphate, Tl₂Cr₂(SO₄)₄+24H₂O

0 212 mols of anhydrous salt are sol in 1 l H₂O at 25° 1 l H₂O dissolves 104 8 g of anhydrous or 163 8 g hydrated salt at 25° Melts in crystal H₂O at 92° (Locke, Am Ch J 1901, 26 175)

Chromic sulphate chloride, Cr₂(SO₄)₂Cl₂+2H₂O

Slightly hygroscopic Sol in H₂O (Schiff, A 124 176)

[CrSO₄, 5H₂O, Cl Sol in H₂O (Weinland, Z anorg 1908, 58 176)

Chromyl sulphate, (CrO₂)SO₄

Decomp by H₂O (Pictet and Karl, Bull Soc 1908, (4) 3 1114)

Cobaltous sulphate, basic

Ppt Insol in H₂O (Berzelius)
6CoO, SO₃+10H₂O (Athanasesco, C R 103 271)

5CoO, SO₃+4H₂O Ppt Very sl sol in H₂O (Habermann, M Ch 5 432)

Cobaltous sulphate, CoSO₄

100 pts H₂O dissolve at

3° 10° 20° 24° 29°
26 2 30 5 36 4 38 9 40 pts anhydrous salt,

35° 44° 50° 60° 70°

46 3 50 4 55 2 60 4 65 7 pts anhydrous salt

(Tobler, A 95 193)

100 pts H₂O at 11–14° dissolve 23 88 pts anhydrous salt (v Hauer, J pr 103 114)

Solubility in 100 pts H₂O at t°, using CoSO₄+7H₂O

t°	Pts CoSO ₄	t°	Pts CoSO ₄	t°	Pts CoSO ₄
0	24 6	36	43 5	72	65 0
1	25 0	37	44 0	73	65 6
2	25 5	38	44 6	74	66 2
3	26 0	39	45 2	75	66 8
4	26 5	40	45 8	76	67 4
5	27 0	41	46 4	77	68 0
6	27 5	42	47 0	78	68 6
7	28 0	43	47 6	79	69 2
8	28 5	44	48 2	80	69 8
9	29 0	45	48 8	81	70 4
10	29 5	46	49 4	82	71 0
11	30 0	47	50 0	83	71 6
12	30 5	48	50 6	84	72 2
13	31 0	49	51 2	85	72 8
14	31 5	50	51 8	86	73 4
15	32 0	51	52 4	87	74 0
16	32 5	52	53 0	88	74 6
17	33 0	53	53 6	89	75 2
18	33 5	54	54 2	90	75 9
19	34 0	55	54 8	91	76 6
20	34 5	56	55 4	92	77 2
21	35 1	57	56 0	93	77 9
22	35 6	58	56 6	94	78 6
23	36 2	59	57 2	95	79 2
24	36 8	60	57 8	96	79 9
25	37 4	61	58 4	97	80 6
26	38 0	62	59 0	98	81 3
27	38 5	63	59 6	99	81 9
28	39 1	64	60 2	100	82 6
29	39 6	65	60 8	101	83 3
30	40 2	66	61 4	102	83 9
31	40 7	67	62 0	103	84 6
32	41 3	68	62 6	104	85 3
33	41 8	69	63 2	105	86 0
34	42 4	70	63 8	106	86 7
35	42 9	71	64 4	106 4	86 9

(Mulder, calculated from his own and Tobler's determinations, Scheik Verhandel 1864 68)

100 g H₂O dissolve 37 8 g CoSO₄ at 25° (Wagner, Z phys Ch 1910, 71 430)

See also +7H₂O

Sp gr of CoSO₄+Aq at t° S=pts CoSO₄ in 100 pts solution, S₁=mols CoSO₄ in 100 mols of solution

S	S ₁	Sp gr
6 8910	0 852	1 0765
5 8140	0 711	1 0641
4 7095	0 570	1 0517
3 5792	0 429	1 0392
2 4273	0 288	1 0263
1 2099	0 141	1 0131

(Charpy, A ch (6) 29 26)

Sp gr of $\text{CoSO}_4 + \text{Aq}$ at room temp containing

7 239	14 156	21 167%	CoSO_4
1 0860	1 1591	1 2398	
(Wagner, W Ann 1883, 18 269)			

Sp gr of $\text{CoSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{CoSO}_4 + \text{Aq}$	Sp gr
1-normal	1 0750
$\frac{1}{2}$ - " "	1 0883
$\frac{1}{4}$ - " "	1 0193
$\frac{1}{8}$ - " "	1 0110

(Wagner, Z phys Ch 1890, 5 37)

100 pts sat solution of CoSO_4 and CuSO_4 contain 22.70 pts of the two salts

Solubility of $\text{CoSO}_4 \cdot 7\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$, 10 H_2O in H_2O at t° 100 g H_2O dissolve grams CoSO_4 and grams Na_2SO_4

t°	grams CoSO_4	grams Na_2SO_4
0	21 855	10 07
5	23 94	13 155
10	25 41	16 665

(Koppel, Z phys Ch 1905, 52 396)

See also under $\text{CoNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

$\text{HC}_2\text{H}_3\text{O}_2$ ppt it completely from $\text{CoSO}_4 + \text{Aq}$ (Persoz)

100 pts absolute methyl alcohol dissolve 1.04 pts CoSO_4 at 18° (de Bruyn, Z phys Ch 10 784)

100 pts absolute methyl alcohol dissolve 54.5 pts $\text{CoSO}_4 + 7\text{H}_2\text{O}$ at 18° , 100 pts absolute methyl alcohol dissolve 42.8 pts $\text{CoSO}_4 + 7\text{H}_2\text{O}$ at 3° , 100 pts 93.5% methyl alcohol dissolve 13.3 pts $\text{CoSO}_4 + 7\text{H}_2\text{O}$ at 3° , 100 pts 50% methyl alcohol dissolve 1.8 pts $\text{CoSO}_4 + 7\text{H}_2\text{O}$ at 3°

100 pts absolute ethyl alcohol dissolve 2.5 pts $\text{CoSO}_4 + 7\text{H}_2\text{O}$ at 3° (de Bruyn, Z phys Ch 10 786)

100 g solution in glycol contain 2.5 g CoSO_4 (de Conneck, Bull Ac Belg 1905 359)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

Insol in ethyl acetate (Naumann, B 1904, 37 3602)

$+\text{H}_2\text{O}$ Sl sol in cold, and only very slowly sol in hot H_2O (Vortmann, B 15 1888)

$+4\text{H}_2\text{O}$ (Frohde, Arch Pharm (2) 127 92)

$+6\text{H}_2\text{O}$ (Marignac)

$+7\text{H}_2\text{O}$ Sol in 24 pts cold H_2O Insol in alcohol (Persoz)

Solubility of $\text{CoSO}_4 + 7\text{H}_2\text{O}$ in H_2O at t° 100 g H_2O dissolve grams CoSO_4

t°	g CoSO_4	t°	g CoSO_4	t°	g CoSO_4
0	25 53	15	33 045	30	42 26
5	28 05	20	36 21	35	45 80
10	30 55	25	39 35	40	48 85

(Koppel, Z phys Ch 1905, 52 395)

M-pt of $\text{CoSO}_4 + 7\text{H}_2\text{O} = 96-98^\circ$ (Tilden, Chem Soc 45 409)

Cobaltocobaltic sulphate, Co_2O_3 , 6CoO , $\text{SO}_3 + 15\text{H}_2\text{O}$

Precipitate Insol in boiling $\text{CoSO}_4 + \text{Aq}$ or $\text{NH}_4\text{OH} + \text{Aq}$ (Gentile, J pr 69 130)

Cobaltic sulphate, $\text{Co}_2(\text{SO}_4)_3 + 18\text{H}_2\text{O}$

Sol in H_2O with immediate decomp and liberation of O Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ without immediate decomp Sol in conc HNO_3 , H_2SO_4 , or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Marshall, Chem Soc 59 760)

Cobaltous cupric sulphate, 2CoSO_4 , $\text{CuSO}_4 + 21\text{H}_2\text{O}$

Easily sol in H_2O (v Hauer, Pogg 125 637)

$+36\text{H}_2\text{O}$ (Liebig)

2CoSO_4 , 2CuSO_4 , H_2SO_4 (Etard)

Cobaltous cupric magnesium potassium zinc sulphate, CoSO_4 , CuSO_4 , MgSO_4 , $4\text{K}_2\text{SO}_4$, $\text{ZnSO}_4 + 24\text{H}_2\text{O}$ (?)

Sol in H_2O (Vohl)

Cobaltous cupric potassium sulphate, CoSO_4 , CuSO_4 , $2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$ (?)

Sol in H_2O (Vohl)

Does not exist (Aston and Pickering, Chem Soc 49 123)

Cobaltous hydrazine sulphate, $\text{CoH}(\text{SO}_4)_2$, $2\text{N}_2\text{H}_4$

1 pt is sol in 305.16 pts H_2O at 12° Sol in HNO_3 with decomp Insol in HCl (Curtius, J pr 1894, (2) 50 331)

Cobaltous iron (ferrous) potassium sulphate, CoSO_4 , Fe_2SO_4 , $2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)

2CoSO_4 , 2FeSO_4 , H_2SO_4 (Etard)

Cobaltous magnesium sulphate, 3CoSO_4 , $\text{MgSO}_4 + 28\text{H}_2\text{O}$

Easily sol in H_2O (Winkelblech)

Cobaltous magnesium potassium sulphate,
 $\text{CoSO}_4, \text{MgSO}_4, \text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)
 Does not exist (Aston and Pickering,
 Chem Soc 49 123)

Cobaltous manganous potassium sulphate,
 $\text{CoSO}_4, \text{MnSO}_4, 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

Cobaltous nickel potassium sulphate, $\text{CoSO}_4, \text{NiSO}_4, 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)
 Does not exist (Thomson, Rep Brit
 Assn Adv Sci 1877 209)

Cobaltous potassium sulphate, $\text{CoSO}_4, \text{K}_2\text{SO}_4 + 6\text{H}_2\text{O}$
 Less sol in H_2O than CoSO_4
 100 pts H_2O dissolve at
 0° 12° 15° 20° 25°
 19.1 30 32.5 39.4 45.3 pts anhydrous salt,

30° 35° 40° 49°
 51.9 55.4 64.6 81.3 pts anhydrous salt
 (Tobler, A 96 126)

100 pts saturated solution contain at
 20° 40° 60° 80°
 14 19.5 24.4 31.8 pts anhydrous salt
 (v Hauer, J pr 74 433)

1 l H_2O dissolves 128.8 g anhydrous
 salt at 25° (Locke, Am Ch J 1902, 27 459)

Cobaltic potassium sulphate, $\text{K}_2\text{Co}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
 Sol in H_2O with decomp (Marshall,
 Chem Soc 59 760)

Cobaltous potassium zinc sulphate, $\text{CoSO}_4, 2\text{K}_2\text{SO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$
 Sol in H_2O (Vohl, A 94 57)

Cobaltous rubidium sulphate, $\text{CoSO}_4, \text{Rb}_2\text{SO}_4 + 6\text{H}_2\text{O}$
 Sol in H_2O (Lutton)
 1 l H_2O dissolves 92.8 g anhydrous salt
 at 25° (Locke, Am Ch J 1902, 27 459)

Cobaltic rubidium sulphate, $\text{Rb}_2\text{Co}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$
 Decomp by H_2O Sol in dil HCl and
 H_2SO_4 Decomp by conc HCl or H_2SO_4
 (Howe and O'Neal, J Am Chem Soc 1898,
 20 762)
 Melts in crystal H_2O at 47° (Locke, Am
 Ch J 1901, 26 183)

Cobaltous sodium sulphate, $\text{CoNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Solubility of $\text{CoNa}_2(\text{SO}_4)_2, 4\text{H}_2\text{O}$ in H_2O at t°
 100 g H_2O dissolve grams CoSO_4 and
 grams Na_2SO_4

t°	g CoSO_4	g Na_2SO_4
20	26.65	24.91
25	25.365	23.325
30	23.13	21.61
35	22.55	20.85
40	20.975	20.055

(Koppel, Z phys Ch 1905, 52 397)

Solubility of $\text{CoNa}_2(\text{SO}_4)_2, 4\text{H}_2\text{O} + \text{CoSO}_4, 7\text{H}_2\text{O}$ in H_2O at t° 100 g H_2O dissolve
 grams CoSO_4 and grams Na_2SO_4

t°	g CoSO_4	g Na_2SO_4	t°	g CoSO_4	g Na_2SO_4
18.5	28.61	23.82	30	32.695	18.17
20	29.42	23.015	35	34.065	15.61
25	30.73	20.575	40	35.01	13.715

(Koppel, Z phys Ch 1905, 52 397)

Solubility of $\text{CoNa}_2(\text{SO}_4)_2, 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$ in H_2O at t° 100 g H_2O dissolve
 grams CoSO_4 and grams Na_2SO_4

t°	g CoSO_4	g Na_2SO_4
18.5	25.50	25.65
20	23.18	27.26
25	16.07	35.18
30	9.20	43.74

(Koppel)

Solubility of $\text{CoNa}_2(\text{SO}_4)_2, 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
 (anhydrous) in H_2O at t° 100 g H_2O
 dissolve grams CoSO_4 and grams Na_2SO_4

t°	g CoSO_4	g Na_2SO_4
35	7.204	50.79
40	7.456	50.095

(Koppel)

See also $\text{CoSO}_4 + \text{Na}_2\text{SO}_4$ under CoSO_4

Cobaltous zinc sulphate
 Efflorescent Decomp on air (Link,
 Crell Ann 1790, 1 32)

Cobaltous sulphate ammonia, $\text{CoSO}_4, 6\text{NH}_3$
 Sol in H_2O with separation of ppt (Rose,
 Pogg 20 152) Very easily sol in $\text{NH}_4\text{OH} + \text{Aq}$
 (Fremy)
 Decomp by alcohol

Cobaltous sulphate hydrazine, $\text{CoSO}_4, 3\text{N}_2\text{H}_4$
 Insol in H_2O Decomp by boiling with
 H_2O Very sol in dil acids and $\text{NH}_4 + \text{Aq}$
 (Franzen, Z anorg 1908, 60 272)

Cobaltous sulphate hydroxylamine, $\text{CoSO}_4 \cdot \text{NH}_2\text{OH} \cdot 2\text{H}_2\text{O}$

Insol in cold, sol in hot H_2O with decomp (Feldt, B 1894, 27 403)

Columbium sulphate

Sol in H_2O (Blomstrand)

Cuprous sulphate, Cu_2SO_4

Decomp by H_2O Sol in conc HCl , in ammonia and sl sol in glacial acetic acid (Recoura, C R 1909, 148 1107)

Cupric sulphate, basic, $10\text{CuO} \cdot \text{SO}_3$

(Pickering, Chem Soc 1907, 91 1984)

$8\text{CuO} \cdot \text{SO}_3 \cdot 12\text{H}_2\text{O}$ Ppt (Kane, A ch 72 269)

$5\text{CuO} \cdot \text{SO}_3 \cdot 6\text{H}_2\text{O}$ Ppt (Smith, Phil Mag J 23 196)

$4\text{CuO} \cdot \text{SO}_3 \cdot 3\text{H}_2\text{O}$ Insol in H_2O (Roucher, J Pharm (3) 37 50)

Min *Brochantite* Sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$

$+3\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O Easily sol in dil acids, even $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Sl sol in $\text{Na}_2\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Cas-

) (Proust) Sol
and more easily in NH_4Cl ,
(Lea)

CuSO_4 dissolves 0.017 g (Pickering, C N 1883, 47 182)

$+5\text{H}_2\text{O}$ Min *Langite*

$+16\text{H}_2\text{O}$ (Andre, C R 100 1138)

$7\text{CuO} \cdot 2\text{SO}_3 \cdot 5\text{H}_2\text{O}$ (Reindel, J pr 100 1)

$+6\text{H}_2\text{O}$ Wholly insol in cold or hot H_2O (Habermann, M Ch 5 432)

$+7\text{H}_2\text{O}$ Insol in H_2O , easily sol in acids
Insol in boiling $\text{CuSO}_4 + \text{Aq}$ (Reindel)

$3\text{CuO} \cdot \text{SO}_3 \cdot 1\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O , easily sol in acids (Stenmann, B 15 1412)

$+2\text{H}_2\text{O}$ Insol in H_2O , sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Shenstone, Chem Soc 47 375)

$+2\frac{1}{2}\text{H}_2\text{O}$ (Reindel, J pr 102 204)

$+4\text{H}_2\text{O}$ Insol in H_2O (Grimbert and Barré, J Pharm (5) 21 414)

$5\text{CuO} \cdot 2\text{SO}_3 \cdot 3\text{H}_2\text{O}$ (Wibel, Dissert 1864)

$11\text{CuO} \cdot 4\text{SO}_3 \cdot 8\text{H}_2\text{O}$ (Clowes, C N 1898, 78 155)

$8\text{CuO} \cdot 3\text{SO}_3 \cdot 10\text{H}_2\text{O}$ (Marchlewski and Sachs, Z anorg 1892, 1 405)

$7\text{CuO} \cdot 3\text{SO}_3 \cdot 12\text{H}_2\text{O}$ (Étard, C R 1887, 104 1615)

$5\text{CuO} \cdot 2\text{SO}_3 \cdot 5\text{H}_2\text{O}$ (Sabatier, Gm K 5 1, 839)

$6\text{H}_2\text{O}$ Min *Arnamite* (Weisbach, J B 1886 2253)

$2\text{CuO} \cdot \text{SO}_3$ Decomp by cold H_2O into CuSO_4 and $4\text{CuO} \cdot \text{SO}_3$ (Roucher)

Insol in H_2O Decomp by hot H_2O
Sol in dil acids (Pozzi-Escot, Bull Soc 1913 (4) 13 816)

According to Pickering (C N 47 181) only

$3\text{CuO} \cdot \text{SO}_3 + 2\frac{1}{2}\text{H}_2\text{O}$ and $4\text{CuO} \cdot \text{SO}_3 + 4\text{H}_2\text{O}$ are true chemical compounds

There is at 25° no definite basic sulphate of copper, all the basic sulphates being solid solutions. The solutions in contact with these basic sulphates contain SO_3 and CuO in equivalent quantities and are all sl acid in reaction (Bell, J phys Chem 1908, 12 179)

Cupric sulphate, CuSO_4

Anhydrous Absorbs H_2O from the air. Combines with, and dissolves in H_2O with great evolution of heat

$+ \text{H}_2\text{O}$ Permanent Sol in H_2O (Étard, C R 87 602)

$+ 2\text{H}_2\text{O}$ (?) (Storer's Dict)

$+ 3\text{H}_2\text{O}$ (Étard, C R 104 1614)

Does not exist (Cross, C N 49 220)

See Foote, p 965

$+ 5\text{H}_2\text{O}$ Superficially efflorescent in dry air

Sol in 2.34 pts H_2O at 18° and sat solution has sp gr 1.2147 (Schiff, A 109 326)

100 pts $\text{CuSO}_4 + \text{Aq}$ sat at b pt 102.2 contain 45 pts of the dry salt or 100 pts H_2O at 102.2° dissolve 81.82 pts CuSO_4 (Griffiths, Q J Sci 18 90)

Sol in less than 4 pts H_2O at ord temp and much more sol in boiling H_2O (Bergmann)

Sol in 4 pts cold and 2 pts hot H_2O (Schubarth)

100 pts H_2O dissolve 33.103 pts $\text{CuSO}_4 + 5\text{H}_2\text{O}$ at 15° and solution has sp gr = 1.1859 (Michel and Krafft, A ch (3) 41 478)

$\text{CuSO}_4 + \text{Aq}$ sat at 8° has 1.17 sp gr (Anthon, A 24 210)

1 pt $\text{CuSO}_4 + 5\text{H}_2\text{O}$ dissolves at

4°	19	31°	37.5°	40°
in 3.32	2.71	1.84	1.7	1.14 pts H_2O

62.5°	75	87.5°	106°	101°
in 1.27	1.07	0.75	0.5	0.47 pts H_2O

(Brands and Cramer 1826)

Sol at 17.5 in 2.412 pts H_2O (Kuntz)

100 pts H_2O dissolve at

9°	10°	20°	30°
31.61	36.95	42.31	48.81 pts $\text{CuSO}_4 + 5\text{H}_2\text{O}$

40°	50°	60°	70°
56.90	65.83	77.39	94.60 pts $\text{CuSO}_4 + 5\text{H}_2\text{O}$

80°	90°	100°
118.03	156.44	203.32 pts $\text{CuSO}_4 + 5\text{H}_2\text{O}$

(Poggiale, A ch (3) 8 463)

100 pts H_2O dissolve at

0°	20°	35°	54°
17	24.3	28.6	36.1 pts anhydrous CuSO_4

(Tobler, A 95 193)

100 pts $\text{CuSO}_4 + \text{Aq}$ sat at $11-14^\circ$ contain 16.23 pts anhydrous CuSO_4 (v Hauer, J pr 103 114)

100 pts H_2O dissolve 15.107 pts CuSO_4 at 0° (Pfaff, A 99 224)

100 pts H₂O dissolve pts CuSO₄ at t°

t°	Pts CuSO ₄
0	14 99
17 9	20 16
24 1	22 37

(Diacon, J B 1866 61)

100 pts H₂O dissolve pts CuSO₄ at t°

t°	Pts CuSO ₄	t	Pts CuSO ₄	t°	Pts CuSO ₄
0	14 15	40	28 50	80	54 53
10	17 50	50	33 31	90	64 35
20	20 53	60	39 01	100	75 22
30	24 34	70	45 74		

(Patrick and Aubert, Transactions of Kansas Acad of Sci 1874 19)

Solubility in 100 pts H₂O at t°

t°	Pts CuSO ₄	t°	Pts CuSO ₄	t°	Pts CuSO ₄
0	15 5	35	27 5	70	45 7
1	16 3	36	27 9	71	46 4
2	16 6	37	28 3	72	47 2
3	16 9	38	28 7	73	47 9
4	17 2	39	29 1	74	48 7
5	17 5	40	29 5	75	49 5
6	17 8	41	29 9	76	50 3
7	18 1	42	30 3	77	51 1
8	18 4	43	30 7	78	51 9
9	18 7	44	31 1	79	52 7
10	19 1	45	31 5	80	53 5
11	19 3	46	31 9	81	54 3
12	19 6	47	32 3	82	55 1
13	19 9	48	32 7	83	55 9
14	20 2	49	33 2	84	56 8
15	20 5	50	33 6	85	57 8
16	20 8	51	34 1	86	58 7
17	21 1	52	34 5	87	59 7
18	21 4	53	35 0	88	60 7
19	21 7	54	35 5	89	61 7
20	22 0	55	36 0	90	62 7
21	22 3	56	36 6	91	63 7
22	22 6	57	37 2	92	64 8
23	23 0	58	37 8	93	65 8
24	23 3	59	38 4	94	66 9
25	23 7	60	39 0	95	68 0
26	24 0	61	39 6	96	69 1
27	24 4	62	40 2	97	70 2
28	24 7	63	40 9	98	71 3
29	25 1	64	41 5	99	72 4
30	25 5	65	42 2	100	73 5
31	25 9	66	42 9	101	74 6
32	26 3	67	43 6	102	75 7
33	26 7	68	44 3	103	76 8
34	27 1	69	45 0	104	77 9 5

(Mulder, Scheik Verhandel 1864 79)

If solubility S=pts anhydrous CuSO₄ in 100 pts solution, S=11 6+0 2614t from -2° to 55°, S=26 5+0 3700t from 55° to 105°, S=45 0-0 0293t from 105° to 190° (Étard, C R 104 1614)

Solubility decreases above 120°, owing to formation of basic salt (Tilden and Shennstone, Phil Trans 1884 23)

100 ccm H₂O dissolve 14 92 g CuSO₄ at 0° (Engel, C R 102 113)

100 ccm H₂O dissolve 22 28-22 30 g CuSO₄ at 20° (Trevor, Z phys Ch 7 468)

Sat CuSO₄+Aq contains % CuSO₄ at t°

t°	% CuSO ₄	t°	% CuSO ₄
-1	12 1	88	38 8
+7	14 1	89	38 9
9	14 5	94	41 8
18	16 9	96	41 9
20	17 2	97	42 0
20	17 4	100	43 6
35	21 3	108	43 8
39	21 8	110	43 4
45	23 9	116	43 8
54	26 9	116	44 0
54	26 6	120	44 8
61	28 8	132	44 8
63	29 1	133	44 7
65	30 0	143	45 0
70	31 6	160	44 2
71 7	32 6	165	44 5
76	34 5	179	42 9
80	36 6	189	42 2
86	37 8		

(Étard, A ch 1894, (7) 2 551)

Solubility in H₂O at t°

t	g CuSO ₄ per 100 g H ₂ O
0	14 15
10	17 68
15	19 25
20	20 78
25	22 29 (by interpolation)

(Cohen, Z phys Ch 1907, 60 71)

1 399 mol are sol in 1 l H₂O at 25° (Herz, Z anorg 1910, 67 366)

100 g CuSO₄+Aq sat at 30° contain 20 32 anhyd CuSO₄ (Schreinemakers, Z phys Ch 1910, 71 110)

+7H₂O (Boisbaudran, C R 65 1249)

+6H₂O (Boisbaudran, C R 66 487)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 18° % = %
 $\text{CuSO}_4 + 5\text{H}_2\text{O}$

%	Sp gr	%	Sp gr	%	Sp gr
1	1 0063	11	1 0716	21	1 1427
2	1 0126	12	1 0785	22	1 1501
3	1 0190	13	1 0854	23	1 1585
4	1 0254	14	1 0923	24	1 1659
5	1 0319	15	1 0993	25	1 1738
6	1 0384	16	1 1063	26	1 1817
7	1 0450	17	1 1135	27	1 1898
8	1 0516	18	1 1208	28	1 1980
9	1 0582	19	1 1281	29	1 2063
10	1 0649	20	1 1354	30	1 2146

(Schiff, calculated by Gerlach, Z anal **8** 288)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 23.9° a=no of $\frac{1}{2}$
 mols in grms dissolved in 1000 grms
 H_2O , b=sp gr if a is $\text{CuSO}_4 + 5\text{H}_2\text{O}$ ($\frac{1}{2}$
 mol wt = 125), c=sp gr if a is CuSO_4
 ($\frac{1}{2}$ mol wt = 80)

a	b	c
1	1 076	1 080
2	1 142	1 154
3	1 200	1 225

(Favre and Valson, C R **79** 968)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 15°
 % = % $\text{CuSO}_4 + 5\text{H}_2\text{O}$

%	Sp gr	%	Sp gr
5	1 0335	20	1 1443
10	1 0688	25	1 1848
15	1 1060	mother liquor	1 185

(Gerlach, Dingl **181** 131)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 18°

% CuSO_4	Sp gr	% CuSO_4	Sp gr
5	1 0513	15	1 1675
10	1 1073	17.5	1 2003

(Kohlrausch, W Ann **1879** 1)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 0° b=pts CuSO_4
 in 100 pts solution

S	Sp gr	S	Sp gr
11 9315	1 1371	5 2181	1 0578
9 8159	1 1108	2 6460	1 0290
7 5474	1 0833		

(Charpy, A ch (6) **29** 26)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at room temp

% CuSO_4	Sp gr
6.79	1 055
12.57	1 1151
17.49	1 1635

(Wagner, W Ann 1883, **18** 265)

Sp gr of $\text{CuSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{CuSO}_4 + \text{Aq}$	Sp gr
1-normal	1 0790
$\frac{1}{2}$ " "	1 0402
$\frac{1}{4}$ " "	1 0205
$\frac{1}{8}$ " "	1 0103
$\frac{1}{16}$ " "	1 0050

(Wagner, Z phys Ch 1890, **5** 38)

B-pt $\text{CuSO}_4 + \text{Aq}$ containing pts CuSO_4 to
 100 pts H_2O

B pt	Pts CuSO_4	B pt	Pts CuSO_4
100 5°	21.3	103 0°	69.0
101 0	36.9	103 5	74.9
101 5	48.0	104 0	80.1
102 0	56.2	104 2	82.2
102 5	63.0		

(Gerlach, Z anal **26** 434)

Sat $\text{CuSO}_4 + \text{Aq}$ boils at 102.2° , and con-
 tains 81.8 pts CuSO_4 to 100 pts H_2O
 (Griffiths)

Crust forms at 102.3° , and solution contains
 60.3 pts CuSO_4 to 100 pts H_2O , highest temp
 observed, 104.8° (Gerlach, Z, anal **26** 426)

Sol in $\text{HCl} + \text{Aq}$, causing a reduction of
 temperature of about 17°

Very sl sol in conc H_2SO_4 (Schulz)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 0°

G per 100 g H_2O		Sp gr
H_2SO_4	CuSO_4	
0 00	14.85	1 144
2 03	14.29	1 143
7 16	15.65	1 158
15 20	9.90	1 170
26 57	6.43	1 195
27 57	6.19	1 211
35 2	3.99	1 224

(Engel, C R 1887, **104** 507)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

Solution			Solid phase
Sp gr	% CuO	% SO_3	
1 2142	9 17	9 26	CuSO ₄ + 5H ₂ O
1 2248	5 91	15 90	
1 2593	3 39	23 09	
1 2934	1 82	28 75	
1 4061	1 32	39 74	
1 4256		41 29	
1 4249		41 04	CuSO ₄ + 5H ₂ O and CuSO ₄ + 3H ₂ O
1 4516	1 38	43 63	
1 4915	1 02	47 82	
1 5124		49 07	CuSO ₄ + H ₂ O
1 5408	0 38	51 46	
1 5643	0 368	53 51	
1 6824	0 109	62 14	
1 7752	0 105	68 34	CuSO ₄
1 8118	0 15	72 41	
1 8266	0 07	74 26	

These results show that the hydrates of CuSO₄ which are stable at 25° are CuSO₄ + 5H₂O, +3H₂O and +H₂O

(Bell and Taber, J phys Chem 1908, **12** 175)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

Solution contains		Solid phase
% CuSO	% H ₂ SO ₄	
18 47	none	CuSO ₄ + 5H ₂ O
12 62	11 14	
5 92	25 53	
3 25	36 77	
2 63	42 15	
2 59	47 66	
2 83	49 00	CuSO ₄ + 5H ₂ O and CuSO ₄ + 3H ₂ O
2 83	49 20	
2 84	49 29	CuSO ₄ + 3H ₂ O
2 70	50 23	
2 19	54 78	CuSO ₄ + 3H ₂ O and CuSO ₄ + H ₂ O
2 11	55 84	
2 15	55 60	CuSO ₄ + H ₂ O
0 95	61 79	
0 17	77 93	
0 15	83 29	CuSO ₄ + H ₂ O
0 19	85 46	
0 44	85 72	CuSO ₄ + H ₂ O and CuSO ₄
0 42	85 81	
0 40	86 04	CuSO ₄
0 19	92 70	

These results show that the hydrates of CuSO₄ which are stable at 25° are CuSO₄ + 5H₂O, +3H₂O and +H₂O

(Foote, J Am Chem Soc 1915, **37** 290)

Sl sol in sat NH₄Cl + Aq, with separation of a double sulphate

Solubility of CuSO₄ in CuCl₂ + Aq at 30°

% CuCl ₂	% CuSO ₄	Solid phase
0	20 32	CuSO ₄ , 5H ₂ O
6 58	13 62	"
15 68	8 93	"
25 67	4 77	"
39 48	3 21	"
42 47	2 90	CuSO ₄ , 5H ₂ O + CuCl ₂ , 2H ₂ O
43 25	1 14	CuCl ₂ , 2H ₂ O
43 95	0	"

(Schreinemakers, Arch Néer Sci 1910, (2) **15** 117)

Solubility of CuSO₄ in LiCl + Aq at 25°

Solid phase, CuSO₄, 5H₂O
(G mols per l of solution)

LiCl	CuSO ₄
0	1 399
0 73	1 257
1 40	1 176
2 83	1 067

(Herz, Z anorg 1910, **67** 366)

Solubility of CuSO₄ in KCl + Aq at 25°

Solid phase, CuSO₄ + 5H₂O
(G mols per l of solution)

KCl	CuSO ₄
0 56	1 496
1 17	1 561
2 34	1 819

(Herz)

Solubility of CuSO₄ in NaCl + Aq at 25°

Solid phase, CuSO₄ + 5H₂O
(G mols per l of solution)

NaCl	CuSO ₄
0	1 399
0 36	1 404
1 32	1 426
2 53	1 507

(Herz)

Solubility of CuSO₄ in RbCl + Aq at 25° , containing 1094 g mols per l = 1568 g mols (Herz)

Slowly sol in sat KNO₃ + Aq, with separation of a double sulphate

Very slowly sol in sat NaNO₃ + Aq, with separation of a double sulphate (Karsten, Berl Abhandl 1840 10)

Solubility of CuSO_4 in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 0°

g per 100 cc solution		Sp gr	g per 100 cc solution		Sp gr
$(\text{NH}_4)_2\text{SO}_4$	CuSO_4		$(\text{NH}_4)_2\text{SO}_4$	CuSO_4	
0	14.79	1.144	5.59	5.13	1.081
3.61	16.09	1.190	7.51	2.95	1.071
4.63	8.38	1.108	12.31	0.94	1.082
4.90	7.26	1.099	20.65	0.80	1.116

(Engel, C R 1886, 102 114)

See also under $(\text{NH}_4)_2\text{SO}_4$ Solubility of CuSO_4 in $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 30°

Composition of the solution		Solid phase
% by wt CuSO_4	% by wt Li_2SO_4	
20.32	0	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
17.50	3.54	"
16.10	6.08	"
13.55	11.94	"
12.14	15.72	"
11.04	17.92	"
10.05	20.55	$\text{CuSO}_4 \cdot 5\text{H}_2\text{O} + \text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
10.08	20.51	"
10.07	20.49	"
6.41	22.23	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
3.39	23.59	"
0	25.24	"

(Schrenemakers, Z phys Ch 1909, 66 692)

Sol in CuCl_2 , $(\text{NH}_4)_2\text{SO}_4$, $\text{NH}_4\text{Cl} + \text{Aq}$ at 30° (Schrenemakers, Z phys Ch 1909, 69 565)Sol in $(\text{NH}_4)_2\text{SO}_4$, $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 30° (Schrenemakers, Z phys Ch 1909, 66 694)100 pts sat solution of CuSO_4 and FeSO_4 contain 17.43 pts of the salts at $11-14^\circ$ (v Hauer, J pr 103 114)100 pts H_2O dissolve 10.85 pts CuSO_4 , 17.47 pts MgSO_4 , and 5.78 pts Na_2SO_4 at 0° (Diacon)100 pts H_2O dissolve 7.169 pts CuSO_4 , 21.319 pts MgSO_4 , and 6.830 pts Na_2SO_4 at 0° (Plaff)Slowly and sl sol in sat $\text{MgSO}_4 + \text{Aq}$ (Karsten)Solubility of CuSO_4 in H_2O in presence of MgSO_4 . 100 pts H_2O dissolve—

No	CuSO_4	MgSO_4	No	CuSO_4	MgSO_4
1	0	26.37	5	12.03	15.67
2	2.64	25.91	6	13.61	8.64
3	4.75	25.30	7	14.99	0
4	9.01	23.54			

In 1, 2, and 3, MgSO_4 was in excess and given amt CuSO_4 added, in 4, both CuSO_4 and MgSO_4 were in excess, in 5, 6, and 7, CuSO_4 was in excess (Diacon, l c)100 pts sat solution of CuSO_4 and MgSO_4 contain 28.58 pts of the salts at $11-14^\circ$ (v Hauer, J pr 103 114)100 pts sat solution of CuSO_4 and MnSO_4 contain 37.90 pts of the salts at $11-14^\circ$ (v Hauer)Solubility of $\text{CuSO}_4 + \text{MnSO}_4$ in H_2O at 25°

G per 100 g H_2O		G per 100 g H_2O	
CuSO_4	MnSO_4	CuSO_4	MnSO_4
20.2	0	9.39	46.77
19.76	3.69	6.47	53.39
13.65	31.52	3.01	58.93
11.61	39.41	0.0	61.83

(Stortenbecker Z phys Ch 1900, 34 112)

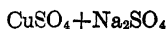
100 pts sat solution of CuSO_4 and NiSO_4 contain 31.03 pts of the salts at $11-14^\circ$ (v Hauer)Solubility of $\text{CuSO}_4 + \text{NiSO}_4$ in H_2O

g per 100 g H_2O			Mol % CuSO_4	
t°	CuSO_4	NiSO_4	Solution	Solid phase
35	9.62	583.9	1.57	0.35
	41.66	484.4	7.69	2.12
	75.39	553.5	11.66	4.77
	106.40	506.5	16.92	6.52
	172.0	483.8	25.6	13.88
	186.9	468.8	27.90	{ 18.77 94.91
67	20.04	729.3	2.65	0.93
	66.01	706.2	8.31	2.86
	88.08	501.6	13.55	3.92
	147.94	675.0	16.39	6.66
	249.9	747.8	24.46	23.32

(Fock, Z Kryst Min 1897, 28 387)

More easily sol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$ than in Na_2SO_4 or $\text{MgSO}_4 + \text{Aq}$, forming a double sulphate, which separates out (Karsten) K_2SO_4 and CuSO_4 mutually displace each other in saturated solutions (Rudorff, Pogg 148 555)When K_2SO_4 and CuSO_4 , both in excess, are dissolved in H_2O , a maximum of solubility of 15.61 pts of the two salts in 100 pts H_2O at 25° is reached in 30 minutes, after which the solubility decreases. This result is obtained either by treating excess of the two salts with H_2O at 25° , or cooling solutions of the two salts sat at higher temp to 25° . The salts are in the proportion of 5.2 pts K_2SO_4 to 10.4 pts CuSO_4 . If present in the same proportion as in their saturated solutions, 5.41 pts K_2SO_4 to 10.13 pts CuSO_4 would be required

If sat solution of one salt is added to sat solution of the other, $K_2Cu(SO_4)_2 + 6H_2O$ separates, as it is less sol than either simple salt, until a state of equilibrium is reached, after which there is no separation, contrary to Rudorff (see above) (Trevor, Z phys Ch 7 486)



Solubility of $CuSO_4$ in presence of Na_2SO_4 at 0° 100 pts H_2O dissolve—

No	$CuSO_4$	Na_2SO_4	No	$CuSO_4$	Na_2SO_4
1	0	4 53	5	15 84	3 55
2	6 01	5 34	6	15 33	1 98
3	9 81	5 73	7	14 99	0
4	16 67	6 48			

In 1, 2, and 3, Na_2SO_4 was in excess and given amt $CuSO_4$ added, in 4, both $CuSO_4$ and Na_2SO_4 were in excess, in 5, 6, and 7, $CuSO_4$ was in excess and Na_2SO_4 added (Dracon, J B 1866 61)

100 pts H_2O dissolve 8 038 pts $CuSO_4$ and 6 31 pts Na_2SO_4 at 0° (Pfaff, A 99 224)

100 pts H_2O dissolve 20 7 pts $CuSO_4$ and 15 9 pts Na_2SO_4 at 15° (Rudorff, B 6 484)

Solubility of $CuSO_4 + Na_2SO_4$

1 Solid phase, 3 mol $CuSO_4 + 1$ mol Na_2SO_4

2 Solid phase, 1 mol $CuSO_4 + 1$ mol Na_2SO_4

3 Solid phase, 1 mol $CuSO_4 + 3$ mol Na_2SO_4

(G in 100 g H_2O)

t	1		2		3	
	$CuSO_4$	Na_2SO_4	$CuSO_4$	Na_2SO_4	$CuSO_4$	Na_2SO_4
10	19 75	12 49	19 70	12 50	19 69	12 55
15	20 69	15 88	20 75	15 90	20 70	15 92
30	22 03	16 36	21 00	20 14	15 28	22 70
50	32 37	11 75	31 45	13 41	28 76	15 25

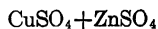
(Massol and Males, C R 1901, 133 287)

Solubility of $CuSO_4, 5H_2O + Na_2SO_4, 10H_2O$

t°	% $CuSO_4$	% Na_2SO_4
0	13 40	6 23
12	14 83	9 82
15	15 00	

(Koppel, Z phys Ch 1903, 42 8)

See also under $CuNa_2(SO_4)_2 + 6H_2O$



Very slowly sol in sat $ZnSO_4 + Aq$, forming a double salt which separates (Karsten)

100 pts sat solution of $CuSO_4$ and $ZnSO_4$ contain 32 70 pts of the salts at 11–14° (v Hauer)

Solubility of $CuSO_4 + ZnSO_4$ in H_2O at 25°

Mols per 100 mols H_2O		Mols per 100 mols H_2O	
Cu	Zn	Cu	Zn
2 28	0	0 82	5 03
1 83	2 08	0 51	5 59
1 41	3 60	0 30	5 56
1 19	5 01	0 00	6 42
1 86	3 36	1 19	5 01
1 22	4 45	0 51	5 59
1 01	4 72	0 267	5 77
		0 00	5 94

(Stortenbecker, Z phys Ch 1897, 22 62)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 827)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

100 pts of a sat solution in 40% alcohol contains 0 25 pt $CuSO_4 + 5H_2O$, 20% alcohol, 3 1 pts, 10% alcohol, 13 3 pts (Schiff, A 118 362)

Anhydrous $CuSO_4$ is sol in absolute methyl alcohol, but insol in absolute ethyl alcohol $CuSO_4 + xH_2O$ is insol in methyl or ethyl alcohol (Klepl, J pr (2) 25 526)

100 pts absolute methyl alcohol dissolve 1 05 pts anhydrous $CuSO_4$ at 18°

100 pts absolute methyl alcohol dissolve 15 6 pts $CuSO_4 + 5H_2O$ at 18°, 100 pts 93 5% methyl alcohol dissolve 0 93 pt $CuSO_4 + 5H_2O$ at 18°, 100 pts 50% methyl alcohol dissolve 0 4 pt $CuSO_4 + 5H_2O$ at 18°, 100 pts absolute methyl alcohol dissolve 13 4 pts $CuSO_4 + 5H_2O$ at 3°

100 pts absolute ethyl alcohol dissolve 1 1 pts $CuSO_4 + 5H_2O$ at 3° (de Bruyn, Z phys Ch 10 786)

Methyl alcohol dissolves 11 5% $CuSO_4 + 5H_2O$ at 0° (Auger, C R 1906, 142 1272)

Glacial acetic acid precipitates $CuSO_4$ completely from $CuSO_4 + Aq$

100 g 95% formic acid dissolve 0 05 g $CuSO_4 + 5H_2O$ at 18 5° (Aschan, Ch Ztg 1913, 37 1117)

Sol in glycerine (Pelouze), picoline (Unverdorben)

100 g glycerine dissolve 36 3 g $CuSO_4 + 5H_2O$ at 15–16° (Ossendowski, Pharm J 1907, 79 575)

100 g glycerine dissolve 30 0 g $CuSO_4$ at 15 5°

100 g solution of $CuSO_4$ in glycol contain 7 6 g at 14 6° (de Coninck, Bull Ac Belg 1905 257)

Anhydrous $CuSO_4$ is insol in acetone (Krug and M'Elroy, J Anal Ch 6 184)

Insol in acetone (Eidmann, C C 1899, II 1014), methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314), benzonitrile (Naumann, B 1914, 47 1370)

Min *Chalcanthite*

Cupric glucinum sulphate, $\text{CuSO}_4 \cdot 4\text{H}_2\text{SO}_4 + 20\text{H}_2\text{O}$

Sol in H_2O (Klatzo, J B 1868 205)
Does not exist (Marignac, A ch (4) 30 45)
 $9\text{CuSO}_4 \cdot \text{H}_2\text{SO}_4 + 50\text{H}_2\text{O}$ As above
Does not exist (Marignac, l c)

Cupric hydrazine sulphate, $\text{CuH}_2(\text{SO}_4)_2 \cdot 2\text{N}_2\text{H}_4$

1 pt is sol in 1148 pts H_2O at 10°
Decomp by acids
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ with decomp (Curtaeus, J pr 1894, (2) 50 331)

Cupric iron (ferrous) sulphate, $\text{CuSO}_4 \cdot \text{FeSO}_4$

Insol in H_2O (Étard, C R 87 602)
 $+2\text{H}_2\text{O}$ (Étard)
 $\text{CuSO}_4 \cdot 2\text{FeSO}_4 + 21\text{H}_2\text{O}$ Sol in H_2O (v Hauer)
 $\text{CuSO}_4 \cdot 3\text{FeSO}_4 + 28\text{H}_2\text{O}$ 100 pts H_2O dissolve 75 pts salt at 7° (Lefort)
 $4\text{CuSO}_4 \cdot \text{FeSO}_4 + 34\text{H}_2\text{O}$ 100 pts H_2O at 15.5° dissolve 75.91 pts (Thomson)

Cupric iron (ferric) sulphate, $\text{CuSO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 + 24\text{H}_2\text{O}$

Sol in H_2O (Bastick)

Cupric iron (ferrous) potassium sulphate, $\text{CuSO}_4 \cdot \text{FeSO}_4 \cdot 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl)

Cupric lead sulphate, $\text{CuO} \cdot \text{PbO} \cdot \text{SO}_3 + \text{H}_2\text{O}$

Min *Immarite*
 $3\text{CuO} \cdot 7\text{PbO} \cdot 5\text{SO}_3 + 5\text{H}_2\text{O}$ Min *Caledonite*
Sol in $\text{HNO}_3 + \text{Aq}$

Cupric magnesium sulphate, $\text{CuSO}_4 \cdot \text{MgSO}_4 + 14\text{H}_2\text{O}$

Efflorescent Sol in H_2O (Vohl, A 94 57)
 $+2\text{H}_2\text{O}$ (Arrot, 1834)
 $\text{CuSO}_4 \cdot 2\text{MgSO}_4 + 21\text{H}_2\text{O}$ Sol in H_2O (v Hauer, Fogg 126 638)
 $\text{CuSO}_4 \cdot 7\text{MgSO}_4 + 56\text{H}_2\text{O}$ Sol in H_2O (Scheff, A 107 64)

Cupric magnesium manganous potassium sulphate, $\text{CuSO}_4 \cdot \text{MgSO}_4 \cdot \text{MnSO}_4 \cdot 3\text{K}_2\text{SO}_4 + 18\text{H}_2\text{O}$

Sol in H_2O (Vohl)

Cupric magnesium potassium sulphate, $\text{CuSO}_4 \cdot \text{MgSO}_4 \cdot 2\text{K}_2\text{SO}_4 + 6\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)
Does not exist (Aston and Pickering, Chem Soc 49 123)

Cupric magnesium potassium zinc sulphate, $\text{CuSO}_4 \cdot \text{MgO}_4 \cdot 3\text{K}_2\text{SO}_4 \cdot \text{ZnSO}_4 + 18\text{H}_2\text{O}$

Sol in H_2O (Vohl)

Cupric manganous sulphate, $5\text{CuSO}_4 \cdot 2\text{MnSO}_4 + 35\text{H}_2\text{O}$

Sol in H_2O (Schauffele, J B 1852 340)
 $2\text{CuSO}_4 \cdot 3\text{MnSO}_4 + 25\text{H}_2\text{O}$ As above (S)
 $\text{CuSO}_4 \cdot \text{MnSO}_4 + \text{H}_2\text{O}$ (Étard, C R 87 602)

Cupric manganous potassium sulphate, $\text{CuSO}_4 \cdot \text{MnSO}_4 \cdot 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl)

Cupric nickel sulphate, $\text{CuSO}_4 \cdot \text{NiSO}_4 + 3\text{H}_2\text{O}$

(Étard, C R 87 602)
 $\text{CuSO}_4 \cdot 2\text{NiSO}_4 + 21\text{H}_2\text{O}$ Sol in H_2O (v Hauer)
 $+18\text{H}_2\text{O}$ Sol in H_2O (Boisbaudran, C R 66 497)
 $2\text{CuSO}_4 \cdot 2\text{NiSO}_4 \cdot 3\text{H}_2\text{SO}_4$ (Étard)

Cupric nickel potassium sulphate, $\text{CuSO}_4 \cdot \text{NiSO}_4 \cdot 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl)
Sol in 4 pts H_2O , insol in alcohol (Bette)
 $4\text{CuSO}_4 \cdot \text{K}_2\text{SO}_4 + 4\text{H}_2\text{O}$ Very sl sol in H_2O
 $\text{K}_2\text{O} \cdot 4\text{CuO} \cdot 4\text{SO}_3 + 4\text{H}_2\text{O}$ Insol in H_2O , but decomp by boiling H_2O into $3\text{CuO} \cdot \text{SO}_3$

Cupric potassium sulphate, $\text{K}_2\text{Cu}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$

100 pts H_2O dissolve 66.666 pts at 102.8° (Griffiths)
Much more sol in hot than cold H_2O (Pierre)
Easily sol in H_2O by boiling decomp into basic salt (Persoz A ch (3) 25 272)

100 pts H_2O dissolve 11.14 pts anhydrous salt at 25° (Trevor, Z phys Ch 7 470)
1 l H_2O dissolves 116.9 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)

See also $\text{CuSO}_4 \cdot \text{K}_2\text{SO}_4$

Min *Cyanochroite*

Cupric potassium zinc sulphate, $\text{CuSO}_4 \cdot 2\text{K}_2\text{SO}_4 \cdot \text{ZnSO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl)

Cupric rubidium sulphate, $\text{CuSO}_4 \cdot \text{Rb}_2\text{SO}_4 + 6\text{H}_2\text{O}$

Sol in H_2O (Tutton)
1 l H_2O dissolves 102.8 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)

Cupric sodium sulphate, basic, $\text{Na}_2\text{SO}_4 \cdot \text{Cu}(\text{OH})_2 \cdot 3\text{CuSO}_4 + 2\text{H}_2\text{O}$

Min *Natrochalcite*

Sl sol in H_2O , easily sol in acids (Palache and Warren, Am J Sci 1908, (4) 26 346)

Cupric sodium sulphate, $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Solubility of the pure double salt $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

t°	100 grams solution contain	
	CuSO_4 grams	Na_2SO_4 grams
17 7	14 34	13 34
19 5	14 54	12 90
23	14 36	12 76
30	14 07	12 37
40 15	13 73	12 26

(Koppel, Z phys Ch 1903, 42 8)

Solubility of the mixture of $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$ and CuSO_4

t°	100 g solution contain	
	CuSO_4 grams	Na_2SO_4 grams
17 7	14 99	13 48?
19 5	15 62	12 06
23	16 41	11 35
30	17 97	9 95
40 15	20 56	8 00

(Koppel)

Solubility of the mixture of $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ and Na_2SO_4

t°	100 g solution contain	
	CuSO_4 grams	Na_2SO_4 grams
18	13 53	13 844
19 5	11 847	15 116
20	11 339	15 697
23	8 185	18 723
25	6 284	21 198
26	5 507	22 44
28	3 746	24 963
28 3	3 661	
30	2 607	28 383
30 2	2 422	
32 2	1 465	32 442
33 9	1 475	32 299
35 3	1 471	32 072
37 2	1 494	31 96

(Koppel)

Solubility of $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ in presence of varying amounts of Na_2SO_4

t°	100 g solution contain	
	CuSO_4 grams	Na_2SO_4 grams
30	5 38	22 17
30	5 41	21 92
30 1	3 69	25 37
40 15	3 97	23 90
30	1 57	32 09

(Koppel)

Copper sulphate and sodium sulphate unite to form a double salt, $\text{CuSO}_4, \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$, which is stable in the presence of the solution above 16 7°. In the presence of copper sulphate the solubility of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is greater than that of the pure salt (Koppel)

Cupric thallous sulphate, $\text{CuSO}_4, \text{Ti}_2\text{SO}_4 + 6\text{H}_2\text{O}$

Decomp by recrystallising from H_2O (Willm, A ch (4) 5 55)

1 l H_2O dissolves 81 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)

Cupric zinc sulphate, $\text{CuSO}_4, 3\text{ZnSO}_4 + 28\text{H}_2\text{O}$

Efflorescent 100 pts H_2O dissolve 80 pts salt at 8° Sol in all proportions in boiling H_2O (Lefort)

$\text{CuSO}_4, 2\text{ZnSO}_4 + 21\text{H}_2\text{O}$ (v Hauer, Pogg 125 637)

$\text{CuSO}_4, \text{ZnSO}_4 + 12\text{H}_2\text{O}$ (Boisbaudran)

$2\text{CuSO}_4, 2\text{ZnSO}_4, \text{H}_2\text{SO}_4$ (Étard)

Cuprous sulphate ammonia, $\text{Cu}_2\text{SO}_4, 4\text{NH}_3$

Sol in $\text{NH}_4\text{OH} + \text{Aq}$, decomp by pure H_2O (Péchar, C R 1903, 136 504)

$+ \text{H}_2\text{O}$ Decomp by H_2O (Foerster and Blankenburg, B 1906, 39 4434)

Cupric sulphate ammonia, basic, $\text{CuSO}_4, 3\text{CuO}, 2\text{NH}_3 + 5\text{H}_2\text{O}$

Decomp by hot H_2O (Pickering, Chem Soc 43 336)

Cupric sulphate ammonia (Cuprammonium sulphate), $\text{CuSO}_4, \text{NH}_3$

Decomp by H_2O (Kane)

Decomp by H_2O giving a basic sulphate (Bouzat, C R 1902, 135 535)

$\text{CuSO}_4, 2\text{NH}_3, [\text{CuSO}_4, 2\text{NH}_3 + 3\text{H}_2\text{O}]$ (Mendelejeff, B 3 422)] Decomp by excess of H_2O into—

$\text{CuSO}_4, 4\text{NH}_3 + \text{H}_2\text{O}$ Sol in 1 5 pts H_2O , but decomp by much H_2O Insol in alcohol Insol in conc $\text{NH}_4\text{OH} + \text{Aq}$ (André, C R 100 1138)

Sol in small quantity of H_2O , decomp in dil solution (Bouzat)

100 g H_2O dissolve 44 56 g anhydrous comp at 25° (Pudschies, Dissert)

100 g H_2O dissolve 18 05 g at 21–22° (Horn and Taylor, Am Ch J 1904, 32 268)

$\text{CuSO}_4, 5\text{NH}_3$ Completely sol in H_2O (Rose, Pogg 20 150)

Sol in small amt of H_2O , decomp in dil solution Insol in liquid NH_3 (Bouzat, C R 1902, 135 535)

Cuprous sulphate carbon monoxide, $\text{Cu}_2\text{SO}_4, 2\text{CO} + \text{H}_2\text{O}$

Very unstable (Joannis, C R 1903, 136 615)

Cupric sulphate zinc oxide, $\text{CuSO}_4, 2\text{ZnO} + 21\text{H}_2\text{O}$

(Larsen, Ch Z Rept 1896, 20 317)
 $2\text{CuSO}_4, 3\text{ZnO} + 12\text{H}_2\text{O}$ (Mailhe, A ch 1902, (7) 27 169)

Didymium sulphate, basic, $\text{D}_2\text{O}_3, \text{SO}_3 = (\text{D}_2\text{O})_2\text{SO}_4$

Insol in cold or boiling H_2O (Marignac)
 Slowly sol in hot dil $\text{HCl} + \text{Aq}$ Easily sol in conc acids
 + $8\text{H}_2\text{O}$ Precipitate (Hermann)
 Composition is $2\text{D}_2\text{O}_3, 3\text{SO}_3 + 3\text{H}_2\text{O}$ or $\text{D}_2(\text{SO}_4)_3 + \text{D}_2\text{O}_3\text{H}_2$ (Frerichs and Smith)
 Composition is $5\text{D}_2\text{O}_3, 3\text{SO}_3 + x\text{H}_2\text{O}$ (Cleve, B 11 910)

Didymium sulphate, $\text{D}_2(\text{SO}_4)_3$

Anhydrous By saturating cold H_2O and warming the solution, the following results were obtained—100 pts H_2O dissolve at
 12° 18° 25° 38° 50°
 43 1 25 8 20 6 13 0 11 0 pts $\text{D}_2(\text{SO}_4)_3$
 + $6\text{H}_2\text{O}$ H_2O dissolves this salt very slowly, 100 pts H_2O dissolve 13 pts $\text{D}_2(\text{SO}_4)_3$ in 24 hours, and 16 4 pts in 2 days. If solution is evap in vacuo until $\text{D}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ separates out, 34 pts $\text{D}_2(\text{SO}_4)_3$ remain dissolved in 100 pts H_2O

+ $5\text{H}_2\text{O}$ (Cleve)

+ $8\text{H}_2\text{O}$ Solutions of this salt contain at
 19° 40° 50° 100°

11 7 8 8 6 5 1 6 pts $\text{D}_2(\text{SO}_4)_3$

(Marignac, A ch (3) 38 170)

+ $9\text{H}_2\text{O}$ (Zsch esche, J Pr 107 75)

Didymium potassium sulphate, $\text{K}_2\text{SO}_4, \text{D}_2(\text{SO}_4)_3 + 2\text{H}_2\text{O}$

Sol in 63 pts H_2O Insol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$ (Marignac)

$3\text{K}_2\text{SO}_4, \text{D}_2(\text{SO}_4)_3$ Sol in 83 pts H_2O at 18° Insol in cold, sl sol in boiling sat $\text{K}_2\text{SO}_4 + \text{Aq}$, 100 ccm of which retain 55 mg D_2O_3 in solution (Cleve)

$4\text{K}_2\text{SO}_4, \text{D}_2(\text{SO}_4)_3$ (Cleve)

$9\text{K}_2\text{SO}_4, 2\text{D}_2(\text{SO}_4)_3 + 3\text{H}_2\text{O}$ (Cleve)

Didymium sodium sulphate, $\text{D}_2(\text{SO}_4)_3, \text{Na}_2\text{SO}_4$, and $+2\text{H}_2\text{O}$

Sol in 200 pts H_2O (Marignac), and still less in sat $\text{Na}_2\text{SO}_4 + \text{Aq}$, 100 ccm of which dissolve only 70 mg D_2O_3 at ord temp (Cleve)

Didymium thallous sulphate, $(\text{D}_2\text{SO}_4)_3, 3\text{Tl}_2\text{SO}_4$

Ppt

$\text{D}_2(\text{SO}_4)_3, \text{Tl}_2\text{SO}_4 + 2\text{H}_2\text{O}$ Sol in H_2O (Zschiesche, J pr 107 98)

Erbium sulphate, $\text{Er}_2(\text{SO}_4)_3$

Anhydrous Easily and rapidly sol in H_2O 100 pts H_2O dissolve 43 pts anhydrous salt at 0°

+ $8\text{H}_2\text{O}$ Less sol in H_2O than anhydrous salt 100 pts H_2O dissolve 30 pts $\text{Er}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ (=23 pts $\text{Er}_2(\text{SO}_4)_3$) at about 20°, at 100°, 100 pts $\text{Er}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ remain dissolved Sat solution deposits crystals when heated to 55° (Hoglund)

100 g of sat solution of $\text{Er}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ at 25° in H_2O contains 11 94 g anhyd $\text{Er}_2(\text{SO}_4)_3$ (Wirth, Z anorg 1912, 76 174)

Solubility of $\text{Er}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ in H_2SO_4 at 25°

N = equiv g H_2SO_4 in 1 l of solvent

C = g oxide in 100 g of solution

C¹ = g anhyd salt in 100 g of solution

N	C	C ¹	N	C	C ¹
0	4 604	7 60	4 32	2 00	3 301
0 1	4 615	7 618	6 685	0 9115	1 505
1 1	3 64	6 00	9 68	0 4439	0 733
2 16	3 04	5 018	15 15	0 145	0 239

(Wirth, Z anorg 1912, 76 174)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Erbium potassium sulphate, $\text{Er}_2(\text{SO}_4)_3, 3\text{K}_2\text{SO}_4$

Slowly sol in H_2O (Hoglund)

Erbium sodium sulphate, $\text{Er}_2(\text{SO}_4)_3, 5\text{Na}_2\text{SO}_4 + 7\text{H}_2\text{O}$

Sol in H_2O (Cleve)

Europium sulphate, $\text{Eu}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$

Stable in the air (Urban and Lacombe, C R 1904, 138 628)

Gadolinium sulphate, $\text{Gd}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$

Solubility in H_2O

Temp	Pts of cl $(\text{SO}_4)_3$ in 100 pts H_2O
0°	3 98
9 3-10 6°	3 33
14 0°	2 80
25 0°	2 40
34 4°	2 26

(Benedicks, Z anorg 1899, 22 409-410)

100 g sat solution of $\text{Gd}(\text{SO}_4)_3 + 8\text{H}_2\text{O}$ at 25° in H_2O contain 2 981 g anhyd $\text{Gd}_2(\text{SO}_4)_3$ (Wirth, Z anorg 1912, 76 174)

Solubility in H_2SO_4 Solid phase, $\text{Gd}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$

N = equiv g H_2SO_4 in 1 l of solvent

C = g oxide in 100 g of solution

C_1 = g anhyd $\text{Gd}_2(\text{SO}_4)_3$ in 100 g of solution

N	C	C_1	N	C	C_1
0	1 793	2 981	2 16	1 789	2 974
0 1	1 98	3 291	6 175	0 528	0 8777
0 505	2 365	3 931	12 6	0 0521	0 0867
1 1	2 29	3 807			

(Wirth)

Sol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$

Gadolinum potassium sulphate, $\text{Gd}_2(\text{SO}_4)_3 \cdot \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

100 grams sat solution in $\text{K}_2\text{SO}_4 + \text{Aq}$ contains 0.87–0.77 grams Gd_2O_3 (Benedicks, Z anorg 1900, 22 410)

Gallium sulphate, $\text{Ga}_2(\text{SO}_4)_3$

Not deliquescent, but very sol in H_2O
Sol in 60% alcohol, insol in ether (Boisbaudran)

Aqueous solution decomp into basic salt by boiling, which redissolves, however, on cooling

Gallium potassium sulphate, $\text{Ga}_2\text{K}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

(Soret, Arch sc phys nat 1885, 14 96)

Gallium rubidium sulphate, $\text{Rb}_2\text{Ga}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

(Soret, Arch sc phys nat 1885, 14 96)

Glucinum sulphate, basic, $3\text{GdO} \cdot \text{SO}_3 + 4\text{H}_2\text{O}$

Sol in H_2O , but decomp by heating or dilution (Berzelius)

$2\text{GdO} \cdot \text{SO}_3 + 3\text{H}_2\text{O}$ Sol in H_2O

$9\text{GdO} \cdot \text{SO}_3 + 14\text{H}_2\text{O}$ (?) Precipitate Insol in H_2O (Berzelius)

According to Debray, this salt when carefully washed is GdO_2H_2

Glucinum sulphate, GISO_4

Anhydrous

Nearly insol in H_2O , but slowly attacked by cold, rapidly by hot H_2O , and is converted into $\text{GISO}_4 + 4\text{H}_2\text{O}$ before dissolving (Parrons, Z anorg 1904, 42 253)

Sp gr of $\text{GISO}_4 + \text{Aq}$ at 25°

Concentration of $\text{GISO}_4 + \text{Aq}$	Sp gr
1—normal	1 0451
$\frac{1}{2}$ —“	1 0229
$\frac{1}{4}$ —“	1 0114
$\frac{1}{16}$ —“	1 0027

(Wagner, Z phys Ch 1890, 5 35)

Solubility of GISO_4 in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{H}_2\text{SO}_4 + \text{Aq}$ % H_2SO_4	100 g of the solution con- tain g GISO_4	Solid phase
5 23	8 212	$\text{GISO}_4 + 6\text{H}_2\text{O}$
8 429	8 429	
9 61	7 944	
18 70	6 603	
34 00	5 631	
40 35	5 773	
45 51	6 628	$\text{GISO}_4 + 4\text{H}_2\text{O}$
50 63	5 438	
56 59	3 640	
63 24	2 244	
65 24	2 128	
73 64	2 185	

(Wirth, Z anorg 1913, 79 359)

See also under +2, 4, and $6\text{H}_2\text{O}$

Insol in liquid NH_3 (Gore, Am Ch J, 1898, 20 828)

+ H_2O (Levi-Malvano, Z anorg 1906, 48 447)

+ $2\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	G GISO_4 per 100 g	
	H_2O	Solution
80	84 76	45 87
91 4	97 77	49 42
105	118 4	54 21
119	149 3	59 88

(Levi-Malvano)

+ $4\text{H}_2\text{O}$ Very sol in H_2O

Sol in its own weight of H_2O at 14° , and in every proportion of boiling H_2O Less sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ than in water (Debray, A ch (3) 44 25)

Solubility in H_2O at t°

t	g GISO_4 per 100 g		t°	g GISO_4 per 100 g	
	H O	solution		H O	solution
30	43 78	30 45	95 4	90 63	47 55
40	46 74	31 85	107 2	115 3	53 58
68	61 95	38 27	111	128 3	56 19
85	76 30	43 28			

(Levi-Malvano)

Sl sol in dilute, insol in absolute alcohol
Can be completely pptd from $\text{GISO}_4 + \text{Aq}$ by $\text{HC}_2\text{H}_3\text{O}_2$ (Persoz)

Insol in acetone (Naumann, B 1904, 37 4329)

Solubility in H_2O at t°

t°	g GISO_4 per 100 g	
	H_2O	solution
31	52 23	34 32
50	60 67	37 77
72 2	74 94	42 85
77 4	81 87	45 01

(Levi-Malvano)

100 g of the aqueous solution contain at 25° , 8.212 g GISO_4 (Wirth, Z anorg 1913, 79 358)

Glucinum iron (ferrous) sulphate, $\text{GISO}_4 \cdot \text{FeSO}_4 + 17\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O (Klatzo, J B 1868 204)

$3\text{GISO}_4 \cdot \text{FeSO}_4 + 28\text{H}_2\text{O}$ Sol in H_2O (Klatzo)

Does not exist (Marignac, A ch (4) 30 45)

Glucinum nickel sulphate, $(\text{Gl}_2\text{Ni})\text{SO}_4 + 4\text{H}_2\text{O}$, or $7\text{H}_2\text{O}$

(Klatzo, J B 1868 205)

Does not exist (Atterberg, Sv V A F 1873, 4 81)

Glucinum potassium sulphate, $\text{GISO}_4 \cdot \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Sl sol in cold, slowly but more sol in hot H_2O (Debray)

$+3\text{H}_2\text{O}$ (Klatzo)

Glucinum potassium hydrogen sulphate, $\text{GH}_2(\text{SO}_4)_2 \cdot 2\text{K}_2\text{SO}_4 + 4\text{H}_2\text{O}$

Easily sol in H_2O Partly decomp by recrystallisation (Atterberg)

Glucinum sodium sulphate, $2\text{GISO}_4 \cdot 3\text{Na}_2\text{SO}_4 + 18\text{H}_2\text{O}$

Sol in H_2O (Atterberg)

Glucinum zinc sulphate, $2\text{GISO}_4 \cdot 3\text{ZnSO}_4 + 35\text{H}_2\text{O}$

Sol in H_2O (Klatzo, J B 1868 205)

Does not exist (Atterberg)

Gold (auroauric) sulphate, $\text{Au}_2(\text{SO}_4)_2$

Decomp by moist air, H_2O , glacial acetic acid, or $\text{HNO}_3 + \text{Aq}$ (142 sp gr) Insol in conc H_2SO_4 (Schottlander, A 217 375)

Gold (auric) sulphate, $\text{Au}_2\text{O}_3 \cdot 2\text{SO}_3 + \text{H}_2\text{O}$, or **Auryl hydrogen sulphate**, $(\text{AuO})\text{HSO}_4$

Deliquescent Decomp by H_2O Sol in $\text{HCl} + \text{Aq}$, not attacked by conc $\text{HNO}_3 + \text{Aq}$ Sol in 6 pts conc H_2SO_4 (Schottlander)

Gold (auric) potassium sulphate, $\text{Au}_2(\text{SO}_4)_3 \cdot \text{K}_2\text{SO}_4$

Not decomp immediately by cold H_2O (Schottlander)

Hydrazine mercuric sulphate hydrazine, $(\text{N}_2\text{H}_5)_2\text{SO}_4 \cdot 3\text{HgSO}_4 \cdot 2\text{N}_2\text{H}_4$

Insol in H_2O Sol in H_2O containing HCl (Ferratini, Gazz ch it 1912, 42 (1) 142)

Hydroxylamine uranyl sulphate,

$(\text{NH}_2\text{OH})_2 \cdot \text{H}_2\text{SO}_4 \cdot 2(\text{UO}_2)\text{SO}_4 + 5\text{H}_2\text{O}$

Extremely sol in H_2O from which it can be cryst (Rumbach, Dissert 1904)

Indium sulphate, $\text{In}_2(\text{SO}_4)_3$

Easily sol in H_2O

$+9\text{H}_2\text{O}$ Easily sol in H_2O

Indium hydrogen sulphate, $\text{InH}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Very deliquescent (Meyer)

Indium potassium sulphate, $\text{InK}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Sol in H_2O , but decomp by boiling (Rossler, J pr (2) 7 14)

$(\text{InO})_2\text{K}(\text{SO}_4)_2 + 3\text{H}_2\text{O}$ Insol in H_2O (Rossler)

Indium rubidium sulphate,

$\text{In}_2(\text{SO}_4)_3 \cdot \text{Rb}_2\text{SO}_4 + 24\text{H}_2\text{O}$

44 28 pts are sol in 100 pts H_2O at 15° (Chabrie, C R 1901, 132 473)

Melts in crystal H_2O at 42° (Locke, Am Ch J 1901, 26 183)

Indium sodium sulphate, $\text{InNa}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Sol in H_2O (Rossler, J pr (2) 7 14)

Iodine sulphate, $\text{I}_2(\text{SO}_4)_3$

Ppt Decomp by H_2O (Fichter, Z anorg 1915, 91 140)

Iodyl sulphate, $(\text{IO})_2(\text{SO}_4)_3$

Possible composition of Weber's (B 20 86) $\text{I}_2\text{O}_5 \cdot 3\text{SO}_3$

Iridium sulphate

Sol in H_2O or alcohol (Berzelius)
 $Ir_2(SO_4)_3$ Sol in H_2O (Rimbach, Z anorg 1907, 52 409)

Iridium potassium sulphate, $Ir_2(SO_4)_3 \cdot K_2SO_4 + 24H_2O$

Mpt 102–103°
 Easily sol in H_2O (Marino, Z anorg 1904, 42 220)
 $Ir_2(SO_4)_3 \cdot 3K_2SO_4$ Sol in H_2O or dil $H_2SO_4 + Aq$, nearly insol in sat $K_2SO_4 + Aq$ (Boisbaudran, C R 96 1406)

Iridium rubidium sulphate, $Ir_2(SO_4)_3 \cdot Rb_2$

Sol in cold, very sol in hot H_2O (Marino, Gazz ch it 1903, 32, (2) 511)
 Mpt 108–109° (Marino, Z anorg 1904, 42 219)

Iridium thallium sulphate, $Ir_2(SO_4)_3 \cdot Tl_2SO_4 + 24H_2O$

Very sol in H_2O (Marino, Z anorg 1904, 42 222)

Iron (ferrous) sulphate, $FeSO_4$

+ H_2O
 + $2H_2O$ Not more sol in H_2O than gypsum (Mitscherlich)
 + $3H_2O$ Sol in H_2O (Kane)
 + $4H_2O$ Separates from conc $FeSO_4 + Aq$ at 80°
 + $7H_2O$ Efflorescent at 33°

1 pt $FeSO_4 + 7H_2O$ dissolves in 16 pts cold and 0.3 pt boiling H_2O

1 pt $FeSO_4 + 7H_2O$ dissolves at

10° 15° 25° 33° 46° 60° 81° 90° 100°
 in 1 64 1 43 0 87 0 66 0 41 0 38 0 37 0 27 0 3 pts H_2O
 (Brandes and Linnhaber Br Arch 7 83)

When boiled with insufficient H_2O for solution a white hydrate is formed which separates out. Solubility increases up to 87°, and then diminishes owing to the above separation (Brandes Pogg 20 381)

Sol in 2 pts cold and 1 pt boiling H_2O (Fourcroy) sol in 2 pt cold H_2O at 18.75° (Abt) sol in 6 pts H_2O at moderate heat and 0.7 pt at 100° (Bergmann)

100 pts H_2O at 15° dissolve 45–50 pts (Urcs Diet)

100 pts H_2O dissolve pts $FeSO_4$ at t

t°	1 pt $FeSO_4$	t	1 pt $FeSO_4$	t	1 pt $FeSO_4$
0	15.8	21	27.4	45	42.9
10	19.9	30	32.6	55	47.0
12	21.3	37	36	70	56
20	25.0				

(Tobler A 95 198)

100 pts $FeSO_4 + Aq$ sat at 11–14° contain 17.02% $FeSO_4$ (v Hauer, J pr 103 114)

100 pts $FeSO_4 + Aq$ sat at 15° contain 37.2% $FeSO_4 + 7H_2O$, solution has sp gr 1.2232 (Schiff, A 118 362)

Solubility in 100 pts H_2O at t°

t°	Pts $FeSO_4$	t°	Pts $FeSO_4$	t°	Pts $FeSO_4$
0	7.9	34	37.1	67	65.1
1	8.7	35	38.0	68	65.0
2	9.5	36	38.9	69	64.9
3	10.4	37	39.8	70	64.8
4	11.2	38	40.7	71	64.7
5	12.0	39	41.7	72	64.5
6	12.9	40	42.6	73	64.4
7	13.7	41	43.5	74	64.2
8	14.5	42	44.4	75	64.0
9	15.3	43	45.3	76	63.7
10	16.2	44	46.2	77	63.4
11	17.0	45	47.1	78	63.1
12	17.9	46	48.1	79	62.7
13	18.7	47	49.0	80	62.3
14	19.5	48	50.0	81	61.9
15	20.4	49	51.0	82	61.5
16	21.2	50	51.9	83	61.0
17	22.1	51	52.9	84	60.4
18	23.0	52	53.8	85	59.8
19	23.8	53	54.8	86	59.2
20	24.7	54	55.7	87	58.5
21	25.6	55	56.7	88	57.7
22	26.4	56	57.7	89	57.0
23	27.3	57	58.7	90	56.2
24	28.1	58	59.7	91	55.3
25	29.0	59	60.7	92	54.3
26	29.9	60	61.7	93	53.3
27	30.8	61	62.7	94	52.2
28	31.7	62	63.7	95	51.0
29	32.6	63	64.8	96	49.6
30	33.5	63.5	65.4	97	48.0
31	34.4	64	65.4	98	46.3
32	35.3	65	65.3	99	44.5
33	36.2	66	65.2	100	42.6

(Mulder, Scheik Verhandel 1864 141)

If solubility $S =$ pts anhydrous $FeSO_4$ in 100 pts solution, $S = 13.5 + 0.3788t$ from -2° to $+65^\circ$, $S = 37.5$ constant from 65° to 98° , $S = 37.5 - 0.6685t$ from 98° to 156° . Practically insol at 156° (Étard, C R 106 740)

Sat $FeSO_4 + Aq$ contains at

—1°	+5°	24°	34°	52°
13.0	15.1	22.7	26.3	32.5% $FeSO_4$
60°	67°	77°	86°	94°
36.4	37.7	37.8	37.8	36.7% $FeSO_4$
102°	112°	130°	152°	
34.7	28.0	17.3	2.5% $FeSO_4$	

(Étard, A ch 1894, (7) 2 553)

100 g H_2O dissolve 26.69 g $FeSO_4$ at 25° (Stortenbecker, Z phys Ch 1900, 34 109)

Solubility of FeSO_4 in H_2O at t°
100 g H_2O dissolve g FeSO_4

t°	G FeSO_4	t°	G FeSO_4
0 00	15 65	52 00	50 20
10 00	20 51	54 03	52 07
15 25	23 86	60 01	54 95
20 13	26 56	65 00	55 59
25 02	29 60	68 02	52 31
30 03	32 93	70 04	56 08
35 07	36 87	77 00	45 90
40 05	40 20	80 41	43 58
45 18	44 32	85 02	40 46
50 21	48 60	90 13	37 27

$\text{FeSO}_4 + 7\text{H}_2\text{O}$ is stable from -1.82° to $+56.6^\circ$, $\text{FeSO}_4 + 4\text{H}_2\text{O}$ from 56.6° to 64.4° , $\text{FeSO}_4 + \text{H}_2\text{O}$ above this point

(Fraenckel, Z anorg 1907, 55 228)

$\text{FeSO}_4 + \text{Aq}$ sat at 30° contains 24.9 g FeSO_4 in 100 g of solution (Schreinemakers, Z phys Ch 1912, 71 110)

Sp gr of $\text{FeSO}_4 + \text{Aq}$ at 15°
% = % $\text{FeSO}_4 + 7\text{H}_2\text{O}$

%	Sp gr	%	Sp gr	%	Sp gr
1	1 005	15	1 082	28	1 161
2	1 011	16	1 088	29	1 168
3	1 016	17	1 094	30	1 174
4	1 021	18	1 100	31	1 180
5	1 027	19	1 106	32	1 187
6	1 032	20	1 112	33	1 193
7	1 037	21	1 118	34	1 200
8	1 043	22	1 125	35	1 206
9	1 048	23	1 131	36	1 213
10	1 054	24	1 137	37	1 219
11	1 059	25	1 143	38	1 226
12	1 065	26	1 149	39	1 232
13	1 071	27	1 155	40	1 239
14	1 077				

(Gerlach, Z anal 8 287)

Sp gr 16.6° of sat solution = 1.219 (Greenish and Smith, Pharm J 1903, 71 881)

Sat $\text{FeSO}_4 + \text{Aq}$ boils at 102.2° (Griffiths), and solution contains 64% FeSO_4 . Crust forms at 102.3° , highest temp observed, 104.8° (Gerlach, Z anal 26 426)

B-pt of $\text{FeSO}_4 + \text{Aq}$ containing pts FeSO_4 to 100 pts H_2O

B pt	Pts FeSO_4	B pt	Pts FeSO_4
100 5°	17 7	101 5°	50 4
101 0	34 4	101 6	53 2

(Gerlach, Z anal 26 433)

100 g of the sat solution contain 22.84 g FeSO_4 at 25° (Wirth, Z anorg 1913, 79 364)

Sol in hot $\text{HCl} + \text{Aq}$ (Kane)
Somewhat sol in conc H_2SO_4 (Bussy and Lecann)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{H}_2\text{SO}_4 + \text{Aq}$ Normality	100 g of the solution contain g FeSO_4	Solid phase
0	22 84	$\text{FeSO}_4 + 7\text{H}_2\text{O}$
2 25	19 03	
6 685	13 40	
10 2	10 30	
12 46	7 26	$\text{FeSO}_4 + \text{H}_2\text{O}$
15 15	4 015	
19 84	0 1522	

(Wirth, Z anorg 1913, 79 364)

More sol in water containing NO than in pure H_2O (Gay, Bull Soc (2) 44 175)

Completely pptd from $\text{FeSO}_4 + \text{Aq}$ by glacial $\text{HC}_2\text{H}_3\text{O}_2$ (Persoz)

Solubility in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ See under $(\text{NH}_4)_2\text{SO}_4$

Solubility in $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 30°

Composition of the solution		Solid phase
% by wt FeSO_4	% by wt Li_2SO_4	
24 87	0	$\text{FeSO}_4, 7\text{H}_2\text{O}$
22 45	4 00	"
21 15	5 58	"
18 79	11 16	"
16 51	15 81	"
16 18	16 52	$\text{FeSO}_4, 7\text{H}_2\text{O} + \text{I}_2\text{SO}_4, \text{H}_2\text{O}$
16 04	16 49	$\text{I}_2\text{SO}_4, \text{H}_2\text{O}$
15 39	16 80	
12 68	18 31	"
5 32	22 15	"
3 74	23 15	"
0	25 1	"

(Schreinemakers, Z phys Ch 1910, 71 110)

Solubility of $\text{FeSO}_4, \text{H}_2\text{O} + \text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$, in 100 g H_2O at t°

t	Grams FeSO_4	Grams Na_2SO_4
0	18 06	6 13
15 5	25 05	15 97

(Koppel, Z phys Ch 1905, 52 405)

See also under $\text{FeNa}_2(\text{SO}_4)_2$

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

Insol in liquid CO_2 (Buchner, Z phys Ch 1906, 54 674)

100 pts sat solution of FeSO_4 in 40% alcohol contains 0.3% FeSO_4 (Schiff)

Insol in alcohol of 0.905 sp gr or less (Anthon, J pr 14 125)

Alcohol and H_2SO_4 precipitate FeSO_4 from $\text{FeSO}_4 + \text{Aq}$, also glacial acetic acid

Anhydrous FeSO_4 is insol in acetone (Krug and M'Elroy, 1893)

Insol in acetone (Fidmann, C C 1899, II 1014)

100 g sat solution in glycol contain 60 g FeSO_4 at ord temp (de Connick)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

Iron (ferrous) sulphate, acid, 2FeO , 3SO_3 , $2\text{H}_2\text{O}$

This salt exists in contact with solutions containing $\text{SO}_3 + 1.637 \text{ H}_2\text{O}$ to about $\text{SO}_3 + 2.186 \text{ H}_2\text{O}$ (Kenrick, J phys Chem 1908, 12 704)

FeO , $2\text{SO}_3 + \text{H}_2\text{O}$ This compd exists with solutions containing $\text{SO}_3 + 1.342 \text{ H}_2\text{O}$ to (about) $\text{SO}_3 + 1.595 \text{ H}_2\text{O}$ (Kenrick)

FeO , $4\text{SO}_3 + 3\text{H}_2\text{O}$ This compd is stable with solutions containing from $\text{SO}_3 + 1.122 \text{ H}_2\text{O}$ to (about) $\text{SO}_3 + 1.342 \text{ H}_2\text{O}$ Rapidly sol in H_2O with ppt of $\text{FeSO}_4 + \text{H}_2\text{O}$ (Kenrick)

Min *Melanterite*

Iron (ferric) sulphate, basic, $10\text{Fe}_2\text{O}_3$, $\text{SO}_3 + \text{H}_2\text{O}$

(Athanasesco, C R 103 27)

$6\text{Fe}_2\text{O}_3$, $\text{SO}_3 + 10\text{H}_2\text{O}$ Insol in H_2O SI sol in warm $\text{HCl} + \text{Aq}$ (Scheerer, Pogg 45 188)

$4\text{Fe}_2\text{O}_3$, $\text{SO}_3 + 11\text{H}_2\text{O}$ (Anthon, Repert 81 237)

$3\text{Fe}_2\text{O}_3$, $\text{SO}_3 + 4\text{H}_2\text{O}$ Insol in H_2O Rather easily sol. in acids (Scheerer, Pogg 44 453, Meister, B 8 771)

$2\text{Fe}_2\text{O}_3$, $\text{O}_3 + 6\text{H}_2\text{O}$ When pptd from cold solutions, is sol in $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$, but insol therein when pptd from hot solutions (Maus)

Only basic sulphate which is a true chemical compound (Pickering, Chem Soc 37 807)

Min *Glockerite* Insol in H_2O Sol in conc H_2SO_4

+ $7\text{H}_2\text{O}$ (Meister)

+ $8\text{H}_2\text{O}$ (Muhlhauser)

+ $15\text{H}_2\text{O}$ Min *Pissophanite*

Fe_2O_3 , $\text{SO}_3 = (\text{FeO})_2\text{SO}_4 + 3\text{H}_2\text{O}$ Insol in H_2O (Soubeiran, A ch 44 329)

$3\text{Fe}_2\text{O}_3$, $4\text{SO}_3 + 9\text{H}_2\text{O}$ (Athanasesco)

$2\text{Fe}_2\text{O}_3$, $3\text{SO}_3 + 8\text{H}_2\text{O}$ Insol in H_2O (Wittstein)

+ $18\text{H}_2\text{O}$ Min *Fibroferrite* SI sol in cold, more easily in hot H_2O

Fe_2O_3 , $2\text{SO}_3 + 10\text{H}_2\text{O}$ Min *Styphicite* + $15\text{H}_2\text{O}$ Sol in H_2O , decomp by heat or evaporation (Muck, J pr 99 103)

$2\text{Fe}_2\text{O}_3$, $5\text{SO}_3 + 13\text{H}_2\text{O}$ Min *Copiapite*

$\text{Fe}_2\text{S}_2\text{O}_8 + 18\text{H}_2\text{O} = 2\text{Fe}_2\text{O}_3$, $5\text{SO}_3 + 18\text{H}_2\text{O}$

a-Copiapite This salt is in equilibrium at 25°

with solutions in which the molecular ratio Fe_2O_3 , SO_3 lies between 1.2889 and 1.2614 (Wirth, Z anorg 1914, 87 37)

(OH) $\text{Fe}_2(\text{SO}_4)_4 + 13\text{H}_2\text{O}$ *β -Copiapite* This salt is in equilibrium at 25° with solutions in which the molecular ratio Fe_2O_3 , SO_3 lies between 1.3472 and 1.2889 (Wirth, Z anorg 1914, 87 37)

According to Pickering (Chem Soc 37 807), all basic ferric sulphates are mixtures excepting $2\text{Fe}_2\text{O}_3$, SO_3

Iron (ferric) sulphate, $\text{Fe}_2(\text{SO}_4)_3$

Anhydrous Slowly deliquescent Nearly insol in H_2O , and $\text{HCl} + \text{Aq}$ Insol in conc H_2SO_4 Very rapidly sol in $\text{FeSO}_4 + \text{Aq}$, even when very dil (Barreswil, C R 20 1366)

Sp gr of $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$ According to F = Franz at 17.5° (J pr (2) 5 280), G = Gerlach at 15° (Z anal 28 494), H = Hager at 18° (Z anal 27 280)

	5	10	15	20 % $\text{Fe}_2(\text{SO}_4)_3$
F	1.0426	1.0854	1.1324	1.1826
G		1.096		1.205
H	1.046	1.097	1.151	1.208
	25	30	35	40 % $\text{Fe}_2(\text{SO}_4)_3$
F	1.2426	1.3090	1.3782	1.4506
G		1.331		1.478
H	1.271	1.337	1.411	1.490
	45	50	55	60 % $\text{Fe}_2(\text{SO}_4)_3$
F	1.5298	1.6148	1.7050	1.8006
G		1.650		

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{H}_2\text{SO}_4 + \text{Aq}$ Normality	100 g. of the solution contain g. $\text{Fe}(\text{SO}_4)_3$
2.25	25.02
6.685	14.58
19.84	0.05

(Wirth, Z anorg 1913, 79 364)

Solubility in $\text{Al}(\text{SO}_4)_3 + \text{Aq}$ at 25°

100 g. of the solution contain	
G $\text{Al}_2(\text{SO}_4)_3$	C $\text{Fe}_2(\text{SO}_4)_3$
	44.97
2.312	12.44
5.200	35.53
6.626	35.82
8.819	34.02
10.03	32.42
*10.23	31.90
10.70	31.91

*Solution sat with respect to both salts (Wirth and Bakke, Z anorg 1914, 87 48)
(See also under $\text{Al}_2(\text{SO}_4)_3$)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 828)

Completely pptd from $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$ by $\text{HC}_2\text{H}_3\text{O}_2$ Sol to large extent in alcohol

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Insol in acetone
 $+2\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O Conc $\text{Fe}_2(\text{SO}_4)_3 + \text{Aq}$ may be boiled without decomp, but dil solutions are decomp on heating A solution containing 1 pt salt to 100 pts H_2O becomes turbid at 76° , 1 pt to 200 pts, at 56° , 1 pt to 400 pts, at 47° , 1 pt to 800 pts, at 40° , 1 pt to 1000 pts, at 38° , 1 pt to 10,000 pts, at 14° (Scheerer)

$+9\text{H}_2\text{O}$ Min *Coquimbite*
 81.43 pts are sol in 18.57 pts H_2O (Wirth, Z anorg 1914, 87 23)

This salt is stable at 25° only in contact with solutions in which the molecular ratio $\text{Fe}_2\text{O}_3 : \text{SO}_3$ lies between 1.3472 and 1.6699 (Wirth, Z anorg 1914, 87 35)

$+10\text{H}_2\text{O}$ Slowly sol in H_2O (Oudemans, R t c 3 331)

Iron (ferroferic) sulphate, 6FeSO_4 , $\text{Fe}_2(\text{SO}_4)_3 + 60\text{H}_2\text{O}$

Sol in all proportions in H_2O (Poumarède, C R 18 854)

$3\text{FeSO}_4, 2\text{Fe}_2(\text{SO}_4)_3 + 12\text{H}_2\text{O}$ Decomp by H_2O Easily sol in dil $\text{HCl} + \text{Aq}$ Insol in alcohol (Abich, 1842)

$\text{FeSO}_4, \text{Fe}_2(\text{SO}_4)_3 + 12\text{H}_2\text{O}$ Min *Voltaire*
 Difficultly sol in H_2O

$\text{FeO}, \text{Fe}_2\text{O}_3, 6\text{SO}_3 + 15\text{H}_2\text{O}$ Deliquescent (Lefort, J Pharm (4) 10 87)

Iron (ferrous) pyrosulphate, FeS_2O_7

Deliquescent Decomp by H_2O (Bolas, Chem Soc (2) 12 212)

Iron (ferric) hydrogen sulphate, $\text{Fe}_2(\text{SO}_4)_3, \text{H}_2\text{SO}_4 + 8\text{H}_2\text{O}$

This salt is in equilibrium at 25° only with solutions where the molecular ratio $\text{Fe}_2\text{O}_3 : \text{SO}_3$ is more acid than 1.6699 (Wirth and Bakke, Z anorg 1914, 87 34)

Sat solution of $\text{Fe}_2(\text{SO}_4)_3, \text{H}_2\text{SO}_4 + 8\text{H}_2\text{O}$ in abs alcohol at 25° contains 8 g $\text{Fe}_2\text{O}_3 + 17.18$ g SO_3 per 100 g sat solution (Wirth and Bakke)

Decomp by H_2O (Recoura, C R 1903, 137 118)

In contact with solutions containing 25% to 28% SO_3 at 25° , the stable solid is $\text{Fe}_2\text{O}_3, 3\text{SO}_3 + 10\text{H}_2\text{O}$ In contact with solutions containing more than 28%, the stable solid is $\text{Fe}_2\text{O}_3, 4\text{SO}_3 + 10\text{H}_2\text{O}$ (Cameron and Robin son, J phys Chem 1907, 11 650)

Iron (ferroferic) hydrogen sulphate, $\text{Fe}_2(\text{SO}_4)_3, \text{FeSO}_4, 2\text{H}_2\text{SO}_4$

Insol in H_2O , but slowly decomp thereby Sol in H_2SO_4 (Étard, C R 87 602)

Iron (ferrous) hydrazine sulphate, $\text{FeH}_2(\text{SO}_4)_2, 2\text{N}_2\text{H}_4$

1 pt is sol in 325 pts H_2O at 12° (Curtius, J pr 1894, (2) 50 331)

Iron (ferrous) magnesium sulphate, $\text{FeSO}_4, \text{MgSO}_4 + 4\text{H}_2\text{O}$

Sol in H_2O (Schiff)

Iron (ferric) magnesium sulphate, $\text{Fe}_2(\text{SO}_4)_3, \text{MgSO}_4 + 24\text{H}_2\text{O}$

(Bastick)

Iron (ferrous) magnesium potassium sulphate, $2\text{K}_2\text{SO}_4, \text{FeSO}_4, \text{MgSO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)

Iron (ferric) manganous hydrogen sulphate, $\text{Fe}_2(\text{SO}_4)_3, 2\text{MnSO}_4, \text{H}_2\text{SO}_4$

Insol in cold H_2O (Étard)

$\text{Fe}_2(\text{SO}_4)_3, 2\text{MnSO}_4, 3\text{H}_2\text{SO}_4$ Sol in H_2O (Étard, C R 86 1399)

Iron (ferric) manganic sulphate, $\text{Fe}_2(\text{SO}_4)_3, \text{Mn}_2(\text{SO}_4)_3$

Insol in cold H_2O , decomp by hot H_2O and $\text{HCl} + \text{Aq}$ (Étard)

Iron (ferrous) manganous potassium sulphate, $\text{FeSO}_4, \text{MnSO}_4, 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)

Iron (ferrous) nickel sulphate, $2\text{FeSO}_4, 2\text{NiSO}_4, \text{H}_2\text{SO}_4$

(Étard, C R 87 602)

Iron (ferric) nickel sulphate, $\text{Fe}_2(\text{SO}_4)_3, \text{NiSO}_4, 2\text{H}_2\text{SO}_4$

Insol in H_2O , but gradually decomp thereby (Étard, C R 87 602)

Iron (ferrous) nickel potassium sulphate, $\text{FeSO}_4, \text{NiSO}_4, 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)

Iron (ferrous) potassium sulphate, $\text{FeSO}_4, \text{K}_2\text{SO}_4$

$+2\text{H}_2\text{O}$ (Marignac, Ann Min (5) 9 19)

Solubility in H_2O at t°

t	% $\text{FeK}_2(\text{SO}_4)$	t	% $10\text{K}_2(\text{SO}_4)$
0.5	22.79	80	42.34
17.2	31.98	90	42.73
40.1	40.86	95	41.01
60	42.63		

(Küster and Thiel, Z anorg 1899, 21 116)

+4H₂OSolubility in H₂O at t°

t°	% FeK ₂ (SO ₄) ₂	t°	% FeK ₂ (SO ₄)
0 5	22 94	80	40 46
17 2	26 79	90	43 82
40 1	32 41	95	44 11
60	35 68		

(Kuster and Thiel)

+6H₂O 100 pts H₂O dissolve at t°

0° 10° 14 5° 16° 25°
 19 6 24 5 29 1 30 9 36 5 pts anhydrous salt,

35° 40° 55° 65° 70°
 41 45 56 59 3 64 2 pts anhydrous salt
 (Tobler, A 95 193)

Solubility in H₂O at t°

t°	% FeK ₂ (SO ₄) ₂	t°	% FeK ₂ (SO ₄) ₂
0 5	18 36	60	42 93
17 2	25 16	80	45 29
40 1	36 72		

(Kuster and Thiel)

Iron (ferric) potassium sulphate, basic,
 4Fe₂O₃, K₂O, 7SO₃+9H₂O=4(Fe₂O₃,
 2H₂O, SO₃), K₂SO₄+7H₂O

Insol in boiling H₂O Sl sol in HCl+Ag,
 more readily in aqua regia (Rammelsberg)
 3Fe₂O₃, K₂O, 4SO₃+6H₂O=K(FeO)₃(SO₄)₂
 +3H₂O Min *Jarosite*
 Fe₂O₃, H₂O, 2SO₃, 2K₂SO₄+5H₂O Sol in
 6 pts cold H₂O Solution soon decomposes
 (Maus, Pogg 11 78)

Sol in 12 5 pts H₂O at 10° (Anthon, Rept
 76 361)

Formula is given as 3Fe₂O₃, 5K₂O, 12SO₃+
 18H₂O by Marignac

3Fe₂O₃, 6SO₃, 2K₂SO₄+22H₂O Sol when
 moist in H₂O Solution soon decomposes
 Insol in alcohol (Soubeiran, A ch 44 329)

3Fe₂O₃, 7SO₃, 5K₂SO₄+12H₂O, and
 +17H₂O (Scheerer, Pogg 87 81)

2Fe₂O₃, 5SO₃, 3K₂SO₄+9H₂O (S)
 3Fe₂O₃, 8SO₃, 4K₂SO₄+20H₂O and 24H₂O
 (S)

**Iron (ferric) potassium sulphate, K₂SO₄,
 2Fe₂(SO₄)₃**

Insol in H₂O, but is gradually decomp
 thereby (Grimm and Ramdohr, A 98 127)
 +2H₂O Nearly insol in H₂O (Weinland,
 Z anorg 1913, 84 364)

K₂Fe₂(SO₄)₄+24H₂O *Iron alum*
 Sol in 5 pts H₂O at 12 5° (Anthon)

Aqueous solution is decomp by heating
 Insol in alcohol

Sp gr of aqueous solution According to

G=Gerlach, at 15° (Z anal 28 496), F=
 Franz, at 17 5° (J pr (2) 5 288), containing
 5 10 15% K₂Fe₂(SO₄)₄+24H₂O,
 F 1 0268 1 0466 1 0672
 G 1 025 1 0507 1 0773

20 25 30% K₂Fe₂(SO₄)₄+24H₂O,
 F 1 0894 1 1136 1 1422
 G 1 1050 1 1340 1 1645

35 % K₂Fe₂(SO₄)₄+24H₂O
 G 1 1967

Melts in crystal H₂O at 28° (Locke, Am
 Ch J 1901, 26 183)

Fe₂(SO₄)₃, 3K₂SO₄ Insol in H₂O, but
 slowly decomp thereby (Etard, C R 84
 1089)

Iron (ferric) potassium sulphate sulphite
See Sulphate sulphate, ferric potassium

**Iron (ferrous) potassium zinc sulphate, FeSO₄,
 2K₂SO₄, ZnSO₄+12H₂O**
 Sol in H₂O

**Iron (ferrous) rubidium sulphate, FeSO₄,
 Rb₂SO₄+6H₂O**

Sol in H₂O (Tutton, Chem Soc 63 337)
 1 l H₂O dissolves 242 g anhydrous salt
 at 25° (Locke, Am Ch J 1902, 27 459)

**Iron (ferric) rubidium sulphate, Rb₂Fe₂
 (SO₄)₂+24H₂O**

Solubility in H₂O

Temp	G per litre	Gram mols of anhydrous salt per litre
25	97 4	0 294
30	202 4	0 617
35	Basic salt formed	

(Locke, Am Ch J 1901, 26 180)

**Iron (ferrous) sodium sulphate, FeSO₄,
 Na₂SO₄+4H₂O**

Sol in H₂O (Marignac, Ann Min (5) 9
 25)

Solubility of FeNa₂(SO₄)₂+4H₂O in 100 g
 H₂O at t°

t	Grams FeSO ₄	Grams Na ₂ SO ₄
21 8	24 34	22 51
24 92	23 62	22 04
34 95	23 91	21 83
40	24 01	22 62

(Koppel, Z phys Ch 1905, 52 406)

Solubility of $\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{FeSO}_4$
7H₂O in 100 g H₂O at t°

t°	grams FeSO ₄	grams Na ₂ SO ₄	t°	grams FeSO ₄	grams Na ₂ SO ₄
18 8	26 63	20 28	31°	33 99	14 41
23	28 82	18 40	35°	35 66	13 85
27	30 95	16 68	40°	39 98	11 92

(Koppel)

Solubility of $\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
10H₂O in 100 g H₂O at t°

t°	grams FeSO ₄	grams Na ₂ SO ₄	t°	grams FeSO ₄	grams Na ₂ SO ₄
18 8	27 23	22 16	28°	11 28	35 94
23	20 31	26 48	31°	6 95	44 75

(Koppel)

Solubility of $\text{FeNa}_2(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
(anhydrous) in 100 g H₂O at t°

t°	grams FeSO ₄	grams Na ₂ SO ₄
35	6 16	46 58
40	6 27	46 99

(Koppel)

See also under FeSO₄

Iron (ferric) sodium sulphate, basic, 2Na₂O,
Fe₂O₃, 4SO₃+7H₂O

Only sl sol in H₂O with decomp (Skrabal,
Z anorg 1904, 38 319)

+8H₂O Min *Urusate* Insol in H₂O,
easily sol in HCl+Aq

3Na₂O, Fe₂O₃, 6SO₃+6H₂O Sol in H₂O
with decomp (Skrabal)

4Fe₂O₃, Na₂O, 5SO₃+9H₂O
Insol in H₂O, difficultly sol in HCl+Aq

(Scheerer, Pogg 45 190)

Iron (ferric) sodium sulphate, [Fe(SO₄)₃]Na₃
+3H₂O

Ppt Nearly insol in H₂O (Weinland, Z
anorg 1913, 84 365)

Iron (ferrous) thallium sulphate, FeSO₄,
Tl₂SO₄+6H₂O

Easily decomp by solution in H₂O (Willm,
A ch (4) 5 56)

Iron (ferric) thallium sulphate, Tl₂Fe₂(SO₄)₄
+24H₂O

Not efflorescent Very easily sol in H₂O

361.5 g anhydrous, or 646 g hydrated
salt are sol in 1 l H₂O at 25° or 0.799 mol

of the anhydrous salt is sol in 1 l H₂O at 25°
Melts in crystal H₂O at 37° (Locke, Am
Ch J 1901, 26 175)

Iron (ferrous) zinc sulphate, FeSO₄, ZnSO₃+14H₂O

2FeSO₄, 2ZnSO₄, H₂SO₄ (Étard, C R 87
602)

Iron (ferric) zinc sulphate, Fe₂(SO₄)₃, ZnSO₄
+24H₂O

(Bastick)

Iron (ferrous) sulphate nitric oxide, FeSO₄, NO

The solubility of NO in FeSO₄+Aq is
diminished by the presence of H₂SO₄, HCl,
phosphoric acid and by the presence of cer-
tain salts (Manchot, A 1910, 372 157)

Fe(NO)SO₄, FeSO₄+13H₂O Decomp in
the air Sol in water (Manchot)

Lanthanum sulphate, basic, 2La₂O₃, 3SO₃+3H₂O

Precipitate (Ferriehs and Smith)
Formula is 3La₂O₃, SO₃+xH₂O (Cleve,
B 11 910)

Lanthanum sulphate, La₂(SO₄)₃

Anhydrous Much less sol in warm than
in cold H₂O 1 pt is sol in less than 6 pts
H₂O, if added in small portions thereto at
2-3°, and the temperature not allowed to rise
to 13°, but if heated to 30°, La₂(SO₄)₃+9H₂O
separates out until the solution is solid
(Mosander)

100 pts H₂O dissolve 2.208 pts La₂(SO₄)₃
at 16.5°, 2.130 pts at 18°, 1.641 pts at 34°

See also under +9H₂O

The solubility of La₂(SO₄)₃ in H₂O is dim-
inished by the presence of (NH₄)₂SO₄, K₂SO₄
or Na₂SO₄ (Barre, C R 1910, 151 871)

Solubility in (NH₄)₂SO₄+Aq at 18°

Pts per 100 pts H ₂ O		Solid phase
(NH ₄) ₂ SO ₄	La ₂ (SO ₄) ₃	
0 00	2 130	La ₂ (SO ₄) ₃ +9H ₂ O
4 011	0 393	La ₂ (SO ₄) ₃ , (NH ₄) ₂ SO ₄ +2H ₂ O
8 727	0 279	"
18 241	0 253	"
27 887	0 476	"
36 112	0 277	"
47 486	0 137	2La ₂ (SO ₄) ₃ , 5(NH ₄) ₂ SO ₄
53 823	0 067	La ₂ (SO ₄) ₃ , 5(NH ₄) ₂ SO ₄
65 286	0 017	"
73 782	0 0033	"

(Barre)

Solubility in K₂SO₄+Aq at 16.5°

Pts per 100 pts H ₂ O		Solid phase
K ₂ SO ₄	La ₂ (SO ₄) ₃	
0 00	2 198	La ₂ (SO ₄) ₃ +9H ₂ O
0 247	0 727	La ₂ (SO ₄) ₃ , K ₂ SO ₄ +2H ₂ O
0 496	0 269	"
0 846	0 185	"
1 029	0 054	La ₂ (SO ₄) ₃ , 5K ₂ SO ₄
1 516	0 022	"

(Barre)

Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 18°

Pts per 100 pts H_2O		Solid phase
Na_2SO_4	$\text{La}_2(\text{SO}_4)_3$	
0 00	2 130	$\text{La}_2(\text{SO}_4)_3 + 9\text{H}_2\text{O}$
0 395	0 997	$\text{La}_2(\text{SO}_4)_3, \text{Na}_2\text{SO}_4$
0 689	0 353	"
0 774	0 299	"
1 136	0 129	"
2 480	0 044	"
3 802	0 019	"
5 548	0 016	"

(Barre)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Insol in acetone (Naumann, B 1904, 37 4329)

+ $9\text{H}_2\text{O}$ Sol in 42.5 pts H_2O , calculated as anhydrous salt, at 23° , and 115 pts H_2O at 100° (Mosander)

Solubility in H_2O

100 pts H_2O dissolve pts	$\text{La}_2(\text{SO}_4)_3$ at t°
t°	Pts $\text{La}_2(\text{SO}_4)_3$
0	3 02
14	2 60
30	1 90
50	1 49
75	0 94
100	0 68

(Muthmann and Rohg, B 1898, 31 1723)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

Normality H_2SO_4	In 100 g of the liquid are dissolved		Solid phase
	g oxide	g sulphate	
0	1 43	2 483	$\text{La}_2(\text{SO}_4)_3 + 9\text{H}_2\text{O}$
0 505	1 69	2 934	"
1 10	1 796	3 118	"
2 16	1 818	3 156	"
3 39	1 42	2 465	"
4 321	1 11	1 927	"
6 685	0 5309	0 9217	"
9 68	0 2659	0 4617	"
12 60	0 2136	0 3709	"
15 15	0 177	0 3073	"

(Wirth, Z anorg 1912, 76 189)

Lanthanum hydrogen sulphate, $\text{La}(\text{SO}_4)\text{H}_3$
(Brauner, Z anorg 1904, 38 330)

Lanthanum potassium sulphate, $\text{La}_2(\text{SO}_4)_3, \text{K}_2\text{SO}_4 + 2\text{H}_2\text{O}$

$\text{La}_2(\text{SO}_4)_3, 5\text{K}_2\text{SO}_4$ (Barre, C R 1910, 151 872)

$\text{La}_2(\text{SO}_4)_3, 3\text{K}_2\text{SO}_4$ Sl sol in H_2O Insol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$ (Cleve)

$\text{La}_2(\text{SO}_4)_3, 4\text{K}_2\text{SO}_4$ As above (Cleve)
 $2\text{La}_2(\text{SO}_4)_3, 9\text{K}_2\text{SO}_4$ As above (Cleve)

Lanthanum rubidium sulphate,

$\text{La}_2(\text{SO}_4)_3, \text{Rb}_2\text{SO}_4$

(Baskerville, J Am Chem Soc 1904, 26 67)

+ $2\text{H}_2\text{O}$ (Baskerville)

$3\text{La}_2(\text{SO}_4)_3, 2\text{Rb}_2\text{SO}_4$ (Baskerville)

Lanthanum sodium sulphate, $\text{La}_2(\text{SO}_4)_3,$

$\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

Sl sol in H_2O (Cleve) (Barre, C R 1910, 151 872)

Lead sulphate, basic, $2\text{PbO}, \text{SO}_3$

Not completely insol in H_2O Decomp by acids, even dil HCl , with formation of PbSO_4 (Barfoed, 1869)

0.050 millimole calc as Pb is sol in 1 l H_2O at 18° (Pleissner, C C 1907, II 1056)

$5\text{PbO}, 3\text{SO}_3$ (Frankland, Proc Roy Soc 46 364)

$\text{Pb}_3\text{O}_4, 2\text{SO}_3$ (Frankland)

$3\text{PbO}, \text{PbSO}_4 + \text{H}_2\text{O}$ Ppt (Stromholm, Z anorg 1904, 38, 442)

$\text{Pb}_4(\text{SO}_4)(\text{OH})$ 0.106 millimole calc as Pb is sol in 1 liter H_2O at 18° (Pleissner, C C 1907 II, 1056)

Lead sulphate, PbSO_4

Sol in 22,816 pts H_2O at 11° (Fresenius, A 59 125)

Sol in 31,569 pts H_2O at 15° (Rodwell, C N 11 50)

Sol in 13,000 pts H_2O (Kremers, Pogg 85 247)

Calculated from electrical conductivity of $\text{PbSO}_4 + \text{Aq}$, 1 l H_2O dissolves 46 mg PbSO_4 at 18° (Kohlrausch and Rose, Z phys Ch 12 241)

4.23×10^{-2} gr are dissolved in 1 liter of sat solution at 20° , 4.41×10^{-2} at 25° (Bottger, Z phys Ch 1903, 46 604)

1 l H_2O dissolves 41 mg PbSO_4 at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

0.126 millimole Pb is sol in 1 liter H_2O at 18° (Pleissner, C C 1907, II 1056)

40 mg are dissolved in 1 l of sat solution at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

0.0824 g PbSO_4 is sol in 1000 cc H_2O at 18° and also at 100° . The fact that PbSO_4 dissolves in H_2O is ascribed to hydrolysis, and in support of this it is shown that the solubility of hydrated oxide of lead, $\text{PbO}, \text{H}_2\text{O}$, in dil H_2SO_4 is the same as the solubility of PbSO_4 in H_2O (Sehnal, C R 1909, 148 1395)

1 l H_2O dissolves 26 mg at 18° , 30 mg at 25° , 38 mg at 37° (Beck and Stegmüller, Arb K Gesund Amt 1910, 34 447)

Solubility in H_2O at t°
(Millimols per l)

t°	$PbSO_4$
18	0 126
25	0 144
37	0 183

(Beck and Stegmüller, Arb K Gesund Amt 1910, **34** 446)

Sol in hot conc $HCl + Aq$ (Fresenius)

Solubility of $PbSO_4$ in $HCl + Aq$

Sp gr of $HCl + Aq$	% HCl in $HCl + Aq$	Pts $HCl + Aq$ for 1 pt $PbSO_4$
1 0519	10 602	681 89
1 0800	16 310	281 73
1 1070	22 010	105 65
1 1359	27 525	47 30
1 1570	31 602	35 03

(Rodwell, Chem Soc **15** 59)

Solubility of $PbSO_4$ in $HCl + Aq$ at t°
(Millimols per l)

t°	0 1N	0 2N	0 3N	0 4N
18	0 126	1 72	2 67	3 63
25	0 144	2 07	3 14	4 29
37	0 183	2 63	4 06	5 43

(Beck and Stegmüller, Arb K Gesund Amt 1910, **34** 446)

Above measurements in $HCl + Aq$ show solubility directly proportional to the hydrogen ions (Beck and Stegmüller)

Sol in $HNO_3 + Aq$, and more sol in hot or conc than in cold or dil $HNO_3 + Aq$

Sol in 172 pts $HNO_3 + Aq$ of 1 144 sp gr at 12.5° (Bischof)

Pptd from HNO_3 solution by dil $H_2SO_4 + Aq$ and not by H_2O (Bischof, **1827**)

Solubility of $PbSO_4$ in $HNO_3 + Aq$

Sp gr of $HNO_3 + Aq$	% HNO_3 in $HNO_3 + Aq$	Pts $HNO_3 + Aq$ for 1 pt $PbSO_4$
1 079	11 55	303 10
1 123	17 50	173 75
1 250	34 00	127 48
1 420	60 00	10282 78

(Rodwell, Chem Soc **15** 59)

Solubility in HNO_3 at 18°
(Millimols per l)

HNO_3	$PbSO_4$
0 1N	0 506
0 2N	0 844
0 3N	1 13
0 4N	1 44

(Beck and Stegmüller)

Sol in 36,504 pts dil $H_2SO_4 + Aq$ (Fresenius) See also under solubility in alcohol
Sl sol in conc H_2SO_4 , from which it is partially pptd by H_2O or completely by alcohol (Fresenius)

100 pts conc H_2SO_4 dissolve 6 pts $PbSO_4$ (Schultz, Pogg **133** 137)

Conc H_2SO_4 dissolves 0 005 pt $PbSO_4$ (Ure)

100 pts H_2SO_4 dissolve 0 13 pt $PbSO_4$, and 100 pts fuming H_2SO_4 dissolve 4 19 pts (Struve, Z anal **9** 31)

More sol in commercial H_2SO_4 than in the more conc acid (Hayes)

100 pts $H_2SO_4 + Aq$ of 1 841 sp gr dissolve 0 039 pts $PbSO_4$, of 1 793 sp gr dissolve 0 011 pt $PbSO_4$, of 1 540 sp gr dissolve 0 003 pt $PbSO_4$

Presence of SO_2 does not increase the solubility, HNO_3 increases the solubility somewhat, *e*, 100 pts $H_2SO_4 + Aq$ of 1 841 sp gr with 5 pts HNO_3 of 1 352 sp gr dissolve 0 044 pt $PbSO_4$, 100 pts H_2SO_4 of 1 749 sp gr with 5 pts HNO_3 of 1 352 sp gr dissolve 0 014 pt $PbSO_4$, 100 pts H_2SO_4 of 1 512 sp gr with 5 pts HNO_3 of 1 352 sp gr dissolve only a trace

Nitrous oxides do not increase the action (Kolb, Dingl **209** 268)

Solubility in dil $H_2SO_4 + Aq$ at 18°
(G per l)

H_2SO_4	$PbSO_4$	H_2SO_4	$PbSO_4$
0	0 0382	0 0245	0 0194
0 0049	0 0333	0 0490	0 0130
0 0098	0 0306	0 4904	0 0052

(Pleissner, Arb K Gesund Amt 1907, **26** 384)

A trace of H_2SO_4 has a considerable effect in reducing the solubility of $PbSO_4$ in H_2O (Sehnal, C R 1909, **148** 1395)

Solubility in dil $H_2SO_4 + Aq$ at 20°
(G per l)

H_2SO_4	$PbSO_4$	H_2SO_4	$PbSO_4$
0	0 082	0 0980	0 013
0 0098	0 051	0 4900	0 006
0 0196	0 025	0 9800	0

(Sehnal)

Pptd from solution in H_2SO_4 by HCl (Bolley, A **91** 113)

Not more insol in dil $HC_2H_3O_2 + Aq$ than in H_2O (Bischof)

Solubility in other acids is prevented by great excess of H_2SO_4 (Wackenroder)

Sol in warm $NH_4OH + Aq$, separating on cooling Completely sol in warm KOH or $NaOH + Aq$

Decomp by boiling with K_2CO_3 , Na_2CO_3 , and $(NH_4)_2CO_3 + Aq$

Sol in NH_4 salts + Aq, but repptd by $H_2SO_4 + Aq$ (Fresenius, A 59 125)

The best solvents of the NH_4 salts are the nitrate, citrate, and tartrate, the two latter should be strongly alkaline with $NH_4OH + Aq$ (Wackenroder)

Sol in $NH_4Cl + Aq$ at 12.5–25°

Sl decomp by $NaCl + Aq$ (Bley)

1 l sat $NaCl + Aq$ dissolves 0.66 g $PbSO_4$ (Bequerel)

Sol in 100 pts cold conc $NaCl + Aq$, and $PbCl_2$ is deposited after a few hours (Field)

Solubility of $PbSO_4$ in $NaCl + Aq$ at 18° (Millimols per l)

NaCl	$PbSO_4$
0.1N	0.546
0.2N	0.904
0.3N	1.28
0.4N	1.68

(Beck and Stegmüller, Arb. K. Gesund. Amt 1910, 34 446)

Sol in $Fe_2Cl_6 + Aq$ (Fresenius, Z anal 19 419)

Sol in $Na_2S_2O_3 + Aq$ (Lowe)

Sol in $(NH_4)_2SO_4 + Aq$ (Rose)

Solubility of $PbSO_4 + PbSO_4$, K_2SO_4 in H_2O

t°	K_2SO_4		Solid phase
	cc in 100 cc of solution	Mol in 100 cc of solution	
0	0.195	0.0112	K_2SO_4 , $PbSO_4 + PbSO_4$
22	0.396	0.0227	"

(Bronsted, Z. phys. Ch. 1911, 77 316)

Sol in 47 pts $NH_4C_2H_3O_2 + Aq$ (1.036 sp gr), and 969 pts $NH_4NO_3 + Aq$ (1.269 sp gr), from the solution in $NH_4C_2H_3O_2$ it is pptd by H_2SO_4 or K_2SO_4 , from solution in NH_4NO_3 by K_2SO_4 but not by H_2SO_4 (Bischof)

Sol in acetates of NH_4 , Na , K , Ca , Al , and Mg (Müller)

Solubility in $NH_4C_2H_3O_2 + Aq$. Excess of $PbSO_4$ was boiled with solution of $NH_4C_2H_3O_2 + Aq$ of varying conc

$NH_4C_2H_3O_2$ in 100 cc	$PbSO_4$ contained in 1 cc solution		
	Hot	Cooled	Cooled 24 hrs
25	0.356		
30	0.418		0.224
32	0.494	0.451	0.242
35	0.513	0.452	
37	0.529		0.238
40	0.539		0.263
45	0.555	0.488	

(Dunnington and Long, Am. Ch. J. 1899, 22 218)

Solubility in ammonium acetate + Aq at 25°

$NH_4C_2H_3O_2$ Millimol per l	Solubility of $PbSO_4$	
	Millimols per l	g per l
0.0	0.134	0.041
103.5	2.10	0.636
207.1	4.55	1.38
414.1	10.10	3.06

(Noyes and Whitecomb, J. Am. Chem. Soc. 1905, 27 756)

Solubility in $KC_2H_3O_2 + Aq$ at 25°

Solid phase, $PbSO_4 + PbK_2(SO_4)_2$

Composition of the solutions

$KC_2H_3O_2$	$Pb(C_2H_3O_2)_2$	$KC_2H_3O_2$	$Pb(C_2H_3O_2)_2$
4.33	2.54	26.58	9.83
9.03	3.55	28.82	11.40
17.81	5.43	28.93	19.41
22.07	5.95		

(Fox, Chem. Soc. 1909, 95 887)

100 pts H_2O containing a drop of $HC_2H_3O_2$ and 2.05 pts $NaC_2H_3O_2$ dissolve 0.054 pt $PbSO_4$, containing 8.2 pts $NaC_2H_3O_2$ dissolve 0.900 pt $PbSO_4$, containing 41.0 pts $NaC_2H_3O_2$ dissolve 11.200 pts $PbSO_4$ (Dibbitts, Z. anal. 1874, 13 139)

Solubility in $NaC_2H_3O_2 + Aq$ at 25°

Composition of the solutions

% Na acetate	% Pb acetate	% Na_2SO_4	% H_2O
6.69	0.78	0.34	92.19
11.76	2.73	1.26	84.25
16.90	5.70	2.49	74.91
19.92	8.24	3.60	65.24
21.51	10.75	4.68	63.10
6.95	0.81	0.35	91.90

The proportion of sulphate in solution in each case corresponded with the amount of Pb present, but was calculated to sodium sulphate, since $Na_2SO_4 + 10H_2O$ cryst. from the solutions on cooling. The solid phase in these solutions was $PbSO_4$.

(Fox, Chem. Soc. 1909, 95 887)

Sol in $Mn(C_2H_3O_2)_2$, $Zn(C_2H_3O_2)_2$, $Ni(C_2H_3O_2)_2$, and $Cu(C_2H_3O_2)_2$ but not in $Hg(C_2H_3O_2)_2$ or $Ag_2C_2H_3O_2 + Aq$

Solubility in $KC_2H_3O_2 + Aq$ is not less than that in $NH_4C_2H_3O_2 + Aq$ (Dibbitts, Z. anal. 13 137)

Insol in $Pb(C_2H_3O_2)_2 + Aq$ (Smith)

Sol in basic lead acetate + Aq, but not in neutral $Pb(C_2H_3O_2)_2 + Aq$ (Stummer, Z. anal. 23 67)

12.2 pts $Ca(C_2H_3O_2)_2$ in very dil solution dissolve 1 pt $PbSO_4$ (Stadel, Z. anal. 2 180)

Sol in $Al(C_2H_3O_2)_3 + Aq$ (Lennsen)

Very easily and abundantly sol in NH_4 tartrate + Aq (Wohler, A 34 235)

Even when native, easily sol in NH_4 citrate + Aq (Smith)

Insol in alcohol (18%) and H_2SO_4 when NH_4 acetate, K tartrate, or NH_4 succinate are present. Insol in alcohol (18%) and H_2SO_4 or $(\text{NH}_4)_2\text{SO}_4$ when Na acetate, Na or NH_4 oxalate are present. Sol in NH_4 dicitrate and K tricitrate in presence of H_2SO_4 , in NH_4 succinate and NH_4 acetate in presence of $(\text{NH}_4)_2\text{SO}_4$, and in NH_4 citrate in presence of H_2SO_4 or $(\text{NH}_4)_2\text{SO}_4$ (Storer, C N 21 17)

Alcohol (59%) alone, or with ethylsulphuric acid or sugar, does not dissolve Pb by 3 months action (Storer)

Insol in acetone (Naumann, B 1904, 37 4329), methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314)

Min *Anglesite* Sol in cold citric acid + Aq (Bolton, C N 37 14)

Lead hydrogen sulphate, PbSO_4 , $\text{H}_2\text{SO}_4 + \text{H}_2\text{O}$

Decomp by H_2O

Lead pyrosulphate, $\text{Pb S}_2\text{O}_7$

Decomp by H_2O (Schultz)

Lead potassium sulphate, PbSO_4 , K_2SO_4

When PbSO_4 is added to potassium acetate + Aq at 25° a double salt, $\text{PbK}_2(\text{SO}_4)_2$ is formed. This salt is insol in the solution which contains only potassium acetate and lead acetate (Fox, Chem Soc 1909, 95 882)

Decomp by H_2O Stable only in solutions of K_2SO_4 , containing at least 0.56% K_2SO_4 at 7° , 0.62% at 17° , 1.09% at 50° , 1.37% at 75° , 1.69% at 100° (Barre, C R 1909, 149 294)

Lead sulphate chloride, PbSO_4 , $2\text{PbCl}_2 + \text{H}_2\text{O}$

Insol in H_2O or $\text{NaCl} + \text{Aq}$ (Becquerel, C R 20 1523)

Lead sulphate fluoride, PbSO_4 , 2PbF_2

Not decomp by H_2SO_4 (Lonyet, C R 24 434)

Lithium sulphate, Li_2SO_4

More sol in cold than in hot H_2O

100 pts H_2O dissolve 34.6 pts Li_2SO_4 at 18° (Wittstein)

100 pts H_2O dissolve pts Li_2SO_4 at t°

t°	Pts Li_2SO_4	t°	Pts Li_2SO_4	t°	Pts Li_2SO_4
0	35.34	45	32.38	100	29.24
20	34.36	65	30.3		

(Kremers, Pogg 95 468)

Sat $\text{Li}_2\text{SO}_4 + \text{Aq}$ contains at

-20°	-16°	-15°	-12°
18.4	22.5	22.6	24.4 % Li_2SO_4

-4°	$+15^\circ$	$+90^\circ$
25.7	25.3	23.9 % Li_2SO_4

(Étard, A ch 1894, (7) 2 547)

Sat solution boils at 105° (Kremers)

Sp gr of $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 19.5° containing			
6.5	7.4	12.5	15.3 % Li_2SO_4
1.05	1.06	1.098	1.118

22.6	24.4	29.4 % Li_2SO_4
1.167	1.178	1.208

(Kremers, Pogg 114 47)

Sp gr of $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 15° containing 5% $\text{Li}_2\text{SO}_4 = 1.0430$, 10% $\text{Li}_2\text{SO}_4 = 1.0877$ (Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 25°

Concentration of $\text{Li}_2\text{SO}_4 + \text{Aq}$	Sp gr
1—normal	1.0453
$1/2$ —	1.0234
$1/4$ —	1.0115
$1/8$ —	1.0057

(Wagner, Z phys Ch 1890, 5 38)

Sp gr of $\text{Li}_2\text{SO}_4 + \text{Aq}$

$\frac{1}{2}\text{Li}_2\text{SO}_4$ g in 1000 g of solution	Sp gr 16/16°
0	1.000000
2.9198	1.002589
16.0461	1.014093

(Dijken, Z phys Ch 1897, 24 109)

Sp gr of $\text{Li}_2\text{SO}_4 + \text{Aq}$ at 20°

Normality of $\text{Li}_2\text{SO}_4 + \text{Aq}$	% Li_2SO_4	Sp gr
2.60	23.48	1.2330
1.96	18.53	1.1650
1.708	16.41	1.1449
1.320	13.01	1.1133
0.747	7.71	1.0678

(Forchheimer, Z phys Ch 1900, 34 24)

Insol in SO_3 (Weber, B 17 2497)

10 ccm of sat Li_2SO_4 in absolute H_2SO_4 contain approx 2.719 g Li_2SO_4 (Bergius, Z phys Ch 1910, 72 355)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 30°

Composition of the solution		Solid phase
% by wt H_2SO_4	% by wt Li_2SO_4	
5 05	22 74	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$
12 23	20 45	"
15 37	19 11	"
16 60	19 10	"
32 70	13 37	"
36 90	11 90	"
42 98	10 57	"
48 00	10 20	"
52 72	11 44	"
54 54	12 92	"
55 08	13 69	Li_2SO_4
56 30	13 87	"
61 46	17 10	"
61 82	17 00	"
62 14	17 97	"
62 49	18 89	$\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$
65 70	16 55	"
69 40	13 75	"
77 30	11 31	"
78 23	11 64	"
81 20	13 28	"
81 70	13 85	"
82 30	15 50	"
83 43	15 65	"

(Van Dorp, Z phys Ch 1910, **73** 289)

Solution in H_2SO_4 contains 17.2% Li_2SO_4 at 30° (Van Dorp, Z phys Ch 1913, **86** 112)

Solubility of $\text{Li}_2\text{SO}_4 + \text{Th}(\text{SO}_4)_2$ in H_2O at 25°

Solid phase, $\text{Th}(\text{SO}_4)_2$
G in 100 g H_2O

Li_2SO_4	$\text{Th}(\text{SO}_4)_2$	Li_2SO_4	$\text{Th}(\text{SO}_4)_2$
0 0	1 722	11 13	11 05
2 57	4 13	13 18	12 54
4 93	6 20	16 12	14 52
6 98	7 95	20 49	16 92
9 23	9 68	16 92	18 87

(Barre, Bull Soc 1912, (4) **11** 647)

Easily sol (Kastner), sl sol (Berzelus) in alcohol

Solubility of Li_2SO_4 in alcohol + Aq at 30° Solid phase $\text{Li}_2\text{SO}_4 \cdot \text{H}_2\text{O}$

G per 100 g sat solution			
$\text{C}_2\text{H}_5\text{OH}$	Li_2SO_4	$\text{C}_2\text{H}_5\text{OH}$	Li_2SO_4
0	25 1	47 28	3 04
11 75	16 16	58 59	1 22
21 19	11 52	69 39	0 4
29 40	8 17	80 74	0
33 31	6 66	94 11	0

(Schreinemakers and van Dorp, Chem Weekbl 1906, **3** 557)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann B 1904, **37** 3601), acetone (Eidmann, C C, **1899**, II 1014, Naumann, B 1904, **37** 4329) + H_2O Very sl efflorescent (Rammelsberg)

Aq solution contains 25.1% Li_2SO_4 at 30° (Schreinemakers, C C **1910**, I 1801), 24.3 g at 50° (Schreinemakers and Cocheret, Chem Weekbl 1905, **2** 771)

Lithium hydrogen sulphate, LiHSO_4

Decomp by H_2O
Cryst from H_2SO_4 (Gmelin)
 $\text{LiH}_3(\text{SO}_4)_2$ Cryst from H_2SO_4 (Schultz, Pogg **133** 137)
 $\text{Li}_2\text{SO}_4 \cdot 7\text{H}_2\text{SO}_4$ (Bergius, Z phys Ch 1910, **72** 355)

Lithium potassium sulphate, $\text{Li}_2\text{SO}_4 \cdot \text{K}_2\text{SO}_4$

This is the only compd of Li_2SO_4 and K_2SO_4 which exists below 100° (Spielrein, C R 1913, **157** 48)

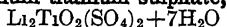
$\text{K}_4\text{Li}_2(\text{SO}_4)_3$ (Knobloch) Has the formula $\text{K}_2\text{Li}_3(\text{SO}_4)_5 + 8\text{H}_2\text{O}$, according to Rammelsberg

Lithium sodium sulphate, $\text{Na}_3\text{Li}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$

$\text{Na}_4\text{Li}_2(\text{SO}_4)_3 + 9\text{H}_2\text{O}$
 $\text{Na Li}_3(\text{SO}_4)_5 + 5\text{H}_2\text{O}$ (Rammelsberg)
Do not exist (Troost)
 Li_2SO_4 , $\text{Na}_2\text{SO}_4 + 5.5\text{H}_2\text{O}$ Exists from 0° – 16°
 $+ 3\text{H}_2\text{O}$ Exists from 32° – 100°
 Li_2SO_4 , $3\text{Na}_2\text{SO}_4 + 12\text{H}_2\text{O}$ Exists from 16° – 24°
 $4\text{Li}_2\text{SO}_4$, $\text{Na}_2\text{SO}_4 + 5\text{H}_2\text{O}$ Exists from 24° – 32°

(Spielrein, C R 1913, **157** 47)Lithium thallic sulphate, $\text{LiTl}(\text{SO}_4)_2 + 3\text{H}_2\text{O}$

(Meyer and Goldschmidt, C C **1903**, I 495)

Lithium titanium sulphate,

Less hygroscopic than K compound
(Mazzuchelli and Pontanelli, C C 1909, II 420)

Lithium uranyl sulphate, $\text{Li}_2\text{SO}_4, \text{UO}_2\text{SO}_4 + 4\text{H}_2\text{O}$

(de Coninck, Chem Soc 1905, 88 (2) 530)

Magnesium sulphate basic,

Sl sol in cold or hot H_2O

Sol in $\text{HCl} + \text{Aq}$ (Thugutt, Z anorg 1892, 2 150)

Magnesium sulphate, MgSO_4

Anhydrous Very slowly sol in H_2O , sol in hot conc H_2SO_4 , less in HCl , and $\text{HNO}_3 + \text{Aq}$

$+ \text{H}_2\text{O}$ Min *Kieserite* Easily sol in warm, but slowly dissolved by cold H_2O

100 g sat solution at 83° contain 40.2 g MgSO_4 (Geiger, Dissert 1904)

$+ 6\text{H}_2\text{O}$, and $+ 7\text{H}_2\text{O}$ The latter exists in two modifications, (a) hexagonal, and (b) the ordinary or rhombic salt

$\text{MgSO}_4 + \text{Aq}$, which on cooling or keeping in closed vessels has deposited $\text{MgSO}_4 + 6\text{H}_2\text{O}$, always contains for 100 pts H_2O at

0°	10°	20°
40.75	42.23	43.87

pts MgSO_4

If only hexagonal $\text{MgSO}_4 + 7\text{H}_2\text{O}$ has been deposited, then the mother liquor contains for 100 pts H_2O at

0°	10°	20°
34.67	38.71	42.84

pts MgSO_4

Solutions prepared from rhombic $\text{MgSO}_4 + 7\text{H}_2\text{O}$ contain for 100 pts H_2O at

0°	10°	20°
26.0	30.9	35.6

pts MgSO_4

(Lowel)

These results may be given in tabular form as follows

Temp	A sat aqueous solution of $\text{MgSO}_4 + 7\text{H}_2\text{O}$ (b) contains for 100 pts H_2O	
	Anhydrous MgSO_4	$7\text{H}_2\text{O}$ (b) salt
0°	26.0	73.31
10°	30.9	93.75
20°	35.6	116.54

Temp	A sat aqueous solution of $\text{MgSO}_4 + 7\text{H}_2\text{O}$ (a) contains for 100 pts H_2O	
	Anhydrous MgSO_4	$7\text{H}_2\text{O}$ (a) salt
0°	34.67	111.74
10°	38.71	133.67
20°	42.84	159.61

Temp	A sat aqueous solution of $\text{MgSO}_4 + 6\text{H}_2\text{O}$ contains for 100 pts H_2O		
	Anhydrous MgSO_4	$6\text{H}_2\text{O}$ salt	$7\text{H}_2\text{O}$ salt
0°	40.75	122.22	146.02
10°	42.32	129.44	155.53
20°	43.87	137.72	167.97

It is seen from table that at the same temp the $6\text{H}_2\text{O}$ salt is more sol than the $7\text{H}_2\text{O}$ (b) salt, and the latter is more sol than $7\text{H}_2\text{O}$ (a) salt, that the solubility of the $7\text{H}_2\text{O}$ (b) salt increases rapidly from 0° to 20° , that the $6\text{H}_2\text{O}$ salt is not much more sol at 20° than at 0° , and at 20° the $7\text{H}_2\text{O}$ (b) salt is nearly as sol as the $6\text{H}_2\text{O}$ salt (Lowel, A ch (3) 43 405)

100 pts H_2O at t° dissolve pts MgSO_4 G L = according to Gay Lussac (A ch (2) 11 311) T = according to Tobler (A 95 198)

t°	G L	T	t°	G I	I
0	25.8	24.7	50	49.7	52.8
10	30.5		55		
20	37.0		60	55.9	
25		37.1	70	60.4	
30	39.8		80	66.1	
40	45.2		90	70.3	

100 pts H_2O at 105.5° dissolve 133.2 pts MgSO_4 (Griffiths)

$\text{MgSO}_4 + \text{Aq}$ sat at 17.5° has sp gr = 1.2932 and contains 55.57 % $\text{MgSO}_4 + 7\text{H}_2\text{O}$ or 100 pts H_2O dissolve 12.06 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ or 60 pts MgSO_4 at 17.5° (Karsten)

100 pts H_2O at 0° dissolve 53.8 pts and 12.1 pts at ord temp (Otto Graham)

Sol in 2 pts cold and 0.5 pt boiling H_2O (four croy)

The aqueous solution contains for 100 pts H_2O 92.217 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at 1° (Michel and Kraft)

1 pt $\text{MgSO}_4 + 7\text{H}_2\text{O}$ is sol in 0.933 pt H_2O at 1° (Cerlach) in 0.92 pt H_2O at 23° (Schiff)

100 pts H_2O dissolve 25.067 pts MgSO_4 at 0° (Pfaff A 99 224)

100 pts H_2O dissolve pts MgSO_4 at t°

t	pts MgSO_4
0	26.57
17.9	33.28
24.1	35.98

(Diacon, J B 1886 62)

100 pts $\text{MgSO}_4 + \text{Aq}$ sat at $18-20^\circ$ contain 25.67-26.38 pts MgSO_4 (v Hauer, J pr 98 137)

Solubility in 100 pts H_2O at t° , using
 $MgSO_4 + 7H_2O$

t°	Pts $MgSO_4$	t°	Pts $MgSO_4$	t°	Pts $MgSO_4$
0	26.9	37	44.2	74	61.4
1	27.4	38	44.7	75	61.9
2	27.9	39	45.2	76	62.3
3	28.3	40	45.6	77	62.8
4	28.8	41	46.1	78	63.2
5	29.3	42	46.5	79	63.7
6	29.7	43	47.0	80	64.2
7	30.2	44	47.5	81	64.6
8	30.6	45	48.0	82	65.1
9	31.1	46	48.4	83	65.6
10	31.5	47	48.9	84	66.0
11	32.0	48	49.3	85	66.5
12	32.4	49	49.8	86	67.0
13	32.9	50	50.3	87	67.5
14	33.4	51	50.7	88	68.0
15	33.8	52	51.2	89	68.4
16	34.3	53	51.7	90	68.9
17	34.7	54	52.2	91	69.4
18	35.2	55	52.7	92	69.9
19	35.7	56	53.2	93	70.4
20	36.2	57	53.6	94	70.9
21	36.7	58	54.1	95	71.4
22	37.1	59	54.5	96	71.9
23	37.6	60	55.0	97	72.4
24	38.0	61	55.5	98	72.8
25	38.5	62	55.9	99	73.3
26	39.0	63	56.4	100	73.8
27	39.5	64	56.8	101	74.3
28	39.9	65	57.3	102	74.8
29	40.4	66	57.7	103	75.2
30	40.9	67	58.2	104	75.7
31	41.4	68	58.6	105	76.2
32	41.8	69	59.1	106	76.7
33	42.3	70	59.6	107	77.2
34	42.8	71	60.0	108	77.7
35	43.3	72	60.5	108.4	77.9
36	43.7	73	61.0		

(Mulder, calculated from his own and other observations, *Scheik Verhandel* **1864** 52)

100 pts H_2O dissolve 72.4 pts $MgSO_4 + 7H_2O$ at 0° , 178 pts at 40° , and 212.6 pts at 49° (Tilden, *Chem Soc* **45** 409)

Supersat $MgSO_4 + Aq$ is brought to crystallization by addition of crystal of $MgSO_4 + 7H_2O$, or an isomorphous substance as $ZnSO_4 + 7H_2O$, $NiSO_4 + 7H_2O$, $FeSO_4 + 7H_2O$, or $CoSO_4 + 7H_2O$ (Thomson, *Chem Soc* **35** 199)

Sat $MgSO_4 + Aq$ contains at

2° 7° 23° 67° 81°
20.9 22.5 26.0 35.6 38.6 % $MgSO_4$,

94° 130° 145° 164° 188°
41.5 45.3 38.0 29.3 20.4 % $MgSO_4$

Readily forms supersat solutions

(Étard, *Ann* 1894, (7) **2** 551)

M-pt of $MgSO_4 + 7H_2O$ is 70° (Tilden, *Chem Soc* **45** 409)

$MgSO_4 + Aq$ with sp gr 1.50 contains 44.4 % $MgSO_4$, sp gr 1.42 39% sp gr 1.30 30% $MgSO_4$ (Dalton)

Sp gr of $MgSO_4 + Aq$ sat at $15^\circ = 1.275$ (Michel and Krafft), at $8^\circ = 1.267$ (Anthon), at $18.75^\circ = 1.293$ (Karsten)

Sp gr of $MgSO_4 + Aq$ at 15°

% $MgSO_4$	Sp gr	% $MgSO_4$	Sp gr
5	1.054	30	1.326
10	1.108	35	1.384
15	1.161	40	1.446
20	1.215	45	1.511
25	1.269	50	1.580

(Calculated from Anthon by Schiff, *A* **107** 303)

Sp gr of $MgSO_4 + Aq$ at 23°

% $MgSO_4 + 7H_2O$	Sp gr	% $MgSO_4 + 7H_2O$	Sp gr
1	1.0048	28	1.1426
2	1.0096	29	1.1481
3	1.0144	30	1.1536
4	1.0193	31	1.1592
5	1.0242	32	1.1648
6	1.0290	33	1.1704
7	1.0339	34	1.1760
8	1.0387	35	1.1817
9	1.0437	36	1.1875
10	1.0487	37	1.1933
11	1.0537	38	1.1991
12	1.0587	39	1.2049
13	1.0637	40	1.2108
14	1.0688	41	1.2168
15	1.07.9	42	1.2228
16	1.0790	43	1.2288
17	1.0842	44	1.2349
18	1.0894	45	1.2410
19	1.0945	46	1.2472
20	1.0997	47	1.2534
21	1.1050	48	1.2596
22	1.1103	49	1.2659
23	1.1156	50	1.2722
24	1.1209	51	1.2786
25	1.1261	52	1.2850
26	1.1316	53	1.2915
27	1.1371	54	1.2980

(Schiff, *A* **113** 185)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 12°

% $\text{MgSO}_4 + 7\text{H}_2\text{O}$	Sp gr	% $\text{MgSO}_4 + 7\text{H}_2\text{O}$	Sp gr
1	1 0046	21	1 1071
2	1 0096	22	1 1125
3	1 0146	23	1 1179
4	1 0196	24	1 1234
5	1 0246	25	1 1289
6	1 0296	26	1 1344
7	1 0346	27	1 1399
8	1 0396	28	1 1454
9	1 0446	29	1 1510
10	1 0497	30	1 1566
11	1 0548	31	1 1622
12	1 0599	32	1 1679
13	1 0650	33	1 1736
14	1 0702	24	1 1793
15	1 0754	35	1 1850
16	1 0807	36	1 1908
17	1 0859	37	1 1965
18	1 0911	38	1 2023
19	1 0964	39	1 2082
20	1 1018	40	1 2140

(Oudemans, Z anal 7 419)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 15°

% MgSO_4	Sp gr	% MgSO_4	Sp gr
1	1 01031	14	1 15083
2	1 02062	15	1 16222
3	1 03092	16	1 17420
4	1 04123	17	1 18618
5	1 05154	18	1 19816
6	1 06229	19	1 21014
7	1 07304	20	1 22212
8	1 08379	21	1 23465
9	1 09454	22	1 24718
10	1 10529	23	1 25972
11	1 11668	24	1 27225
12	1 12806	25	1 28478
13	1 13945	25 248	1 28802

(Gerlach, Z anal 8 287)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 23.5° a=no of $\frac{1}{2}$ mols in grms dissolved in 1000 g H_2O , b=sp gr if a is $\text{MgSO}_4 + 7\text{H}_2\text{O}$, $\frac{1}{2}$ mol wt =123, c=sp gr if a is MgSO_4 , $\frac{1}{2}$ mol wt =60

a	b	c	a	b	c
1	1 056	1 059	5	1 203	1 260
2	1 103	1 114	6	1 229	
3	1 141	1 166	7	1 252	
4	1 174	1 214	8	1 273	

(Favre and Valson, C R 79 968)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 15°

% MgSO_4	Sp gr	% MgSO_4	Sp gr
5	1 0510	20	1 2200
10	1 1052	25	1 2861
15	1 1602		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 0° S=pts MgSO_4 in 100 pts solution

S	Sp gr	S	Sp gr
13 800	1 1586	7 4046	1 0826
11 7458	1 1329	5 0447	1 0557
9 6218	1 1072	2 5907	1 0284

(Charpy, A ch (6) 29 26)

Sat $\text{MgSO}_4 + \text{Aq}$ boils at 105° (Griffiths), 108.4° (Mulder)

Crust forms at 103.5° (solution containing 48.4 pts MgSO_4 to 100 pts H_2O), highest temp observed, 105° (Gerlach, Z anal 26 426)

B-pt of $\text{MgSO}_4 + \text{Aq}$ containing pts MgSO_4 to 100 pts H_2O

B pt	Pts MgSO_4	B pt	Pts MgSO_4	B pt	Pts MgSO_4
100 5°	8 8	102 5°	34 7	104 5°	51 3
101 0	16 7	103 0	39 5	105	54 6
101 5	23 5	103 5	43 8	108	75(?)
102 0	29 5	104 0	47 7		

(Gerlach, Z anal 26 432)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 9.5°

Mass of salt per unit mass of solution	Density of solution (g per cc)
0 00191	1 00170
0 00380	1 00346
0 00569	1 00526
0 00758	1 00705
0 01132	1 01060

(McGregor, C N 1887, 55 6)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{MgSO}_4 + \text{Aq}$	Sp gr
1—normal	1 0584
$\frac{1}{2}$ —“	1 0297
$\frac{1}{5}$ —“	1 0152
$\frac{1}{8}$ —“	1 0076

(Wagner, Z phys Ch 1890, 5 38)

Sp gr at $16\frac{1}{4}^\circ$ of $\text{MgSO}_4 + \text{Aq}$ containing 11.0222% $\text{MgSO}_4 = 1.11471$, containing 8.343% $\text{MgSO}_4 = 1.08558$ (Schonrock, Z phys Ch 1893, 11 782)

Sp gr of $\text{MgSO}_4 + \text{Aq}$		
G-equivalents MgSO_4 per liter	t°	Sp gr t°/t°
0 002548	17 989	1 0001625
0 005093	18 020	1 000324
0 01015	17 995	1 000639
0 02023	17 980	1 001274
0 05023	18 047	1 003117
0 09950	18 033	1 006122
0 17773	18 014	1 012035
0 29459	17 997	1 017806
0 48671	17 994	1 029101
0 5022	17 90	1 03000
5 0220	17 95	1 26970
0 002616	14 096	1 0001672
0 005230	14 109	1 0003311
0 01042	14 098	1 000659
0 02077	14 092	1 001306
0 12462	14 199	1 007682
0 24567	14 092	1 014980

(Kohlrausch, W Ann 1894, **53** 27)

Sp gr of $\text{MgSO}_4 + \text{Aq}$	
$\frac{1}{2} \text{MgSO}_4$ g in 1000 g of solution	Sp gr 16°/16°
0	1 000000
0 5368	1 000570
1 0917	1 001157
"	1 001141
2 1076	1 002234
4 1367	1 004372
9 0608	1 009523
18 0846	1 018954
37 1342	1 038983
52 1362	1 054867

(Dijken, Z phys Ch 1897, **24** 108)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 18°, when p = per cent strength of the solution, d = observed density, and w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
26 25	1 2903	1 3374
25 91	1 2860	1 3319
24 53	1 2693	1 3101
21 60	1 2330	1 2650
18 41	1 1950	1 2187
13 79	1 1423	1 1562
12 63	1 1291	1 1413
11 29	1 1147	1 1246
8 08	1 0803	1 0859
2 01	1 0204	1 0191

(Barnes, J phys Chem 1898, **2** 542)

Sp gr of $\text{MgSO}_4 + \text{Aq}$ at 20°		
Normality of $\text{MgSO}_4 + \text{Aq}$	% MgSO_4	Sp gr
2 73	25 46	1 2879
1 86	18 61	1 2019
0 934	10 14	1 1049
(Forchheimer, Z phys Ch 1900, 34 24)		
Sp gr of dil $\text{MgSO}_4 + \text{Aq}$ at 20 004°		
Conc = g equiv per l at 20 004°		
Sp gr compared with H_2O at 20 004° = 1		
Conc		Sp gr
0 0000		1 000,000,0
0 0001		1 000,006,4
0 0002		1 000,012,9
0 0003		1 000,019,4
0 0004		1 000,025,9
0 0005		1 000,032,4
0 0010		1 000,064,8
0 0020		1 000,129,4
0 0050		1 000,322,4
0 0100		1 000,642,1

(Lamb and Lee, J Am Chem Soc 1913, **35** 1684)

More sol in $\text{HCl} + \text{Aq}$ than in H_2O (Richter)

In sat $\text{HCl} + \text{Aq}$, anhydrous MgSO_4 is scarcely sol, $\text{MgSO}_4 + 7\text{H}_2\text{O}$ dissolves, but is precipitated by a current of HCl gas (Hensgen, B **10** 259)

Margueritte (C R **43** 50) denies the precipitation

For solubility in H_2SO_4 , see $\text{MgH}_2(\text{SO}_4)_2$

Completely pptd from $\text{MgSO}_4 + \text{Aq}$ by conc $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Persoz)

Somewhat sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ with separation of a double sulphate

Rapidly sol in $\text{KCl} + \text{Aq}$ with separation of K_2SO_4

Sol in sat $\text{NaCl} + \text{Aq}$ without pptn of the latter

Easily sol in sat $\text{KNO}_3 + \text{Aq}$ without causing any pptn

Sol in sat $\text{NaNO}_3 + \text{Aq}$ (Karsten)

Rapidly sol in sat $\text{CuSO}_4 + \text{Aq}$, when saturation is reached, a double salt separates out (Karsten)

100 pts sat $\text{MgSO}_4 + \text{NiSO}_4 + \text{Aq}$ at 18–20° contain 30 93 pts of the two salts, 100 pts sat $\text{MgSO}_4 + \text{ZnSO}_4 + \text{Aq}$ at 18–20° contain 35 45 pts, 100 pts sat $\text{MgSO}_4 + \text{NiSO}_4 + \text{ZnSO}_4 + \text{Aq}$ at 18–20° contain 35 62 pts (v Hauer, J pr **98** 137)

100 pts H_2O dissolve 14 1 pts MgSO_4 and 9 8 pts K_2SO_4 , if sat $\text{MgSO}_4 + \text{Aq}$ is sat with K_2SO_4 , 32 4 pts MgSO_4 and 8 2 pts K_2SO_4 , if sat $\text{K}_2\text{SO}_4 + \text{Aq}$ is sat with MgSO_4 , all at 15° (Mulder, J B **1866**)

100 pts H_2O dissolve 25 95 pts MgSO_4 and 5 21 pts Na_2SO_4 at 0° (Diacon, J B **1866** 62)

100 pts H_2O dissolve 15 306 pts MgSO_4 and 13 086 pts Na_2SO_4 at 0° (Pfaff, A 99 224)

See also under $\text{MgNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Solubility of mixtures of MgSO_4 and $\text{MgNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$ at t°

t°	g per 100 g H_2O	
	Na_2SO_4	MgSO_4
22	23 3	31 4
24 5	27 2	24 2
30	36 1	19 1
35	33 9	18 44

(Roozeboom, 1888, Z phys Ch 2 518)

See also under $\text{MgNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Slowly sol in sat $\text{ZnSO}_4 + \text{Aq}$ without pptn until saturation, when a double salt separates out

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)

100 pts dil alcohol containing at 15°

10 20 40 % alcohol
contain 39 3 21 3 1 62% $\text{MgSO}_4 + 7\text{H}_2\text{O}$
(Schiff, A 118 365)

At higher temp the solubility increases proportional to the temp (Gerardin, A ch (4) 5 145)

100 pts absolute methyl alcohol dissolve 1 18 pts MgSO_4 at 18° (de Bruyn, Z phys Ch 10 783)

100 pts absolute methyl alcohol dissolve 41 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at 17° , 100 pts absolute methyl alcohol dissolve 29 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at $3-4^\circ$, 100 pts 93% methyl alcohol dissolve 9 7 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at 17° , 100 pts 50% methyl alcohol dissolve 4 1 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at $3-4^\circ$ (de Bruyn, R t c 11 112)

100 pts absolute ethyl alcohol dissolve 1 3 pts $\text{MgSO}_4 + 7\text{H}_2\text{O}$ at 3° (de Bruyn)

Insol in CS_2 (Arcowski, Z anorg 1894, 6 257)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1910, 43 314), acetone (Naumann, B 1904, 37 4329)

100 g 95% formic acid dissolve 0 34 g MgSO_4 at 19° (Aschan, Ch Ztg 1913, 37 1117)

100 g sat solution of MgSO_4 and sugar in H_2O contains 46 52, g sugar + 14 0 g MgSO_4 , or 100 g H_2O dissolve 119 6 g sugar + 36 0 g MgSO_4 (Kohler, Z Ver Zuckerind, 1897, 47 447)

Magnesium hydrogen sulphate, $\text{MgH}_2(\text{SO}_4)_2$

Decomp by H_2O Sol in H_2SO_4 Insol in methyl acetate (Naumann, B 1909, 42 3790)

$\text{MgH}_2(\text{SO}_4)_2$ Boiling H_2SO_4 dissolves about 2% MgSO_4 , from which this compound crystallises (Schultz, Pogg 133 137)

Magnesium pyrosulphate, MgS_2O_7

Decomp by H_2O

Magnesium manganous sulphate, $\text{MgSO}_4, 2\text{MnSO}_4 + 15\text{H}_2\text{O}$

Min *Fauserite*

Magnesium manganous zinc sulphate, $\text{MgSO}_4, \text{MnSO}_4, \text{ZnSO}_4 + 21\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 99 124)

Magnesium nickel sulphate, $\text{MgSO}_4, 3\text{NiSO}_4 + 28\text{H}_2\text{O}$

Sol in H_2O (Schiff)

Magnesium nickel potassium sulphate, $\text{MgSO}_4, \text{NiSO}_4, 2\text{K}_2\text{SO}_4 + 12\text{H}_2\text{O}$

Sol in H_2O (Vohl, A 94 57)

Magnesium potassium sulphate, $\text{MgK}_2(\text{SO}_4)_2 + 6\text{H}_2\text{O}$

100 pts H_2O dissolve 22 7 pts anhydrous salt at $16 5^\circ$ (Mulder)

100 pts H_2O dissolve at

0°	10°	20°	30°	35°
14 1	19 6	25 0	30 4	33 3

pts anhydrous salt,

45°	55°	60°	65°	75°
40 5	47 0	50 2	53 0	59 8

pts anhydrous salt

(Tobler, A 95 193)

100 g H_2O dissolve 30 52 g $\text{MgK}(\text{SO}_4) + 6\text{H}_2\text{O}$ at 15° (Lothian, Pharm J 1909, 82 292)

Solubility in H_2O at t°

t	Sat solution concn		Mols K_2SO_4 mols MgSO_4 in the solution	100 pt dl	
	% K_2SO_4	% MgSO_4		K_2SO_4	MgSO_4
10	9 4	9 8	1 1 52	11 63	12 11
20	10 9	10 8	1 1 43	13 92	13 79
30	12 4	11 8	1 1 38	16 36	15 56
40	13 8	13 1	1 1 37	18 88	17 92
50	14 7	14 8	1 1 46	20 85	20 99
60	15 2	16 3	1 1 55	22 19	23 79
70	15 6	16 8	1 1 52	23 07	21 85
80	16 0	17 1	1 1 56	23 91	25 56
80	16 6	18 1	1 1 58	25 42	27 72
90	17 2	18 2	1 1 54	26 62	28 17

(Precht, B 1882 15 1668)

Sp gr of aqueous solution at 15° containing

2 4 6 8% hydrous salt,
1 0129 1 0261 1 0394 1 053

10 12 14 16% hydrous salt,
1 0668 1 0808 1 095 1 1094

18 20 22% hydrous salt
1 124 1 1388 1 1539
(Schriff, A 113 183, calculated by Gerlach,
Z anal 8 287)

Sp gr of $\text{MgK}_2(\text{SO}_4)_2 + \text{Aq}$ at 18°

G-equiv of salt per l	Sp gr
1 0010	1 0633
0 8345	1 0531
0 6688	1 0427
0 3744	1 0243
0 0998	1 0040
0 02004	1 0015
0 01004	1 0004

These results lead the author to conclude that in dil solutions the double salt is decomposed into its constituents (McKay, *Elektrochem Zeit* 1899, 6 115)

Min *Picromerie*
+4H₂O (van der Heide, B 26 414)
2MgSO₄, K₂SO₄, Min *Langbeinite*
Deliquescent Absorbs 56.26% H₂O from air to form K₂SO₄, MgSO₄+6H₂O (Mallet, *Chem Soc* 1900, 77 220)
4MgSO₄, K₂SO₄+5H₂O (van't Hoff and Kassatkin, B A B 1889 951)

Magnesium potassium zinc sulphate, MgSO_4 ,
2K₂SO₄, ZnSO₄+12H₂O
Sol in H₂O (Vohl, A 94 57)

Magnesium potassium sulphate chloride,
MgSO₄, K₂SO₄, MgCl₂+6H₂O
Min *Karnit*

Magnesium rubidium sulphate, MgSO_4 ,
Rb₂SO₄+6H₂O
Sol in H₂O (Lutton, *Chem Soc* 63 337)
1 l H₂O dissolves 202 g anhydrous salt at 25° (Locke, *Am Ch J* 1902, 27 459)
2MgSO₄, Rb₂SO₄ Deliquescent (Mallet, *Chem Soc* 1900, 77 223)

Magnesium sodium sulphate, MgSO_4 , Na₂SO₄,
+4H₂O
Min *Blodite*, *Simonyite*
Blodite is efflorescent, Simonyite, deliquescent
+5H₂O Min *Iowite*
+6H₂O Decomp on air Sol in 3 pts cold H₂O
Na₂Mg(SO₄)₄ Min *Vanthoffite* (van't Hoff, B A B 1902 414)
MgNa₂(SO₄)₂+4H₂O Min *Astrakanite*

100 mols H₂O hold mols salt in solution at t°

t°	MgSO ₄	Na ₂ SO ₄
22	4 70	2 95
24 5	3 68	3 45
30	3 60	3 60
35	3 69	3 69
47	3 60	3 60

(Roozeboom, R t c 1887, 6 333)

Solubility of mixtures of $\text{MgNa}_2(\text{SO}_4)_2 + 4\text{H}_2\text{O}$ and Na₂SO₄ at t°

t	g per 100 g H O	
	Na ₂ SO ₄	MgSO ₄
18 5	43 0	45 5
22	35 2	48 9
24 5	32 5	50 3
30	25 9	55 0
35	23 5	59 4

(Roozeboom, Z phys Ch 1888, 2 518)
See also under MgSO₄

Magnesium thallous sulphate, MgSO_4 , Tl₂SO₄,
+6H₂O

Sol in H₂O, but decomp by repeated recrystallisations (Werther)

Magnesium uranyl sulphate,
MgSO₄, (UO₂)SO₄+5H₂O
(de Coninck, *Chem Soc* 1905, 88 (2) 530)

Magnesium zinc sulphate, MgSO_4 , ZnSO₄+
14H₂O
Sol in H O (Pierre, A ch (3) 16 244)
+10H₂O (Pierre)
3ZnSO₄, 5MgSO₄+56H₂O (Schriff)
There are only two compounds, 2(MgSO₄, 7H₂O), ZnSO₄, 7H₂O and MgSO₄, 7H₂O, ZnSO₄, 7H₂O (Hollmann, Z phys Ch 1901, 37 212, and 1902, 40 577)

Magnesium sulphate potassium chloride,
MgSO₄, KCl+3H₂O or MgSO₄, K₂SO₄,
MgCl₂+6H₂O

Min *Karnit*
100 pts H₂O dissolve 79.56 pts at 18° (Krause, *Arch Pharm* (3) 6 326)
Not sol in a mixture of abs alcohol and ether, which dissolves out MgCl₂ (Lehmann, J B 1867 416)
Alcohol dissolves out MgCl₂, also little H₂O Much H₂O dissolves completely (Zincken, *Miner Jahrb* 1865 310)

Magnesium sulphate potassium chromate,
2MgSO₄, K₂CrO₄+9H₂O
Sol in H₂O (Étard, C R 85 443)

Manganous sulphate, basic, 3MnO , $2\text{SO}_3 + 3\text{H}_2\text{O}$

Insol in H_2O , but slowly decomp thereby (Gorgeu, C R **94** 1425)

Manganous sulphate, MnSO_4

Anhydrous

Absorbs H O from the air to form $\text{MnSO}_4 + 4\text{H}_2\text{O}$
1 pt MnSO_4 is sol in pts H_2O at t°

t°	Pts H_2O	t°	Pts H_2O	t°	Pts H_2O
6 25	1 77	18 75	1 667	75	1 494
10	1 631	37 5	1 457	101 25	2 031

Or—

100 pts H_2O dissolve pts MnSO_4 at t

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
6 25	56 49	18 75	60 00	75	66 95
10	61 29	37 5	68 63	101 25	49 33

(Brandes Pogg **20** 575)

Sol in 2.5 pts H_2O at 18.75° at 62.5° it is difficult to dissolve 1 pt MnSO_4 in 3 pts H_2O but the sat solution at 62.5° does not become cloudy on heating to 100° (Jahn)

100 pts $\text{MnSO}_4 + \text{Aq}$ sat at $11-14^\circ$ contain 37.5 pts MnSO_4 (v Hauer, J pr **103** 114)

Sat $\text{MnSO}_4 + \text{Aq}$ contains at

-8° -5° $+5^\circ$ 18° 22°
30 0 31 0 34 1 38 3 38 2% MnSO_4 ,
 23° 32° 45° 52° 70°
39 1 41 7 44 2 36 4 41 1% MnSO_4 ,
 83° 110° 115° 123° 130° 140°
36 3 18 4 21 5 16 7 13 6 9 4% MnSO_4
(Étard, A ch 1894, (7) **2** 553)

Solubility in H_2O increases from $0-55^\circ$, and decreases from $55-145^\circ$. The increasing solubility is that of $\text{MnSO}_4 + 5\text{H}_2\text{O}$, and $\text{MnSO}_4 + 2\text{H}_2\text{O}$ separates out at 35° , and is completely insol at 145° (Étard)

If solubility S = pts anhydrous MnSO_4 in 100 pts solution, $S = 30.0 + 0.2828t$ from -8° to 57° , $S = 48.0 - 0.4585t$ from 57° to 150°

Practically insol in H_2O at 180° (Étard, C R **106** 208)

Solubility varies according to the hydrate used. Above results of Étard show the solubility of $\text{MnSO}_4 + 7\text{H}_2\text{O}$ at 0° , and $\text{MnSO}_4 + 3\text{H}_2\text{O}$ at 57° . Anhydrous MnSO_4 is stable only above 117° (Linebarger)

100 pts H_2O dissolve pts anhydrous MnSO_4 at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
120	67 18	141	41 18	155	26 49
132	63 16	146	38 83	170	16 15

(Linebarger, Am Ch J **15** 225)

$+ \text{H}_2\text{O}$ Stable only between 57° and 117°

100 pts H_2O dissolve pts MnSO_4 from $\text{MnSO}_4 + \text{H}_2\text{O}$ at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
48	87 98	78	79 13	115	69 78
53	86 10	90	75 63	117	68 81
65	84 33	100	71 27		
72	82 73	106	70 14		

(Linebarger)

Min *Szmkite*

Solubility of $\text{MnSO}_4 + \text{H}_2\text{O}$ in H_2O at t°

t	Pts MnSO_4 per 100 pts H_2O	t°	Pts MnSO_4 per 100 pts H_2O
41 5	61 06	75	49 45
50 1	58 01	84 8	44 87
67 1	51 37	95	38 71
		99 6	34 27

Av of varying results

(Cottrell, J phys Ch 1900, **4** 652)

Linebarger's determinations are inaccurate (Cottrell)

$+ 2\text{H}_2\text{O}$ Stable between 40° and 57°

100 pts H_2O dissolve pts MnSO_4 from $\text{MnSO}_4 + 2\text{H}_2\text{O}$ at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
35	68 88	42	77 63	50	83 16
40	75 31	45	80 07	55	86 27

(Linebarger)

$+ 3\text{H}_2\text{O}$ Stable between 30° and 40°

100 pts H_2O dissolve pts MnSO_4 from $\text{MnSO}_4 + 3\text{H}_2\text{O}$ at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
5	54 68	25	66 85	68	71 89
12	60 56	30	67 38	53	72 81
16	63 41	35	68 31	57	73 17
19	65 12	40	70 63		

(Linebarger)

$+ 4\text{H}_2\text{O}$ Sl efflorescent Less sol in boiling than in cold H_2O

100 pts H_2O at 4.4° dissolve 31 pts MnSO_4
 $+ 4\text{H}_2\text{O}$ (Jahn)

100 pts H₂O at t° dissolve pts MnSO₄+4H₂O

t°	Pts MnSO ₄ + 4H ₂ O	t°	Pts MnSO ₄ + 4H ₂ O
6 25	113 22	37 5	149
10	123	75	144
18 75	122	101 25	93

(Brandes Pogg 20 575)

Solubility of MnSO₄ in 100 pts H₂O at t°, using MnSO₄+4H₂O

t°	Pts MnSO ₄	t°	Pts MnSO ₄	t°	Pts MnSO ₄
0	55 4	35	71 9	70	61 5
1	55 9	36	72 2	71	61 5
2	56 5	37	72 4	72	61 5
3	57 1	38	72 7	73	61 5
4	57 7	39	72 9	74	61 5
5	58 2	40	73 1	75	61 5
6	58 8	41	73 3	76	61 5
7	59 4	42	73 5	77	61 5
8	60 0	43	73 7	78	61 5
9	60 5	44	73 9	79	61 5
10	61 1	45	74 0	80	61 5
11	61 7	46	74 2	81	61 5
12	62 2	47	74 4	82	61 5
13	62 7	48	74 6	83	61 5
14	63 3	49	74 7	84	61 4
15	63 8	50	74 8	85	61 3
16	64 3	51	74 9	86	61 2
17	64 8	52	75 1	87	61 0
18	65 3	53	75 2	88	60 8
19	65 8	54	75 3	89	60 6
20	66 3	55	74 7	90	60 3
21	66 7	56	74 0	91	60 0
22	67 2	57	72 9	92	59 6
23	67 6	58	71 5	93	59 2
24	68 1	59	69 5	94	58 6
25	68 5	60	65 9	95	57 9
26	68 9			96	57 2
27	69 3	63 5	61 3	97	56 3
28	69 7	64	61 5	98	55 4
29	70 0	65	61 5	99	54 3
30	70 4	66	61 5	100	52 9
31	70 7	67	61 5	101	51 2
32	71 0	68	61 5	102	49 3
33	71 3	69	61 5	102 5	47 4
34	71 6				

(Mulder, Scheik Verhandel 1864 137)

100 pts H₂O dissolve pts MnSO₄ from MnSO₄+4H₂O at t°

t	Pts MnSO ₄	t	Pts MnSO ₄	t°	Pts MnSO ₄
2 2	57 88	25	72 23	48	84 33
7 3	61 78	30	74 67	52	86 16
11	64 01	35 5	78 81	56	88 19
15	67 12	40	79 63		
20	69 93	45	83 06		

(Linebarger)

Stable in aqueous solution between 25° and 31° (Schieber, M 1898, 19 281)

Solubility of MnSO₄+4H₂O in H₂O at t°

t°	Pts MnSO ₄ per 100 pts H ₂ O	t°	Pts MnSO ₄ per 100 pts H ₂ O
16 0	63 97	35 0	67 87
17 7	64 16	35 5	68 09
18 5	64 19	39 9	68 81
25 0	65 32	49 9	72 48
30 0	66 43	50 0	72 62
32 2	66 83		

(Cottrell, J phys Ch 1900, 4 651)

Linebarger's determinations are inaccurate (Cottrell)

Solubility in H₂O at t°

t°	g MnSO ₄ for 100 g H ₂ O
30 15	66 38
35	68 22

(Richards and Fraprie, Am Ch J 1901, 26 77)

+5H₂O Sol in 1 pt H₂O at 18 75° (Jahn, A 28 110)

Stable from 8° to 18°

100 pts H₂O dissolve pts MnSO₄ from MnSO₄+5H₂O at t°

t°	Pts MnSO ₄	t°	Pts MnSO ₄	t°	t° MnSO ₄
0	58 05	20	75 16	40	84 63
2 5	62 41	25	78 63	42	85 27
4	64 22	30	79 16	45	86 16
7	66 83	32	80 38	47 7	86 95
10	68 05	34	82 04	53	88 89
15	72 33	37	83 91	54	89 08

(Linebarger)

Stable in aqueous solution between 15° and 20° (Schieber, M 1898, 19 281)

Solubility of MnSO₄+5H₂O at t°

t°	Pts MnSO ₄ per 100 pts H ₂ O	t	Pts MnSO ₄ per 100 pts H ₂ O
5	58 06	16	61 59
9	59 23	25	64 78
12	60 19	30	67 76
12 3	60 16	31 1	67 92
15	61 08	35 5	71 61

(Cottrell, J phys Ch 1900, 4 651)

Linebarger's determinations are inaccurate (Cottrell)

Solubility in H_2O at $25^\circ = 65.09 \text{ g MnSO}_4$
for 100 g H_2O (Richards and Fraprie, Am
Ch J 1901, 26 77)

+6 H_2O Stable from -5° to $+8^\circ$

100 pts H_2O dissolve pts MnSO_4 from
 $\text{MnSO}_4 + 6\text{H}_2\text{O}$ at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
-4	55 87	9	70 88	30	76 24
0	64 21	15	72 45	34	77 02
3	66 87	20	74 35	35	77 23
5	67 49	25	75 38	38	7 481

(Linebarger)

+7 H_2O Efflorescent

Sol in less than 0.5 pt H_2O at 18.75°
(Jahn)

Stable between -10° and -5°

100 pts H_2O dissolve pts MnSO_4 from
 $\text{MnSO}_4 + 7\text{H}_2\text{O}$ at t°

t°	Pts MnSO_4	t°	Pts MnSO_4	t°	Pts MnSO_4
10	50 11	0	53 61	10	59 91
8	50 93	5	54 83	15	64 34
-5	51 53	7	56 62		

(Linebarger)

Stable in aqueous solution below 0°
(Schieber, M 1898, 19 281)

Solubility of $\text{MnSO}_4 + 7\text{H}_2\text{O}$ in H_2O at t°

t°	Pts MnSO_4 per 100 pts H_2O	t°	Pts MnSO_4 per 100 pts H_2O
-10	47 96	9	59 33
0	56 23	12	61 78
5	56 38	14 3	63 93

(Cottrell, l c)

M-pt of $\text{MnSO}_4 + 7\text{H}_2\text{O}$ is 54° (Tilden,
Chem Soc 45 409)

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at 15°

% MnSO_4 +4 H_2O	Sp gr	% MnSO_4 +4 H_2O	Sp gr
1	1 006	29	1 208
2	1 013	30	1 2150
3	1 020	31	1 224
4	1 025	32	1 231
5	1 0320	33	1 244
6	1 038	34	1 250
7	1 044	35	1 2579
8	1 050	36	1 268
9	1 056	37	1 276
10	1 0650	38	1 285
11	1 072	39	1 295
12	1 079	40	1 3038
13	1 085	41	1 313
14	1 093	42	1 322
15	1 1001	43	1 331
16	1 106	44	1 340
17	1 114	45	1 3495
18	1 121	46	1 360
19	1 129	47	1 370
20	1 1363	48	1 380
21	1 144	49	1 389
22	1 150	50	1 3986
23	1 160	51	1 410
24	1 166	52	1 420
25	1 1751	53	1 430
26	1 183	54	1 440
27	1 190	55	1 4514
28	1 200		

(Gerlach, Z anal 8 288)

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at 23° a=no of $\frac{1}{2}$
mols in grms dissolved in 1000 g H_2O ,
b=sp gr if a is $\text{MnSO}_4 + 5\text{H}_2\text{O}$, $\frac{1}{2}$ mol
wt = 120.5, c=sp gr if a is MnSO_4 ,
 $\frac{1}{2}$ mol wt = 75.5

a	b	c	a	b	c
1	1 068	1 071	6	1 306	3 576
2	1 128	1 139	7	1 341	1 429
3	1 181	1 202	8	1 371	
4	1 227	1 262	9	1 399	
5	1 269	1 320	10	1 426	

(Favre and Valson, C R 79 968)

Above table recalculated by Gerlach (Z anal
28 475)

% MnSO_4 +5 H_2O	Sp gr	% MnSO_4 +5 H_2O	Sp gr
10	1 0630	40	1 2900
20	1 1325	50	1 3800
30	1 2070		

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at 15° a=%, b=sp gr if a is MnSO_4 , c=sp gr if a is $\text{MnSO}_4 + 4\text{H}_2\text{O}$, d=sp gr if a is $\text{MnSO}_4 + 5\text{H}_2\text{O}$, e=sp gr if a is $\text{MnSO}_4 + 7\text{H}_2\text{O}$

a	b	c	d	e
5	1 0500	1 0340	1 0310	1 0270
10	1 1035	1 0690	1 0630	1 0545
15	1 1605	1 1055	1 0965	1 0830
20	1 2215	1 1435	1 1315	1 1130
25	1 2870	1 1835	1 1685	1 1440
30	1 3575	1 2255	1 2070	1 1765
35		1 2695	1 2470	1 2105
40		1 3155	1 2885	1 2455
45		1 3640	1 3315	1 2815
50			1 3760	1 3185
55				1 3565

(Gerlach, Z anal **28** 475)

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at 0° S=p'ts MnSO_4 in 100 pts solution

S	Sp gr	S	Sp gr
16 7450	1 1834	8 8295	1 0928
14 0462	1 1519	6 0172	1 0622
11 5804	1 1239	3 0865	1 0315

(Charpy, A ch (6) **29** 26*)

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at room temp containing

11 45	18 8	22 08	% MnSO_4
1 1469	1 2513	1 3082	

(Wagner, W Ann 1883, **18** 271)

Sp gr of $\text{MnSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{MnSO}_4 + \text{Aq}$	Sp gr
1—normal	1 0728
$\frac{1}{2}$ —	1 0365
$\frac{1}{4}$ —	1 0179
$\frac{1}{8}$ —	1 0087
$\frac{1}{16}$ —	1 0041

(Wagner, Z phys Ch 1890, **5** 39)

Sp gr at $16\frac{1}{4}^\circ$ of $\text{MnSO}_4 + \text{Aq}$ containing 30.819% $\text{MnSO}_4 = 1.36267$ (Schonrock, Z phys Ch 1893, **11**, 781)

Sat $\text{MnSO}_4 + \text{Aq}$ boils at 102.4° , crust forms at 101.6° , and solution contains 48.7 pts MnSO_4 to 100 pts H_2O

B-pt of $\text{MnSO}_4 + \text{Aq}$ containing pts MnSO_4 to 100 pts H_2O

B pt	Pts MnSO_4	B pt	Pts MnSO_4
100 5°	17 1	102 0°	58 9
101 0	32 1	102 4	68 4
101 5	46 2		

(Gerlach, Z anal **26** 434)

Sol in about 20 pts boiling H_2SO_4 , and more sol in boiling $\text{H}_2\text{SO}_4 + \text{Aq}$ of 1.6 sp gr (Schultz, Pogg **133** 137)

Completely pptd from solution by $\text{HC}_2\text{H}_3\text{O}_2$ (Persoz)

For solubility in $(\text{NH}_4)_2\text{SO}_4$, see under $(\text{NH}_4)_2\text{SO}_4$

$\text{MnSO}_4 + \text{Aq}$ sat at 10° , then sat with K_2SO_4 at same temp contains for 100 pts H_2O 16.7 pts MnSO_4 and 44.3 pts K_2SO_4 (Mulder)

Solubility of $\text{MnSO}_4 + \text{Na}_2\text{SO}_4$ in H_2O at 35°

g per 100 g sat solution		
MnSO_4	Na_2SO_4	Solid phase
39 45	0	$\text{MnSO}_4, \text{H}_2\text{O}$
33 92	5 23	"
33 06	7 97	$\text{MnSO}_4, \text{H}_2\text{O} + 9\text{MnSO}_4, 10\text{Na}_2\text{SO}_4$
32 92	7 42	"
31 05	9 20	$9\text{MnSO}_4, 10\text{Na}_2\text{SO}_4$
27 67	10 76	"
22 14	14 28	"
14 58	20 01	"
13 96	21 91	"
12 19	22 49	$9\text{MnSO}_4, 10\text{Na}_2\text{SO}_4 + \text{MnSO}_4, 3\text{Na}_2\text{SO}_4$
10 45	23 41	$\text{MnSO}_4, 3\text{Na}_2\text{SO}_4$
7 43	26 58	"
5 69	29 31	"
5 11	30 52	$\text{MnSO}_4, 3\text{Na}_2\text{SO}_4 + \text{Na}_2\text{SO}_4$
2 96	31 33	Na_2SO_4
0	33	"

(Schrenemakers and Provije, Proc Ak Wet Amsterdam, 1913, **15** 326)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 825)

Anhydrous MnSO_4 insol in absolute alcohol

1000 pts alcohol of 0.872 sp gr dissolve 6.3 pts MnSO_4

Sol in 50 pts of 50% alcohol Insol in absolute alcohol (Brundes, Pogg **20** 556)

100 pts solution saturated at 15° in dil alcohol containing

0 10 50 60 % alcohol, contain 56.25 51.4 2.0 0.66 pts $\text{MnSO}_4 + 5\text{H}_2\text{O}$

(Schiff, A **118** 365)

When $\text{MnSO}_4 + 7\text{H}_2\text{O}$ is boiled with absolute alcohol none is dissolved but $\text{MnSO}_4 + 3\text{H}_2\text{O}$ is formed

When $\text{MnSO}_4 + 7\text{H}_2\text{O}$ is dissolved in 15–50% alcohol, the liquid separates into two layers, the lower containing less (12–14%) alcohol and more (47–49%) salt, the upper containing

more (50-55%) alcohol and less (13-22%) salt. If the alcohol has the above strength (15-50%) the separation takes place at ordinary temp., but with 13-14% or 60% or more alcohol, warming is necessary to effect the separation (Schuff, A 118 363)

Solubility of $\text{MnSO}_4 + \text{H}_2\text{O}$ in alcohol + Aq at t°

Composition of two layers sat with the solid salt at t°

t°	Alcohol layer		Water layer	
	% alcohol	% MnSO_4	% alcohol	% MnSO_4
30	45 20	2 49	8 69	30 15
31	43 90	2 74	8 47	30 10
35	41 71	3 44	9 24	28 61
37	38 26	4 84	11 03	26 47
41	34 01	5 86	11 93	24 97
42	32 37	6 89	13 57	23 09
43	31 42	8 51	14 33	22 01

(Schreinemakers and Deuss, Z phys Ch 1912, 79 559)

Composition of alcohol solutions sat with $\text{MnSO}_4 + \text{H}_2\text{O}$ at t°

t	% H_2O	% alcohol	% MnSO_4
50	63 74	0	36 26
	65 21	6 67	28 12
	65 23	16 02	18 75
	64 83	22 63	12 54
	59 41	36 47	4 12
35	61 4	0	38 6
	62 13	5 50	32 37
	62 06	6 46	31 48
	62 01	7 48	30 51
	*62 15	9 24	28 61
	*54 85	41 71	3 44
	50 69	47 73	1 58
	50 16	48 27	1 57
30	61 4	0	38 6
	61 43	2 26	36 31
	61 25	5 09	33 66
	60 78	5 96	*33 26
	*61 16	8 69	30 15
	*52 31	45 20	2 49
	44 83	54 19	0 98
	30 95	68 97	0 08
	9 19	90 80	0 01

Composition of the solutions sat with respect to one another

t°	water layer		alcohol layer	
	% alcohol	% MnSO_4	% alcohol	% MnSO_4
50	†5 68	34 95	†53 64	0 97
	†7 69	30 99	†45 83	2 19
	†8 70	29 20	†41 93	3 11
	†11 85	24 84	†35 15	5 95
35	†8 38	29 52	†42 38	3 07
	*9 24	28 61	*41 71	3 44
	10 75	26 33	36 89	5 19
	15 09	21 85	30 06	9 03
30	†7 60	32 40	†50 97	1 74
	*8 69	30 15	*45 20	2 49
	10 46	27 58	40 71	3 93
	11 86	25 75	37 54	5 20
	16 18	20 86	29 89	9 64

(Schreinemakers and Deuss)

†Metastable solutions

*Solutions also sat with respect to $\text{MnSO}_4, \text{H}_2\text{O}$

Solubility of $\text{MnSO}_4 + 4\text{H}_2\text{O}$ in alcohol + Aq

g H_2O	g alcohol	$\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$
55 86	30 03	14 11
52 25	43 59	4 16
49 41	47 66	2 94
45 34	53 00	1 66
42 56	56 24	1 20

(Linebarger, Am Ch J 1892, 14 380)

Solubility of $\text{MnSO}_4 + 5\text{H}_2\text{O}$ in alcohol + Aq

Composition of the solution sat with $\text{MnSO}_4 + 5\text{H}_2\text{O}$

t°	alcohol layer		water layer	
	% alcohol	% MnSO_4	% alcohol	% MnSO_4
10	37 06	5 44	13 78	25 25
15	44 56	2 79	9 25	29 79
17 6	47 11	2 22	8 53	30 88
21	53 55	1 10	6 10	35 05
25	53 09	1 23	6 81	33 72

Composition of solution sat with solid substance at 25°

% H_2O	% alcohol	% MnSO_4	Solid phase
60 7	0	39 3	$\text{MnSO}_4 + 5\text{H}_2\text{O}$
*59 47	6 81	33 72	
*45 68	53 09	1 23	"
42 05	57 39	0 56	"
23 30	76 70	0 0	$\text{MnSO}_4 + \text{H}_2\text{O}$

*The solutions also sat with respect to one another

(Schreinemakers and Deuss)

*The two liquids are sat with respect to one another

Composition of the two solutions sat with respect to one another at 25°

Water layer		Alcohol layer	
% alcohol	% MnSO ₄	% alcohol	% MnSO ₄
*6 81	*33 72	*53 09	1 23
8 48	31 51	49 76	1 83
15 02	22 61	32 75	8 01

*Also sat with MnSO₄, 5H₂O
(Schrenemakers and Deuss)

Insol in absolute ether between 5° and 7°, and no crystal H₂O is removed thereby. Insol in boiling oil of turpentine, but 1 mol crystal H₂O is removed from MnSO₄+4H₂O (Brandes, Pogg 20 568)

Insol in benzonitrile (Naumann, B 1914, 47 1370), ethyl acetate (Naumann, B 1910, 43 314), acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

100 g sat solution in glycol contain 0.5 g MnSO₄ (de Coninck, Bull Ac roy Belg 1905 359)

MnSO₄+7H₂O occurs as the min *Mallardite*

Manganomanganic sulphate, MnO, MnO₂, 4SO₃+9H₂O

Deliquescent. Decomp by H₂O. Sol in little dil H₂SO₄+Aq (Fremy, C R 82 475)

Manganic sulphate, Mn₂(SO₄)₃

Extremely deliquescent. Sol in H₂O with evolution of heat, and decomposition into a basic sulphate. Behaves similarly with dilute acids. Sol in traces in cold conc H₂SO₄. Insol in cold conc HNO₃+Aq. Sol in conc HCl+Aq. Decomp by absolute alcohol (Carius, A 98 53)

Manganyl sulphate, MnO₂, SO₃

Sol in H₂SO₄ but solution decomp if below 40-60° Baume. Solubility in 40° Baumé acid = 15% 55°, 4-5%. Solution can be heated to 60-80° without decomp (Bad Anilin u Sodafabrik, C C 1905, II 1398)

Manganous hydrogen sulphate

MnSO₄ is sol in 20 pts boiling conc H₂SO₄, more sol in boiling H₂SO₄+Aq of 1.6 sp gr (Schultz)

MnH₂(SO₄)₂, and +H₂O. Sol in H₂O with decomp (Schultz)

MnH₃(SO₄)₄. Sol in H₂O with decomp (Schultz)

Manganic hydrogen sulphate, Mn₂H₂(SO₄)₄+8H₂O

Deliquescent. Decomp by H₂O. Sol in dil H₂SO₄+Aq (Francke, J pr (2) 36 251)

Manganous hydrazine sulphate, MnH₂(SO₄)₂, 2N₂H₄

1 pt is sol in 60 pts H₂O at 18°. Stable in the air at 100° (Curtius, J pr 1894, (2) 50 331)

Manganous nickel potassium sulphate,

MnSO₄, NiSO₄, 2K₂SO₄+12H₂O. Sol in H₂O (Vohl, A 94 57)

Manganous potassium sulphate, K₂SO₄, MnSO₄+2H₂O

+4H₂O. Efflorescent (Pierre, A ch (3) 16 239)

2MnSO₄, K₂SO₄ (Mallet, C N 1899, 80 301)

Manganic potassium sulphate, K₂Mn₂(SO₄)₄, +24H₂O

Decomp by dissolving in H₂O (Mitscherlich)

Manganomanganic potassium sulphate,

Mn₃(SO₄)₃, 5K₂SO₄=3Mn(SO₄)₂, 2MnSO₄, 5K₂SO₄

Decomp by much H₂O. Sol in dil or conc H₂SO₄. Insol in alcohol or ether (Francke, J pr (2) 36 166)

Manganous potassium zinc sulphate, MnSO₄, 2K₂SO₄, ZnSO₄+12H₂O

Sol in H₂O (Vohl)

Manganous rubidium sulphate, MnSO₄,

Rb₂SO₄+6H₂O

Sol in H₂O (Tutton, Chem Soc 63 337). 1 l H₂O dissolves 357 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27, 459)

+2H₂O (Wyruboff, Bull Soc Min 1891, 14 242)

2MnSO₄, Rb₂SO₄ (Wyruboff)

Manganic rubidium sulphate, Mn₂(SO₄)₃, Rb₂SO₄+24H₂O

Deliquescent (Christensen, Z anorg 1901, 27 333)

Manganous sodium sulphate, MnSO₄, Na₂SO₄

+2H₂O. Deliquescent in moist air (Geiger)

+4H₂O. Sol in 1.2 pts boiling H₂O (Geiger)

Manganous sulphate ammonia, MnSO₄, 4NH₃

Decomp by H₂O (Rose Pogg 20 148)

Manganous sulphate cupric oxide, MnSO₄, 2CuO+3H₂O

(Mailhe, A ch 1902, (7) 27 392)

MnSO₄, 3CuO+xH₂O (Recoura, C R 1901, 132 1415)

MnSO₄, 24CuO+xH₂O (Recoura)

Manganous sulphate hydrazine, $\text{MnSO}_4 \cdot 2\text{N}_2\text{H}_4$

Very unstable

Somewhat sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 285)**Manganous sulphate hydroxylamine, $\text{MnSO}_4 \cdot \text{NH}_2\text{OH} + 2\text{H}_2\text{O}$** Insol in H_2O (Feldt, B 1894, 27 405)**Mercurous sulphate, basic, $2\text{Hg}_2\text{O} \cdot \text{SO}_3 + \text{H}_2\text{O}$** Sol in 25,000 pts H_2O at 20° (Gouy, C R 1900, 130 1401)**Mercurous sulphate, Hg_2SO_4** Sol in 500 pts cold, and 300 pts hot H_2O (Wackenroder, A 41 319)Solubility in H_2O at $18^\circ = 7.8 \times 10^{-4}$ g mol per liter (Wilsmore, Z phys Ch 1900, 35 305)1 l H_2O dissolves 11.71×10^{-4} g-mol Hg_2SO_4 at 25° (Drucker, Z anorg 1901, 28 362)Solubility in H_2O at t°

t°	In 100 pts of the solution	
	Hg_2SO_4	H_2SO_4
16.5	0.055	0.008
33	0.060	0.018
50	0.065	0.037
75	0.074	0.063
91	0.084	0.071
100	0.092	0.071

(Barre, A ch 1911, (8) 24 203)

Solubility in H_2O at 25° is 20% greater than at 18° and $= 11.71 \times 10^{-4}$ g mol per l. By addition of increasing amts of H_2SO_4 the solubility is somewhat, but not regularly, decreased, K_2SO_4 lowers solubility less than H_2SO_4 (Drucker, Z anorg 1901, 28 362)

Easily sol in dil $\text{HNO}_3 + \text{Aq}$, from which solution it is separated by dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Wackenroder, A 41 319)Abundantly sol in hot, less sol in cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Berzelius)Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

H_2SO_4 normality	g mol Hg_2SO_4 per litre
0.0400	8.31×10^{-4}
0.1000	8.78×10^{-4}
0.2000	8.04×10^{-4}

(Drucker, Z anorg 1901, 28 362)

Partially decomp by hot NH_4 salts + Aq (Mahlé, A ch (3) 5 179)5 times more sol in sat $\text{CdSO}_4 + \text{Aq}$ than in H_2O (Huett, Phys Rev 1907, 25. 16)Sat ZnSO_4 or $\text{CdSO}_4 + \text{Aq}$ attack much less

than pure H_2O , yet the solubility of Hg_2SO_4 in these solutions is greater, i.e., 0.8 g in 1 l $\text{ZnSO}_4 + \text{Aq}$ and 1.1 g in 1 l $\text{CdSO}_4 + \text{Aq}$ at 20° (Gouy, C R 1900, 130 1402)

Solubility in 0.2N $\text{K}_2\text{SO}_4 + \text{Aq} = 9.05 \times 10^{-4}$ g mol per l at 25° (Drucker, Z anorg 1901, 28 362)

Solubility of Hg_2SO_4 in $\text{K}_2\text{SO}_4 + \text{Aq}$

t°	g per 100 g sat solution		
	K_2SO_4	Hg_2SO_4	free H_2SO_4
15	2.90	0.0475	0.0080
	5.70	0.0703	0.0093
	8.22	0.0912	0.0098
	8.77	0.0994	
	9.44	0.1080	0.0110
33	2.94	0.0677	0.0250
	5.68	0.1015	0.0350
	8.30	0.1364	0.0441
	10.70	0.1724	0.0438
	11.90	0.1902	0.0420
75	3.10	0.1344	0.1681
	5.75	0.2120	0.2135
	8.50	0.2951	0.2514
	13.20	0.4610	0.2503
	17.30	0.6440	0.2225

(Barre, A ch 1911, (8) 24 202)

About 3 times as sol in sat $\text{ZnSO}_4 + \text{Aq}$ as in distilled H_2O (Wright, Phil Mag (5) 1885, 19 29)

Mercuric sulphate, basic, $2\text{HgO} \cdot \text{SO}_3$

(Mailhé, A ch 1902, (7) 27 394)

 $3\text{HgO} \cdot \text{SO}_3$ (Mineral turpeth)Sol in 2000 pts cold and 600 pts boiling H_2O (Fourcroy A ch 10 307)

Sol in 43,478 pts H_2O at 16° when pptd cold, and in 32,258 pts at 16° when pptd at 100° (Cameron, Z anal 19 144)

Sol in warm dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Rosc)

Solubility in H_2O is increased by addition of H_2SO_4 up to an acid content of 4.3 mol SO_3 to 93.7 mols H_2O (Hortsmann, Z phys Ch 1895, 17 665)

Sol in warm conc HCl or $\text{HBr} + \text{Aq}$ (Ditte)

Sol in alkali chlorides + Aq (Mailhé)

Sol in dil HNO_3 or in $\text{HCl} + \text{Aq}$. More easily sol in the warm acids (Ry, Chem Soc 1897, 71 1099)

$3\text{HgO} \cdot 2\text{SO}_3 + 2\text{H}_2\text{O}$ (Hortsmann, Z phys Ch 1895, 17 659)

$4\text{HgO} \cdot 3\text{SO}_3$ (Hopkins Sill Am J 18 364)

Mercuric sulphate, HgSO_4

Decomp by H_2O into $3\text{HgO} \cdot \text{SO}_3$, and a sol acid salt. Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$. Decomp by all acids (Berzelius)

Sol in warm conc HCl or HBr + Aq, very sl sol in boiling conc HI + Aq (Ditte, A ch (5) **17** 124)

Very sl sol in hot conc HF (Ditte, A ch 1879, (5) **17** 125)

Sol in HCN + Aq (Mohr)

Sol with decomp in NaCl + Aq (Miahle) Insol in liquid NH₃ (Franklin, Am Ch J 1898, **20** 829)

Insol in conc alcohol

Insol in acetone (Naumann, B 1904, **37** 4329), methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1910, **43** 314)

Insol in benzonitrile (Naumann, B 1914, **47** 1370)

Insol in pyridine (Schroeder, Dissert **1901**)

+H₂O Decomp by H₂O (Eisfeldt, Pharm Centr **1853** 812)

Mercuriomercuric sulphate, Hg₂O, 2HgO, SO₃

Insol in cold H₂O, not decomp by boiling H₂O Decomp by HCl + Aq (Brooke, Pogg **66** 63)

Hg₂SO₄, HgSO₄ (Baskerville, J Am Chem Soc 1897, **19** 875)

Mercuric hydrogen sulphate, HgH₂(SO₄)₂

(Braham, C N **42** 163)

Mercuric potassium sulphate, 3HgSO₄,

K₂SO₄ + 2H₂O

Sol in H₂O (Hirzel, J B **1850** 332)

Mercuric sulphate chloride ammonium chloride, 2HgSO₄, HgCl₂, 2NH₄Cl

Decomp with H₂O Ether dissolves out HgCl₂ (Kosmann, A ch (3) **27** 238)

Mercuric sulphate cyanide, HgSO₄, Hg(CN)₂ + 5H₂O

Decomp by conc or warm acids (Rupp, Arch Pharm 1912, **250** 280)

Mercuric sulphate hydrazine, HgSO₄, N₂H₄

Ppt (Hofmann and Marburg, A 1899, **305** 216)

Mercuric sulphate hydrobromide, HgSO₄, 2HBr

Sol in H₂O without separation of basic sulphate (Ditte, A ch (5) **17** 122)

3HgO, SO₃, 6HBr Sol in H₂O (Ditte)

Mercuric sulphate hydrochloride, HgSO₄, HCl

Not attacked by HCl Sl sol in HNO₃ (Baskerville, J Am Chem Soc 1901, **23** 895)

HgSO₄, 2HCl Sol in H₂O without separation of a basic salt Very sol in warm H₂SO₄, solidifying on cooling if very conc, or crystallising if dil (Ditte)

Very deliquescent

Very sol in H₂O (Baskerville, J Am Chem Soc 1901, **23** 895)

+H₂O (Baskerville, J Am Chem Soc 1901, **23** 895)

3HgO, SO₃, 6HCl Sol in H₂O (Ditte)

Mercuric sulphate hydroxylamine, HgSO₄, 2NH₂OH + H₂O

Decomp by cold H₂O (Adams, Am Ch J 1902, **28** 209)

Mercuric sulphate iodate iodide, 6(3HgO, 2SO₃), 6HgI₂, Hg(IO₃)₂

Decomp by H₂O and acids (Bruckner, M 1907, **28** 961)

Mercuric sulphate iodide, basic, 3HgO, 2SO₃, HgI₂

3(3HgO, 2SO₃), 2HgI₂ + 10H₂O

2(3HgO, 2SO₃), HgI₂ + 10H₂O Very sol in hot conc HNO₃

3HgO, 2SO₃, HgSO₄, HgI₂ + 10H₂O (Ditte, C R 1905, **140** 1167)

Mercuric sulphate iodide, HgSO₄, HgI₂

Decomp by H₂O, not by alcohol or ether (Riegel, J B pr Pharm **11** 396)

3HgSO₄, HgI₂ Decomp by cold or hot H₂O Sol in H₂SO₄ + Aq (Ditte, C R 1905, **140** 1165)

4HgSO₄, HgI₂ + 15H₂O, and +18H₂O Decomp by cold or hot H₂O Sol in H₂SO₄ (Ditte)

Mercuric sulphate phosphide

See *Dimercuriphosphonium mercuric sulphate*

Mercuric sulphate sulphide, basic, 2HgO, SO₃, HgS

Somewhat sol in HCl, H₂SO₄ and HNO₃ (Jacobson, Pogg 1846, **68** 412)

4HgO, 3SO₃, 2HgS + 4H₂O Sl sol in H₂SO₄ (Estrup, Z anorg 1909, **62** 169)

Mercuric sulphate sulphide, 2HgSO₄, HgS

Sl sol in hot HCl, H₂SO₄, or HNO₃ + Aq Easily sol in hot aqua regia (Jacobson, Pogg **68** 410)

2HgSO₄, HgS (Palm, C C **1863** 122)

HgSO₄, 2HgS (Barfoed, J B **1864** 282)

Sol in aqua regia (Deniges, Bull Soc 1915, (4) **17** 355)

HgSO₄, 3HgS Insol in H₂O Easily sol in aqua regia, decomp by HNO₃ into—

3HgSO₄, HgS Insol in all acids except aqua regia (Spring, A **199** 116)

Molybdenum sesquisulphate (?)

Basic Insol in H₂O

Neutral Decomp by H₂O into acid and basic salts

Acid Sol in H₂O (Berzelius)

Molybdenum disulphate (?)Sol in H_2O **Molybdenum sulphate, $\text{Mo}_2\text{O}_5, 2\text{SO}_3$**

Very slowly sol in cold, more quickly sol in hot H_2O (Bailhache, C R 1901, **132** 476)
 $7\text{MoO}_3, 2\text{MoO}_3, 7\text{SO}_3 + \text{Aq}$ (Péchar, C R 1901, **132** 630)

Molybdic sulphate, $\text{MoO}_3, \text{SO}_3$ Deliquescent Sol in H_2O (Schultz-Sellack, B 4 14)

$\text{MoO}_3, 3\text{SO}_3 + 2\text{H}_2\text{O}$ Deliquescent Partially sol in H_2O (Anderson, Berz J B **22** 161)

Does not exist (Schultz-Sellack)

Molybdenum sulphate ammonia, $5\text{NH}_3, \text{MoO}_2\text{SO}_3, 7\text{MoO}_3 + 8\text{H}_2\text{O}$ $3\text{NH}_3, \text{MoO}_2\text{SO}_3, 7\text{MoO}_3 + 10\text{H}_2\text{O}$

Both very sol in water but less sol in H_2O containing ammonium salts (Péchar, C R 1901, **132** 630)

Neodymium sulphate, basic, $\text{Nd}_2\text{O}_3, \text{SO}_3$ Insol in H_2O Nearly insol in dil acids (Wohler, B 1913, **46** 1730)Insol in H_2O (Matignon, C R 1902, **134** 658)**Neodymium sulphate, $\text{Nd}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$** Solubility in 100 pts H_2O at t°

t°	pts $\text{Nd}_2(\text{SO}_4)_3$
0	9 50
16	7 05
30	5 04
50	3 72
80	2 70
100	2 21

(Muthmann and Rolig, B 1898, **31** 1728)**Neodymium hydrogen sulphate, $\text{Nd}(\text{SO}_4\text{H})_3$** (Brauner, Z anorg 1904, **38** 331)**Neodymium potassium sulphate**

Cryst modification more sol in cold than in hot H_2O (Boudouard, C R 1898, **126** 901)

Nickel sulphate, basicVery sl sol in H_2O (Berzelius)

$6\text{NiO}, 5\text{SO}_3 + 4\text{H}_2\text{O}$ (Athanasesco, C R **103** 271)

$7\text{NiO}, 7\text{H}_2\text{O}, \text{SO}_3 + 3\text{H}_2\text{O}$ Nearly insol in H_2O (Habermann, M **5** 432)

$5\text{NiO}, \text{SO}_3, 5\text{NiO}, 2\text{SO}_3$, and $5\text{NiO}, 3\text{SO}_3$ (Pickering, Chem Soc 1907, **91** 1985)

 $6\text{NiO} \text{ SO}_3$ (Stromholm C C **1906**, 1 1222)**Nickel sulphate, NiSO_4** 100 pts H_2O dissolve pts NiSO_4 at t°

2 16° 20° 23° 31°
 30 4 37 4 39 7 41 45 3 pts NiSO_4

41° 50° 53° 60° 70°
 49 1 52 54 4 57 2 61 9 pts NiSO_4

(Tobler A **95** 193)

100 pts of sat solution contain at 11 14° 28 84 at 18 20° 30 77 pts anhydrous salt (v Hauer W A B **53** 2 221)

100 pts H_2O at 112 5° dissolve 185 71 pts NiSO_4 (Griffiths)

$\text{NiSO}_4 + 7\text{H}_2\text{O}$ is sol in 3 pts H_2O at 12 5° (Tup putn)

100 pts H_2O at 15 5° dissolve 75 6 pts $\text{NiSO}_4 + 7\text{H}_2\text{O}$

Sat $\text{NiSO}_4 + \text{Aq}$ contains at

-3° +2° 5° 11° 17° 54°
 21 7 22 7 23 1 25 2 26 6 33 6% NiSO_4

68° 74° 92° 97° 110° 117° 119°
 38 2 38 7 42 4 44 2 46 5 48 8 49 4% NiSO_4

(Étard, A ch 1894, (7) 2 552)

See also below under hydrated salts

Sp gr of $\text{NiSO}_4 + \text{Aq}$ containing g $\text{NiSO}_4 + 7\text{H}_2\text{O}$ in 1000 g H_2O at 23 5°

140 5 g (= 1/2 mol) 281 421 5 562
 1 073 1 136 1 190 1 238

602 5 843 983 5 1124
 1 280 1 317 1 349 1 378

Containing NiSO_4 (anhydrous)

77 5 g (= 1/2 mol) 155 232 5 310 387 5 465
 1 079 1 153 1 224 1 292 1 358 1 421

(Gerlach, Z anal **28** 468)

Sp gr of $\text{NiSO}_4 + \text{Aq}$ at 0° S = pts NiSO_4 in 100 pts solution, S_1 = mols NiSO_4 in 100 mols solution

S	S_1	Sp gr
4 2930	0 581	1 0522
3 9591	0 476	1 0431
3 2845	0 392	1 0357
2 5043	0 297	1 0271
1 6131	0 189	1 0173
0 8327	0 097	1 0089

(Charpy, A ch (6) **29** 26)

Sp gr of $\text{NiSO}_4 + \text{Aq}$ at room temp containing

10 62 18 19 25 35% NiSO_4
 1 0925 1 1977 1 3137

(Wagner, W Ann 1883, **18** 272)Sp gr of $\text{NiSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{NiSO}_4 + \text{Aq}$	Sp gr
1-normal	1 0773
1/2- "	1 0391
1/4- "	1 0198
1/8- "	1 0017

(Wagner, Z phys Ch 1890, **5** 39)

For solubility of $\text{NiSO}_4 + \text{Na}_2\text{SO}_4$ in H_2O , see under $\text{NiSO}_4 + 7\text{H}_2\text{O}$ and $\text{NiNa}_2(\text{SO}_4)_2$
 100 pts sat $\text{NiSO}_4 + \text{ZnSO}_4 + \text{Aq}$ at 18–20° contain 35.45 pts of the two salts (v Hauer)
 Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 828)
 $\text{HC}_2\text{H}_3\text{O}_2$ precipitates it completely from aqueous solution (Persoz)
 100 pts absolute methyl alcohol dissolve 0.5 pt NiSO_4 at 18° (de Bruyn, Z phys Ch 10 783)

Solubility of $\text{NiSO}_4 \cdot 3\text{CH}_3\text{O} + 3\text{H}_2\text{O}$ in methyl alcohol at 14°

P = % anhydrous NiSO_4 in the sat solutions

Alcohol % by wt	P	In 1000 mol of the solution		
		Mol NiSO_4	Mol CH_3O	Mol H_2O
100	3 72	7 75	969	23 2
97 5	0 77	1 65	950	48 5
95	0 455	0 96	908	91
92 5	0 50	1 0	871	128
90	0 70	1 6	830	168
89	1 01	2 0	814	184
88	1 25	2 4	800	198
87	1 48	2 9	781	216
86	1 73	3 2	767	230
85	1 93	3 6	755	241

(de Bruyn, R t c 1903, 22 418)

This salt is more sol in ethyl alcohol than in methyl alcohol

See also under hydrated salts

For solubility of NiSO_4 in ethyl alcohol, see under hydrated salts

100 g sat solution in glycol contain 9.7 g NiSO_4 at ord temp (de Coninck, Bull Ac Roy Belg 1905 359)

Insol in methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate, (Naumann, B 1904, 37, 3602)

Very sl sol in acetone (Krug and M'Elroy)

Insol in acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

+ H_2O Very sl sol in abs methyl alcohol After standing in contact with it for 8–9 months, the solution contains 1.34% NiSO_4 (de Bruyn R t c 1903, 22 414)

+ $2\text{H}_2\text{O}$ Cryst from sat $\text{NiSO}_4 + \text{Aq}$ at 131° (Steele and Johnson)

+ $4\text{H}_2\text{O}$ Solubility in methyl alcohol + Aq at 10° Time = 24 hrs P = % anhydrous salt in the sat solutions

Alcohol of 100% 80% 50% 20% water
 P 7 38 0 66 1 43 14 8 25 1

(de Bruyn, R t c 1903, 22 414)

+ $6\text{H}_2\text{O}$ Two modifications α -blue, tetragonal, β -green, monoclinic

Solubility of α - $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ in H_2O at t°

Salt used	t°	g NiSO_4 in 100 g H_2O	Salt remaining
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	32 3	43 57	$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)
	33 0	43 35	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	34 0	43 84	
	35 6	43 79	
$\text{NiSO}_4 + 6\text{H}_2\text{O}$	44 7	48 05	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	44 7	47 97	
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	50 0	50 15	
	51 0	50 66	
	52 0	52 34	
	53 0	52 34	

(Steele and Johnson)

Solubility of β - $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ in H_2O at t°

Salt used	t°	g NiSO_4 per 100 g H_2O	Salt remaining
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	54 5	52 50	$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (green)
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	57 0	53 40	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$			
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	60 0	54 84	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$			
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	69 0	58 38	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	70 0	59 44	
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	73 0	60 72	
$\text{NiSO}_4 + 6\text{H}_2\text{O}$ (blue)	80 0	63 17	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$			
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	89 0	67 90	
$\text{NiSO}_4 + 7\text{H}_2\text{O}$	99 0	76 71	

(Steele and Johnson, Chem Soc 1904, 85 118)

Tr point from α - to β - salt = 53.3° (Steele and Johnson)

100 pts absolute methyl alcohol dissolve 31.6 pts $\text{NiSO}_4 + 6\text{H}_2\text{O}$ at 17°, 100 pts 93.5% methyl alcohol dissolve 7.8 pts $\text{NiSO}_4 + 6\text{H}_2\text{O}$ at 18°, 100 pts 50% methyl alcohol dissolve 1.9 pts $\text{NiSO}_4 + 6\text{H}_2\text{O}$ at 18° (de Bruyn, Z phys Ch 10 786)

α -Salt Solubility in methyl alcohol + Aq at 14° Time = 5 to 6 hrs

Alcohol % by wt	% NiSO_4	In 1000 mol of the solution		
		Mol NiSO_4	Mol CH_3O	Mol H_2O
100	12 4	26	794	180
97 5	10 6	22 3	808	170
95	6 5	14	817	169
92 5	3 06	5 9	838	156
90	1 18	2 3	821	177
85	0 315	0 57	757	242
80	0 25	0 4	688	312
60	0 46	0 8	453	546
40	2 43	3 5	265	732
20	14 7	21	105	874
0 (water)	26 0	39	0	961

(de Bruyn, R t c 1903, 22 412)

β salt Solubility in methyl alcohol + Aq at
14° Time = 24 hrs

Alcohol % by wt	% NiSO ₄	In 1000 mol of the solution		
		Mol NiSO ₄	Mol CH ₄ O	Mol H ₂ O
100	15 7	33 8	763	203
97 5	12 4	26	781	193
95	10 0	20 3	784	196
92 5	5 61	11 1	800	189
90	2 35	4 5	810	185
89	1 79			
88	1 29			
87	0 97			
86	0 735			
85	0 61	1 3	755	244
80	0 415	0 7	682	317
60	0 75	1 3	453	546
40	3 11	4 0	264	732
20	14 1	21 0	105	874
0 (water)	27 2	40 0	0	960

(de Bruyn)

+7H₂O

Solubility in 100 pts H₂O at t°, using
NiSO₄+7H₂O

t°	Pts NiSO ₄	t°	Pts NiSO ₄	t°	Pts NiSO ₄
0	29 3	33	45 5	66	63 6
1	29 7	34	46 0	67	64 1
2	30 1	35	46 5	68	64 7
3	30 5	36	47 0	69	65 3
4	31 0	37	47 5	70	65 9
5	31 5	38	48 0	71	66 5
6	32 0	39	48 5	73	67 0
7	32 5	40	49 0	72	67 6
8	33 0	41	49 6	74	68 2
9	33 5	42	50 1	75	68 8
10	34 0	43	50 6	76	69 3
11	34 5	44	51 2	77	69 9
12	35 0	45	51 7	78	70 5
13	35 5	46	52 3	79	71 1
14	36 0	47	52 8	80	71 7
15	36 5	48	53 4	81	72 3
16	37 0	49	53 9	82	72 9
17	37 5	50	54 5	83	73 5
18	38 0	51	55 0	84	74 1
19	38 5	52	55 6	85	74 6
20	39 0	53	56 1	86	75 2
21	39 5	54	56 7	87	75 8
22	40 0	55	57 3	88	76 4
23	40 5	56	57 9	89	77 0
24	41 0	57	58 4	90	77 6
25	41 5	58	59 0	91	78 2
26	42 0	59	59 6	92	78 8
27	42 5	60	60 2	93	79 4
28	43 0	61	60 7	94	80 1
29	43 5	62	61 3	95	80 7
30	44 0	63	61 9	96	81 3
31	44 5	64	62 4	97	81 9
32	45 0	65	63 0	98	82 5

Solubility in 100 pts H₂O at t° — *Continued*

t°	Pts NiSO ₄	t°	Pts NiSO ₄	t°	Pts NiSO ₄
99	83 1	103	85 6	107	88 1
100	83 7	104	86 2	108	88 7
101	84 3	105	86 8	108 4	88 7
102	84 9	106	87 5		

(Mulder, calculated from his own and Tobler's determinations, Scheik Verhandel 1864 70)

Solubility in H₂O at t°

Salt used	t°	g NiSO ₄ in 100 g H ₂ O	Salt remaining
NiSO ₄ +7H ₂ O	-5	25 74	NiSO ₄ +7H ₂ O
"	0	27 22	"
"	9	31 55	"
"	15	34 19	"
"	22 6	37 90	"
"	22 8	38 88	"
"	30 0	42 46	"
NiSO ₄ +6H ₂ O	30 0	42 47	"
NiSO ₄ +7H ₂ O	32 3	44 02	"
"	33 0	45 74	"
"	34 0	45 5	"

(Steele and Johnson, Chem Soc 1904, 85 116)

M-pt of NiSO₄+7H₂O = 98-100° (Tilden, Chem Soc 45 409)

Tr point from α -6H₂O salt to 7H₂O salt = 31 5° (Steele and Johnson)

Exists also in an unstable, more soluble modification (Fedorow, C C 1903, II 95)

Solubility of NiSO₄·7H₂O + Na₂SO₄·10H₂O
in 100 g H₂O at t°

t	grams NiSO ₄	grams Na ₂ SO ₄
0	22 46	10 09
5	25 28	15 245
10	28 26	20 64

(Koppel, Z phys Ch 1905, 52 401)
See also under NiNa₂(SO₄)₄

100 pts absolute methyl alcohol dissolve 46 pts NiSO₄+7H₂O at 17°, 100 pts absolute methyl alcohol dissolve 24 7 pts NiSO₄+7H₂O at 4°, 100 pts 93 5% methyl alcohol dissolve 10 1 pts NiSO₄+7H₂O at 4°, 100 pts 50% methyl alcohol dissolve 2 pts NiSO₄+7H₂O at 4° (de Bruyn, Z phys Ch 10 786)

Solubility in methyl alcohol+Aq at 14°
Time, 5 to 6 hrs

Alcohol % by wt	% NiSO ₄	In 1000 mol of solution		
		Mol NiSO ₄	Mol CH ₃ O	Mol H ₂ O
100	16 8	35 7	714	250
97 5	13 9	29	734	237
95	11 6	23 6	742	234 5
92 5	8 12	16 2	760	224
90	5 78	11 2	758	231
85	1 52	3	744	253
84	1 06			
83	0 985			
82	0 83			
81	0 665			
80	0 653	1 2	687	312
60	0 805	1 3	453	546
45	1 73			
40	2 78	4	264	732
35	4 55			
30	6 33			
20	13 7	20	105	875
0 (water)	26 4	39 5	0	960 5

(de Bruyn, R t c 1903, **22** 411)

100 g absolute ethyl alcohol dissolve 1.3 g NiSO₄+7H₂O at 4°, and 2 g at 17° (de Bruyn, Z phys Ch **10** 786)
Min *Morenosite*

Nickel hydrazine sulphate, NiH₂(SO₄)₂, 2N₂H₄

1 pt is sol in 275.5 pts H₂O at 18° SI sol in hot H₂O Sol in HNO₃ with decomp, insol in HCl Sol in NH₄OH+Aq (Curtius, J pr 1894, (2) **50** 331)

Nickel potassium sulphate, NiSO₄, K₂SO₄+6H₂O

Sol in 8.9 pts H₂O (Tupputi)

100 pts H₂O dissolve at

0° 10° 14° 20° 30°
5.3 8.9 10.5 13.8 18.6 pts anhydrous salt,

36° 49° 55° 60° 75°

20.4 27.7 32.4 35.4 45.6 pts anhydrous salt
(Tobler, A **95** 193)

Saturated solution contains at

20° 40° 60° 80°

8.7 12.3 17.6 22.0% anhydrous salt

(v Hauer, J pr **74** 433)

1 l H₂O dissolves 68.8 g anhydrous salt at 25° (Locke, Am Ch J 1902, **27** 459)

Nickel potassium zinc sulphate, NiSO₄, 2K₂SO₄, ZnSO₄+12H₂O

Sol in H₂O (Vohl, A **94** 51)

Nickel rubidium sulphate, NiSO₄, Rb₂SO₄+6H₂O

Sol in H₂O (Tutton, Chem Soc **63** 337)
1 l H₂O dissolves 59.8 g anhydrous salt at 25° (Locke, Am Ch J 1902, **27** 459)

Nickel sodium sulphate, NiNa₂(SO₄)₂+4H₂O

Solubility of NiNa₂(SO₄)₂ 4H₂O in 100 g H₂O at t°

t°	grams NiSO ₄	grams Na ₂ SO ₄
20	29 31	26 87
25	27 33	25 33
30	24 64	22 58
35	23 66	21 67
40	21 88	20 65

(Koppel, Z phys Ch 1905, **52** 401)

Solubility of NiNa₂(SO₄)₂ 4H₂O+NiSO₄ 7H₂O in 100 g H₂O at t°

t°	grams NiSO ₄	grams Na ₂ SO ₄	t°	grams NiSO ₄	grams Na ₂ SO ₄
18 5	30 70	25 805	30	34 98	19 825
20	31 59	25 355	35	36 01	16 435
25	33 11	23 07	40	37 935	14 295

(Koppel)

Solubility of NiNa₂(SO₄)₂ 4H₂O+Na₂SO₄ 10H₂O in 100 g H₂O at t°

t°	grams NiSO ₄	grams Na ₂ SO ₄
18 5	26 14	29 455
20	24 07	31 365
25	18 81	37 13
30	9 87	44 25

(Koppel)

Solubility of NiNa₂(SO₄)₂ 4H₂O+Na₂SO₄ (anhydrous) in 100 g H₂O at t°

t°	grams NiSO ₄	grams Na ₂ SO ₄
35	7 13	49 595
40	7 245	49 03

(Koppel)

Nickel thallium sulphate, NiSO₄, Tl₂SO₄+6H₂O

Easily sol in H₂O Can be recryst from little H₂O without decomp (Werther, J pr **92** 132)

1 l H₂O dissolves 46.1 g anhydrous salt at 25° (Locke, Am Ch J 1902, **27** 459)

Nickel zinc sulphate, NiSO₄, ZnSO₄+13H₂O

Sol in 3-4 pts cold H₂O Insol in alcohol (Tupputi, **1811**)

Completely sol in NH₄OH+Aq
2NiSO₄, 2ZnSO₄, H₂SO₄ (Étard, C R **87** 602)

Nickel sulphate ammonia, $\text{NiSO}_4 \cdot 6\text{NH}_3$

Sol in H_2O with separation of hydroxide (Rose, Pogg **20** 151)

$\text{NiSO}_4 \cdot 5\text{NH}_3 + 3\frac{1}{2}\text{H}_2\text{O}$ Deliquescent (André, C R **106** 936)

$\text{NiSO}_4 \cdot 4\text{NH}_3 + 2\text{H}_2\text{O}$ Easily sol in H_2O
Can be recrystallized out of little H_2O Insol even in dil alcohol (Erdmann)

Nickel sulphate cupric oxide, $\text{NiSO}_4 \cdot 2\text{CuO} + 6\text{H}_2\text{O}$

(Mailhe, Bull Soc 1902, (3) **27** 172)
 $2\text{NiSO}_4 \cdot 3\text{CuO} + 10\text{H}_2\text{O}$, and $+12\text{H}_2\text{O}$ (Mailhe)

$5\text{NiSO}_4 \cdot 16\text{CuO} + x\text{H}_2\text{O}$ (Recoura, C R 1901, **132** 1415)

$\text{NiSO}_4 \cdot 20\text{CuO} + x\text{H}_2\text{O}$ (Recoura)

Nickel sulphate, hydrazine, $\text{NiSO}_4 \cdot 3\text{N}_2\text{H}_4$

Ppt (Curtius, J pr 1894, (2) **50** 343)

Nickel sulphate hydroxylamine, $\text{NiSO}_4 \cdot 6\text{NH}_2\text{OH}$

Decomp by H_2O (Uhlenhut, A 1899, **307** 334)

Nitrosyl sulphate, $\text{H}(\text{NO})\text{SO}_4$

See Nitrosulphonic acid

Osmious sulphate

Easily sol in H_2O and alcohol

Osmic sulphate

Sol in H_2O (Berzelius)

Palladous sulphate, basic, $\text{PdSO}_4 \cdot 7\text{PdO} + 6\text{H}_2\text{O}$, and $10\text{H}_2\text{O}$

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$ (Kane)

Palladous sulphate, $\text{PdSO}_4 \cdot 2\text{H}_2\text{O}$

Deliquescent in moist air, very sol in H_2O , but decomp by much H_2O , with separation of a basic salt (Kane)

Phosphoryl sulphate, $(\text{PO})_2(\text{SO}_4)_2$ (?)

Possible composition of Weber's (B **20** 86) P_2O_5 , 3SO_3 (?)

$3\text{P}_2\text{O}_5 \cdot 2\text{SO}_3$ Immediately decomp by H_2O (Adie, C N 1891, **63** 102)

Platmic sulphate, $\text{Pt}(\text{SO}_4)_2$

Deliquescent Sol in H_2O , alcohol, or ether, also in H_3PO_4 , HCl , and $\text{HNO}_3 + \text{Aq}$ (Berzelius)

$\text{H}_2\text{PtO}_5 \cdot 2\text{H}_2\text{O}$ Sol in H_2O (Blondel, A ch 1905, (8) **6** 109)

$\text{PtO}_2 \cdot \text{SO}_3 + 4\text{H}_2\text{O}$ Ppt Decomp by H_2O Sol in H_2SO_4

$\text{PtSO}_4(\text{OH})_2 \cdot 4\text{Pt}(\text{OH})_4 + 3\text{H}_2\text{O}$ Ppt (Prost, Bull Soc (2) **46** 156)

$\text{Pt}_5\text{SO}_4\text{O}_{13} + 16\text{H}_2\text{O}$ As above (Prost)

Platinum hydroxylamine sulphate,

Only sl sol in H_2O , sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Uhlenhut, A 1900, **311** 123)

Platmic potassium sulphate, basic

Insol in boiling H_2O , HNO_3 , H_2SO_4 , H_3PO_4 , $\text{HC}_2\text{H}_3\text{O}_2$, or $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in boiling $\text{HCl} + \text{Aq}$ Sl decomp by aqua regia (E Davy)

$\text{Pt}_{10}(\text{SO}_4)_2\text{O}_{10} \cdot 3\text{K}_2\text{SO}_4 + 34\text{H}_2\text{O}$ Insol in H_2O (Prost, Bull Soc (2) **46** 156)

$\text{Pt}_{18}(\text{SO}_4)_3\text{O}_{22} \cdot 5\text{K}_2\text{SO}_4 + 34\text{H}_2\text{O}$ As above (Prost)

Platinum rubidium sulphate, $\text{Pt}_6\text{Rb}_8(\text{SO}_4)_4 + 17\text{H}_2\text{O}$

Sol in H_2O (Prost, Bull Soc (2) **46** 156)

Platinum sulphate sulphocarbamide, $\text{PtSO}_4 \cdot 4\text{CS}(\text{NH}_2)_2$

Insol in H_2O Sol in conc H_2SO_4 without decomp (Kurnakow J pr 1894, (2) **50**, 489)

Potassium sulphate, K_2SO_4

Not hygroscopic in the ordinary sense of the word 100 pts K_2SO_4 over H_2O at $14-20^\circ$ absorb 58 pts H_2O in 22 days, and finally deliquesce completely (Mulder)

12 pts K_2SO_4 mixed with 100 pts H_2O lower the temp 3.3° (Rudorff, B **2** 68)

100 pts H_2O dissolve with absorption of heat at 0°

8.36 pts K_2SO_4 (Gay-Lussac)

8.46 " (Mulder)

8.5 " (Gerardin)

7.31 " (Moller, Pogg **117** 386)

7.3-7.9 " (Nordenskiöld, Pogg **136** 314)

100 pts H_2O at 0° dissolve 8.36 pts K_2SO_4 at 12.72°
10.57 pts at 49.08° 16.91 pts at 63.90° 19.29 pts at 101.50° 26.33 pts (Gay Lussac A ch (2) **11** 311)

Solubility in 100 pts H_2O at t°

t°	Pts K_2SO_4	t°	Pts K_2SO_4
0	7.8	47.0	16.0
15.65	10.3	70.2	20.3
28.1	12.8	98.0	23.9

(Nordenskiöld Pogg **136** 341)

100 pts sat K_2SO_4 at 101.7° contain 17.5 pts K_2SO_4 or 100 pts H_2O at 101.25° dissolve 21.212 pts K_2SO_4 (Griffiths)

100 pts H_2O at 102.8° dissolve 29 pts K_2SO_4 (Penny) at 15° 7.3.6.25 pts (Ure's Dict) at 100° 20 pts (Ure's Dict) at 100° 24.2 pts (Wenzel)

Sol in 9.081 pts H_2O at 15° (Gerlach) in 16 pts at 15° and 5 pts at 100° (Berzelius) in 18 pts cold and 5 pts boiling H_2O in 12 pts H_2O at 0° and 4 pts boiling H_2O (M R and P) in 12 pts H_2O at 18.75° (Abt)

K_2SO_4 sat at 15° has sp gr = 1.0774 and contains 10.055 pts K_2SO_4 up 100 pts H_2O (Michel and Krafft A ch (3) **41** 478)

100 pts H_2O dissolve 9.26 pts K_2SO_4 at 15.6° , and sat solution has sp gr = 1.177 (Page and Keightley, Chem Soc (2) **10** 566)

Solubility in 100 pts H₂O at t°

t°	Pts K ₂ SO ₄	t°	Pts K ₂ SO ₄	t°	Pts K ₂ SO ₄
0	8 5	35	13 1	70	19 8
1	8 6	36	13 3	71	20 0
2	8 7	37	13 4	72	20 2
3	8 8	38	13 6	73	20 4
4	9 0	39	13 8	74	20 6
5	9 1	40	14 0	75	20 8
6	9 2	41	14 2	76	21 0
7	9 3	42	14 3	77	21 2
8	9 4	43	14 5	78	21 4
9	9 5	44	14 7	79	21 6
10	9 7	45	14 9	80	21 8
11	9 8	46	15 1	81	22 0
12	9 9	47	15 3	82	22 2
13	10 0	48	15 5	83	22 4
14	10 2	49	15 6	84	22 6
15	10 3	50	15 8	85	22 8
16	10 4	51	16 0	86	23 0
17	10 5	52	16 2	87	23 2
18	10 7	53	16 4	88	23 4
19	10 8	54	16 6	89	23 6
20	10 9	55	16 8	90	23 9
21	11 1	56	17 0	91	24 1
22	11 2	57	17 2	92	24 3
23	11 3	58	17 4	93	24 5
24	11 5	59	17 6	94	24 7
25	11 6	60	17 8	95	25 0
26	11 7	61	18 0	96	25 2
27	11 9	62	18 2	97	25 5
28	12 0	63	18 4	98	25 7
29	12 2	64	18 6	99	25 9
30	12 3	65	18 8	100	26 2
31	12 5	66	19 0	101	26 4
32	12 6	67	19 2	102	26 6
33	12 8	68	19 4	102 25	26 75
34	13 0	69	19 6		

(Mulder, calculated from his own and other experiments, Scheik Verhandel **1864** 50)

If solubility S=pts anhydrous salt in 100 pts of solution, S=7.5+0.1070t from 0° to 163°. Solubility from 163° to 220° is constant at 25 (Étard, C R **106** 208)

Solubility of K₂SO₄ in 100 pts H₂O at t°

t°	Pts K ₂ SO ₄	t	Pts K ₂ SO ₄	t°	Pts K ₂ SO ₄
16	9 76	39	14 21	120	26 5
20	10 30	54	17 39	143	28 8
28	12 59	98	23 91	170	32 9
36	13 28				

(Tilden and Shenstone, Phil Trans **1884** 23)

Solubility of K₂SO₄ in H₂O 100 pts H₂O dissolve at

4 3° 18 4° 69 9°
8 16 10 8 19 7 pts K₂SO₄

(Andreae, J pr (2) **29** 456)

100 ccm H₂O dissolve 12 04 g K₂SO₄ at 25° (Trevor, Z phys Ch **7** 468)

Sat K₂SO₄+Aq contains at

21° 23° 60° 99° 130°
10 1 10 3 14 5 19 1 21 1% K₂SO₄,

130° 152° 175° 195° 220°
21 3 22 8 24 5 23 8 24 6% K₂SO₄

(Étard, A ch **1894**, (7) **2** 549)

Solubility of K₂SO₄ in H₂O at t°

G K₂SO₄ per 100 g H₂O

t°	K ₂ SO ₄	Sp gr	t°	K ₂ SO ₄	Sp gr
0 40	7 47	1 0589	58 95	18 01	1 1089
15 70	10 37	1 0770	74 85	20 64	1 1157
31 45	13 34	1 0921	89 70	22 80	1 1194
42 75	15 51	1 1010	101 1*	24 21	1 1207

*=b-pt

(Berkeley, Phil Trans Roy Soc **1904**, **203** A, 189)

100 g H₂O dissolve 0 133 gram-equivalent K₂SO₄ at 25° (Van't Hoff and Meyerhoffer, Z phys Ch **1904**, **49** 315)

1 l sat K₂SO₄+Aq at 25° contains 0 617 mols K₂SO₄ (Herz Z anorg **1911**, **73** 274)

Solubility of K₂SO₄ in H₂O at t°

t°	% K ₂ SO ₄
4 78	7 82
30 05	11 43
54 20	14 77
68 90	16 40

(Le Blanc and Schmandt, Z phys Ch **1911**, **77** 614)

100 g H₂O dissolve 12 10 g K₂SO₄ at 25° (Amadori, Rend Acc Linc **1912**, (5) **21** II 667)

Solubility of K₂SO₄ in H₂O at various pressures Figures denote pts K₂SO₄ contained in 100 pts sat K₂SO₄+Aq at t° and A pressure in atmospheres

A	0°	15°	15 5°	16 2°
1	6 81	9 14	9 24	9 35
20	7 14		9 44	9 54
30	7 14			

(Moller, Pogg **117** 386)

Sat K₂SO₄+Aq boils at 101 5°, and contains 26 33 pts K₂SO₄ to 100 pts H₂O (Gay-Lussac), at 101 7°, and contains 21 2 pts K₂SO₄ to 100 pts H₂O (Griffiths), at 102 25°, and contains 26 75 pts K₂SO₄ to 100 pts H₂O (Mulder), boils at 103° (Kremers)

Crust forms at 101 7°, and solution contains 25 3 pts K₂SO₄ to 100 pts H₂O, highest

temp observed, 102 1° (Gerlach, Z anal **26** 426)

B-pt of K_2SO_4 +Aq containing pts K_2SO_4 to 100 pts H_2O

B pt	Pts K_2SO_4	B pt	Pts K_2SO_4
100 5°	7	102°	30 0
101 0	14 5	102 1	31 6
101 5	22 1		

(Gerlach, Z anal **26** 430)

Sp gr of K_2SO_4 at 19 5°

% K_2SO_4	Sp gr	% K_2SO_4	Sp gr
2 401	1 0193	9 264	1 0783
4 744	1 0385	10 945	1 0909
6 988	1 0568		

(Kremers Pogg **95** 120)

Sp gr and B pt of K_2SO_4 +Aq at 12 5°

Pts K_2SO_4 to 100 pts H_2O	Sp gr	B pt	Pts K_2SO_4 to 100 pts H_2O	Sp gr	B pt
1	1 0079	100 38°	6	1 0456	101 12
2	1 0151	100 63°	7	1 0524	101 25°
3	1 0231	100 75°	8	1 0599	101 25°
4	1 0305	100 88°	9	1 0676	101 38°
5	1 0391	101°	10	1 0735	101 5°

(Brandes and Gruner **1827**)

K_2SO_4 +Aq sat at 8° has 1 072 sp gr (Anthon, A **24**, 211)

K_2SO_4 +Aq saturated at 12° contains 10 38% K_2SO_4 and has sp gr 1 0716 (Struve, Zeit Ch (2) **5** 323), saturated at 15° contains 11 01% K_2SO_4 and has sp gr 1 0831 (Gerlach), saturated at 18 75° contains 10 74% K_2SO_4 and has sp gr 1 0798 (Kars-ten)

Sp gr of K_2SO_4 +Aq at 15°

% K_2SO_4	Sp gr	% K_2SO_4	Sp gr	% K_2SO_4	Sp gr
1	1 0082	5	1 0410	8	1 0664
2	1 0163	6	1 0495	9	1 0750
3	1 0245	7	1 0579	9 92	1 0830
4	1 0328				

(Gerlach, Z anal **8** 287)

Sp gr of K_2SO_4 +Aq at 18°

% K_2SO_4	Sp gr
5	1 0395
10	1 0815

(Kohlrausch, W Ann **1879** 1)

Sp gr of K_2SO_4 +Aq at 15°/15° a=pts K_2SO_4 in 100 pts of the solution, b=pts K_2SO_4 in 100 pts H_2O

a	b	Sp gr
1	1 010	1 00808
3	3 093	1 02447
5	5 263	1 04091
7	7 527	1 05776
9	9 890	1 07499
9 92	11 013	1 08305

(Gerlach, Z anal **28** 493)

Sp gr of K_2SO_4 +Aq at 20° containing 0 5 mol K_2SO_4 to 100 mols H_2O =1 03758, containing 1 mol K_2SO_4 to 100 mols H_2O =1 06744 (Nicol, Phil Mag (5) **16** 122)

Sp gr of K_2SO_4 +Aq at 25°

Concentration of K_2SO_4 +Aq	Sp gr
1-normal	1 0664
$1/2$ "	1 0338
$1/4$ "	1 0170
$1/8$ "	1 0084

(Wagner, Z phys Ch 1890, **5** 37)

K_2SO_4 +Aq containing 67% K_2SO_4 has sp gr 20°/20°=1 0549 (Le Blanc and Rohland, Z phys Ch 1896, **19** 278)

Sp gr of K_2SO_4 +Aq at 20 1°, when p=per cent strength of solution, d=observed density, w=volume conc in gr per cc ($\frac{pd}{100}=w$)

p	d	w
9 83	1 0800	0 10615
8 172	1 0657	0 08708
6 779	1 0539	0 07144
5 021	1 0394	0 05218
3 127	1 0238	0 03202
2 508	1 0186	0 02554
1 448	1 0100	0 01463
1 079	1 0070	0 01087
1 047	1 0066	0 01053
0 455	1 0018	0 00456

(Barnes, J phys Chem 1898, **2** 543)

Sp gr of K_2SO_4 +Aq at 18°

$\frac{1}{2}$ K_2SO_4 g equiv per l	Sp gr at 18
0 8327	1 0567
0 7975	1 0539
0 6688	1 0456
0 5029	1 0344
0 5016	1 0340
0 2508	1 0173
0 01001	1 0006

(McKay, Elektrochem Zeit 1899, **6** 115)

Sp gr of sat K_2SO_4 +Aq at t°

t°	g K_2SO_4 sol in 100 g H_2O	Sp gr
0	7 35	1 058
10	9 22	1 069
20	11 11	1 081
30	12 97	1 089
40	14 76	1 097
50	16 50	1 106
60	18 17	1 114
70	19 75	1 121

(Tscherna], J Russ phys Chem Soc 1912,
44 1565)Sol in conc acids, not pptd by glacial
 $HClH_3O_2$ Insol in KOH +Aq of 1 35 sp gr
(Liebig, A 11 262)Solubility of K_2SO_4 in H_2SO_4 +Aq at 18° .

Mols per 100 mols solution		Solid phase
$K SO_4$	H_2SO_4	
1 10	0	K_2SO_4
1 59	0 95	"
2 49	2 70	"
2 75	3 17	$K_2SO_4, KHSO_4$
2 75	3 74	"
2 83	5 08	"
2 80	5 79	$K_2SO_4, 3KHSO_4$
2 61	5 61	$K_2SO_4, 6KHSO_4$
2 25	6 19	" + $KHSO_4$
1 08	7 94	$KHSO_4$
0 77	9 2	"
0 44	22 7	"

(Stortenbecker, R t c 1902, 21 407)

Solubility in H_2SO_4 +Aq at 0°

1000 g of the solution contain		Solid phase
Mols $H SO_4$	Mols $K SO_4$	
0 37	0 59	$K SO_4$
0 75	0 55	"
1 08	0 64	"
1 13	0 74	$K SO_4 + K H(SO_4)_2$
1 44	0 73	$K H(SO_4)_2$
1 66	0 71	"
1 66	0 69	"
1 89	0 66	$K H(SO_4)_2 + K H$
1 88	0 69	"
2 15	0 59	$K a + K b$
2 12	0 61	"
2 29	0 54	$K b$
2 30	0 53	$K b + KHSO_4$
2 33		"
2 48	0 43	$KHSO_4$
3 08	0 28	"
4 45	0 12	"
5 27	0 09	"

These results show that at 0° there existbetween $K_2H(SO_4)_2$ and $KHSO_4$, two acid
sulphates, K_a and K_b K_a is probably
 $K_2SO_4, 3KHSO_4$ and K_b is probably K_2SO_4 ,
 $6KHSO_4$

(D'Ans, Z anorg 1909, 63 228)

3 1 mols K_2SO_4 are sol in absolute H_2SO_4
at 25° (Bergius, Z phys Ch 1910, 73 353)Solubility in H_2SO_4 +Aq at 25°

Millimols H_2SO_4 in 10 ccm	Millimols K_2SO_4 in 10 ccm
	6 17
3 97	8 92
7 57	10 82
14 35	14 86

(Herz, Z anorg 1912, 73 276)

Solubility in H_2SO_4 +Aq at 25°

In 1000 g of the solution		Solid phase
Mols SO_3	Mols $K SO_4$	
6 42	0 171	$KHSO_4$
6 60	0 190	"
6 91	0 266	$KHSO_4 + K H_2(SO_4)_2, H_2O$
7 26	0 182	"
7 62	0 157	"
7 88	0 167	"
8 00	0 201	"
8 10	0 250	$K H_3(SO_4)_2, H_2O$
8 15	0 352	"
8 16	0 364	$K H_1(SO_4)_2, H_2O + K H_3(SO_4)_2$
8 29	0 341	"
8 33	0 322	"
8 45	0 325	"
8 62	0 346	"
8 57	0 384	$K H_4(SO_4)_2$
8 71	0 412	"
8 82	0 553	$K H_4(SO_4)_2$
8 65	0 880	$K H_3(SO_4)_2 + KHSO_4$
8 63	0 899	$KHSO_4$ (metastable solution)
8 70	0 882	"
8 96	0 561	"
9 80	0 365	"
9 78	0 430	"
9 80	0 665	$KHSO_4$
9 66	0 904	"
9 66	0 937	"

(D'Ans, Z anorg 1913, 80 239)

Pptd from K_2SO_4 +Aq by NH_4OH +Aq
(Sullivan)

Solubility of K_2SO_4 in $NH_4OH + Aq$ at 20°

G NH_3 in 100 ccm H_2O	G K_2SO_4 in 100 ccm H_2O
0	10 804
6 08	4 100
15 37	0 828
24 69	0 140
31 02	0 042

(Girard, Bull Soc (2) 43 522)

1 l sat solution in H_2O contains 105.7 g K_2SO_4 at 20° , in $NH_4OH + Aq$ (5.2% NH_3), 45.2 g (Konowalow, J Russ Phys Chem Soc 1894, 31 985)

Solubility of K_2SO_4 in $KOH + Aq$ at 25°

In 1000 g of the solution

Mols K_2SO_4	Mols $(KOH)_2$
0 617	0 0
0 433	0 258
0 280	0 433
0 137	1 13
0 035	2 86
0 009	3 42
~ ~	4 809

einer, Z anorg 1910, 67 438)

Sol in sat $NH_4Cl + Aq$ without pptn (See NH_4Cl)

Sl sol in sat $KCl + Aq$ without pptn
100 g sat $KCl + Aq$ at 25° dissolve 0.0167 g equiv K_2SO_4 at 25° (Van't Hoff and Meyerhoffer Z phys Ch 1904 49 315)

Sl sol in sat $KNO_3 + Aq$ without causing pptn

1 l of the solution contains 50.7 g $K_2SO_4 + 216.5$ g $KNO_3 = 267.2$ g mixed salts at 15°
Sp gr $K_2SO_4 + KNO_3 + Aq = 1.165$

1 l of the solution contains 47.66 g $K_2SO_4 + 308.5$ g $KNO_3 = 356.2$ g mixed salts at 25°
Sp gr of $K_2SO_4 + KNO_3 + Aq = 1.210$ (Euler, Z phys Ch 1904, 49 313)

See also under KNO_3

Sol in sat $NaNO_3 + Aq$ without causing pptn at first, but soon KNO_3 is pptd (Karsten) (See $NaNO_3$)

Sol in $(NH_4)_2SO_4 + Aq$ with pptn of $(NH_4)_2SO_4$ (Rudorff, B 6 485) (See $(NH_4)_2SO_4$)

More sol in aqueous solutions of other salts, as Na_2SO_4 , $MgSO_4$, $CuSO_4$, etc., than in pure H_2O (Pfaff, A 99 227)

Sol in sat $Na_2SO_4 + Aq$, $MgSO_4 + Aq$, $NaCl + Aq$ (See $MgSO_4$ and $NaCl$)

Solubility of K_2SO_4 in $Na_2SO_4 + Aq$

Temp = 34°		Temp = 60°	
% Na_2SO_4	% K_2SO_4	% Na_2SO_4	% K_2SO_4
0	11.9	0	15.3
7.1	10.7	6.6	13.9
31.4	4.3	27.1	8.2
33.1	0	31.3	0

(Nacken, B A B 1910 1016)

100 g H_2O sat with both K_2SO_4 and Li_2SO_4 dissolve

4.74 g $Li_2SO_4 + 10.3$ g K_2SO_4 at 15°
11.5 g " + 16.4 g " " 62°
18.52 g " + 26.2 g " " 100°

(Rabe, Z anorg 1902, 31 156)

Sl sol in sat $ZnSO_4$ or $CuSO_4 + Aq$ with separation of double salt

100 pts H_2O dissolve 8.5 + 0.12 pts K_2SO_4 . On addition of a K salt, K_2SO_4 is pptd. The amount of K_2SO_4 remaining in solution plus the amt of K in the salt added is a constant (Blarez, C R 112 939)

Solubility of $K_2SO_4 + Th(SO_4)_2$ at 16° Solid phase, $Th(SO_4)_2$

Pts per 100 pts H_2O		Pts per 100 pts H_2O	
K_2SO_4	$Th(SO_4)_2$	K_2SO_4	$Th(SO_4)_2$
0 000	1 390	1 487	0 870
0 424	1 667	1 633	0 635
1 004	2 193	1 844	0 370
1 152	3 191	2 512	0 128
1 224	2 514	3 092	0 070
1 283	2 222	4 050	0 027
1 348	1 706	4 825	0 003
1 378	1 637		

(Barre, C R 1911, 150 1555)

Difficultly sol in 20% $K_2C_2H_3O_2 + Aq$ (Stromeyer)

Solubility in K acetate + Aq at 21°

Composition of the solution		
% K acetate	% K_2SO_4	H ₂ O
6 11	6 65	87.24
8 68	5 09	86.23
11 29	3 99	84.72
15 59	2 35	82.06
20 12	1 23	78.61
29 95	0 39	69.66

The solid phase in these solutions is K_2SO_4 (Fox, Chem Soc 1909, 95 58)

100 g hydroxylamine dissolve 3.5 g K_2SO_4 at $17-18^\circ$ (de Bruyn, Z phys Ch 1892, 10 782)

Easily sol in liquid HF (Franklin, Z anorg 1905 46 2)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Neither dissolved nor attacked by liquid NO_2 (Frankland, Chem Soc 1901, 79 1361)

Insol in absolute alcohol

Insol in alcohol, the sp gr of which is 0.905 (Anthon)

Solubility in dil alcohol increases with the temp

100 pts alcohol of 0.939 sp gr (53% by vol, 45% by weight) dissolve at

4° 8° 60°
0.16 0.21 0.92 pts K_2SO_4

(Gerardin, A ch (4) 5 147)

100 pts of the sat solution at 15° in alcohol of

10 20 30 40% by weight,
contain 3.9 1.46 0.56 0.21 pts K_2SO_4
(Schiff, A 118 362)

Solubility in acetic acid + Aq at 25°

Concentration of the acetic acid Mol/Liter	Solubility of K_2SO_4 Mol/Liter
0.000	0.6714
0.070	0.6619
0.137	0.6559
0.328	0.6350
0.578	0.6097
1.151	0.5556
2.183	0.4743

(Rothmund and Wilsmore, Z phys Ch 1902, 40 620)

Solubility in phenol + Aq at 25°

Concentration of the phenol Mol/Liter	Solubility of K_2SO_4 Mol/Liter
0.000	0.6714
0.016	0.6650
0.021	0.6614
0.032	0.6598
0.040	0.6555
0.047	0.6522
0.064	0.6502
0.076	0.6494
0.127	0.6310
0.152	0.6251
0.236	0.6042
0.252	0.5956
0.308	0.5834
0.409	0.5572
0.464	0.5480
0.486	0.5425
0.495	0.5389
0.498 (saturated)	0.5377

(Rothmund and Wilsmore, Z phys Ch 1902, 40 619)

100 g 95% formic acid dissolve 36.5 g K_2SO_4 at 21° (Aschan, Ch Ztg 1913, 37 1117)

Solubility in organic substances + Aq at 25°

Organic substance	Composition of the solutions		
	% organic substance	% K_2SO_4	% H ₂ O
Alcohol	1.35	9.17	89.48
	4.80	6.90	88.30
	7.80	4.96	87.24
	9.70	4.32	85.98
	12.34	3.57	84.09
	14.51	2.71	82.78
	15.26	2.66	82.08
	20.50	1.83	77.67
	26.91	0.97	72.12
	35.97	0.41	63.62
	43.90	0.22	55.88
	69.26	0.016	30.72
Pyridine	4.23	7.95	87.82
	13.90	4.77	81.33
	24.51	2.75	72.74
	34.19	1.47	64.34
	46.29	0.45	53.26
	55.93	0.12	43.95
	75.90	0.006	24.09
Ethylene glycol	3.16	9.67	87.17
	9.89	7.69	82.53
	18.47	5.74	75.79
	32.11	3.57	64.32
	49.03	1.83	49.14
Chloral hydrate	6.44	9.13	84.43
	9.09	8.41	82.50
	12.38	7.79	79.83
	13.20	7.31	79.49
	22.07	5.88	72.05
	33.15	4.54	62.31
	44.40	3.36	52.24
	47.30	2.92	49.78
	62.82	2.00	35.18
	70.28	1.75	27.97
Glycerol	80.36	1.40	18.24
	85.26	1.08	13.66
	8.96	8.87	82.17
	13.36	7.69	78.95
	20.34	6.47	73.19
	24.15	5.83	70.02
	33.73	4.44	61.83
	40.40	3.65	55.95
	43.52	3.38	53.10
	50.18	2.69	47.13
Mannitol	57.22	2.07	40.71
	67.94	1.53	30.53
	78.18	0.98	20.84
	98.28	0.73	0.99
	3.20	10.32	86.48
	5.82	10.07	84.11
	8.35	9.61	82.04
	11.26	9.19	79.55
	14.30	8.66	77.04
	17.22	8.35	74.43

Solubility in organic substances + Aq at 25° —
Continued

Organic substance	Composition of the solutions		
	% organic substance	% K_2SO_4	% H_2O
Sucrose	9 56	9 65	80 79
	18 55	8 65	72 80
	28 16	7 42	64 42
	37 24	6 35	56 41
	47 55	5 21	47 24
	57 00	4 24	38 76
Acetone	4 92	7 20	87 88
	10 06	5 02	84 92
	16 23	2 96	80 81
	24 31	1 50	74 19
	37 19	0 47	62 34
	46 29	0 20	53 51
	62 40	0 03	37 57

(Fox and Gage, Chem Soc 1910, **97** 381)

Sol in 76 pts glycerine of 1.225 sp gr at ordinary temp (Vogel, N Rept **16** 557)

Insol in acetone (Krug and M'Elroy, Eidman, C C **1899**, II 1014)

Insol in CS_2 (Arcowski, Z anorg 1894, **6** 257), benzonitrile (Naumann, B 1914, **47** 1370), methyl acetate (Naumann, B 1909 **42** 3790) ethyl acetate (Naumann

104 g K_2SO_4 + 219 0

5°, or 100 g sat solution con-
 O_4 + 66 74 g sugar (Kohler,

and 1897, **47** 447)

Glycerite

+ $\frac{1}{2}H_2O$ 100 pts H_2O dissolve 9 82 pts (Ogier, C R **82** 1055)

Tripotassium hydrogen sulphate, $K_3H(SO_4)_2$
Sol in H_2O

Potassium hydrogen sulphate, $KHSO_4$

1 07 pts $KHSO_4$ (= 1 pt $K_2S_2O_7$) dissolve

at 0° in 2 95 pts H_2O

" 20° " 2 08 "

" 40° " 1 59 "

" 100° " 0 88 "

(Kremers, Pogg **92** 497)

Sp gr of $KHSO_4$ + Aq at 15° containing

5 10 15 % $KHSO_4$,

1 0354 1 0726 1 1116

20 25 27% $KHSO_4$

1 1516 1 1920 1 2110

(Kohlrausch, W Ann **1879** 1)

Sat solution boils at 105 5° (Griffiths), **108** (Kremers)

Alcohol dissolves out H_2SO_4

K_2SO_4 crystallises from dilute solutions

100 g 95% formic acid dissolve 14 6 g $KHSO_4$ at 19 3° (Aschan, Ch Ztg 1913, **37** 1117)

Insol in methyl acetate (Naumann B 1909, **42**, 3790)

Mm Mismite

+ $5\frac{1}{2}H_2O$ Deliquescent (Senderens, Bull Soc (3) **2** 278)

Potassium dihydrogen sulphate, $K_2H_2(SO_4)_2$

Sol in H_2O (Phillips, Phil Mag **1** 429)

Composition is $4K_2O$, $7SO_3$ + $3H_2O$, according to Berthelot (A ch (4) **30** 442)

Potassium trihydrogen sulphate, $KH_3(SO_4)_2$

Sol in H_2O with rise of temperature (Schultz, Pogg **133** 137)

+ $1\frac{1}{2}H_2O$ (Lescœur, C R **78** 1044)

Potassium disulphate (pyrosulphate), $K_2S_2O_7$

When dissolved in exactly the necessary amount of hot H_2O for solution, it crystallises on cooling without decomp. Decomp by excess of H_2O (Jacquelin, A ch **70** 311)

Insol in methyl acetate (Naumann, B 1909 **42** 3790)

Potassium hydrogen disulphate, KHS_2O_7

Sol in fuming H_2SO_4 without decomposition

Potassium octosulphate, $K_2S_8O_{25}$

Decomp by H_2O (Weber)

Potassium praseodymium sulphate, $3K_2SO_4$, $Pr_2(SO_4)_3 + H_2O$

Sl sol in H_2O

Sol in conc HCl and HNO_3 (Von Scheele Z anorg 1898, **18** 358)

Potassium rhodium sulphate, $3K_2SO_4$, $Rh_2(SO_4)_3$

Does not exist (Eidm, C R **107** 234)

K_2SO_4 , $Rh_2(SO_4)_3 + 24H_2O$ Very sol in H_2O (Piccini, Z anorg 1901, **27** 66)

Potassium samarium sulphate, $9K_2SO_4$, $2Sm_2(SO_4)_3 + 3H_2O$

Sl sol in H_2O

Sl sol in sat K_2SO_4 + Aq

1 l sat K_2SO_4 + Aq dissolves 0 5 g Sm_2O_3 (Cleve, Bull Soc (2) **43** 166)

Potassium scandium sulphate, $3K_2SO_4$, $Sc_2(SO_4)_3$

Very slowly sol in cold, more easily sol in warm H_2O Insol in sat K_2SO_4 + Aq

Sol in H_2O and in dil K_2SO_4 + Aq (Meyer, Z anorg 1914, **86** 279)

$2K_2SO_4$, $Sc_2(SO_4)_3$ Sol in K_2SO_4 + Aq (Cleve)

Does not exist (Nilson)

Potassium sodium sulphate, $3K_2SO_4$, Na_2SO_4

100 pts H_2O dissolve 40 8 pts at 103 5° (Penny, Phil Mag (4) **10** 401)

$5K_2SO_4$, Na_2SO_4 100 pts H_2O at 100° dissolve 25 pts, at 12 7°, 10 1 pts, at 4 4°, 9 2 pts (Gladstone, Chem Soc **6** 111)

Potassium strontium sulphate, $K_2Sr_2(SO_4)_2$ Decomp by $(NH_4)_2CO_3 + Aq$ (Rose Pogg 93 604) $K_2SO_4, SrSO_4$ This is the only double salt formed from these two components between 0° and 100° 100 pts of the sat solution in equilibrium with $SrSO_4$ and the double salt contain at17.5° 50° 75° 100°
1.27 188 271 3.9 pts K_2SO_4

(Barre, C R 1909, 149 292)

Potassium tellurium sulphate, $KHSO_4, 2TeO_2, SO_3 + 2H_2O$

(Metzner, A ch 1898, (7) 15 203)

Potassium terbium sulphateEasily sol in H_2O Sl sol in $K_2SO_4 + Aq$ Delafontaine, Zeit Chem (2) 2 230)**Potassium thallic sulphate, $KTI(SO_4)_2 + 4H_2O$** Decomp by H_2O (Fortini, Gazz ch t 1905, 35 (2) 453) $2K_2O, TI_2O_3, 4SO_3$ Insol in H_2O Very difficultly sol in warm dil $H_2SO_4 + Aq$ Strecker, A 135 207)**Potassium thorium sulphate, $K_2SO_4, Th(SO_4)_2 + 4H_2O$** Sol in hot H_2O containing a few drops HCl (Barre, A ch 1911, (8) 24 227) $2K_2SO_4, Th(SO_4)_2 + 2H_2O$ Slowly sol in old, easily and abundantly in hot H_2O , and is gradually decomp by boiling Easily sol in acids Insol in alcohol (Berzelius) $3.5K_2SO_4, Th(SO_4)_2$ Insol in $K_2SO_4 + Aq$ if con contrations above 4.5% (Barre) $4K_2SO_4, Th(SO_4)_2 + 2H_2O$ (Chydenius)**Potassium tin (stannous) sulphate, $K_2SO_4, SnSO_4$**

(Marignac)

Potassium tin (stannic) sulphate, $K_2Sn(SO_4)_2$ Easily sol in H_2O with decomp

Sol in HCl (Weinland, Z anorg 1907, 54 250)

Potassium tin (stannous) sulphate chloride, $4K_2SO_4, 4SnSO_4, SnCl_2$ Can be recrystallised from H_2O (Marignac, Ann Min (5) 12 62)**Potassium titanium sulphate, $K_2SO_4, Ti(SO_4)_2 + 3H_2O$** Difficultly sol in H_2O or $HCl + Aq$ Decomp by much H_2O (Wallace, Pogg 102 453)**Potassium titanyl sulphate, $2K_2SO_4, 3TiO, SO_4 + 10H_2O$** Very sol in H_2O with decomp Insol in conc H_2SO_4 (Rosenheim, Z anorg 1901, 26 251) $K_2SO_4, TiO_2SO_4 + 7H_2O$ Very hygroscopic and sol in H_2O (Mazzuchelli and Pontanelli, C C 1909, II 420) $K_2SO_4, (TiO)SO_4$ (Spence, C C 1901, II 747)**Potassium uranous sulphate, $K_2SO_4, U(SO_4)_2 + H_2O$** Very sl sol in H_2O (Rammelsberg)**Potassium uranyl sulphate, $K_2SO_4, (UO_2)SO_4 + 2H_2O$** Sol in 9 pts H_2O at 22° and in 0.51 pt at 100° Insol in alcohol (Ebelmen, A ch (3) 5 211)100 pts of aqueous solution sat at 25° contain 10.5 pts salt, at 70.5° contain 23.93 pts salt (Rimbach, B 1904, 37. 478) $+ 3H_2O$ (de Coninck, Chem Soc 1905, 88 (2) 394) $2K_2SO_4, (UO_2)SO_4 + 2H_2O$ Decomp by H_2O Cannot be cryst from rather conc H_2SO_4 , as it is completely decomp by it (Rimbach, B 1905, 38 1572) $K_2O, 2UO_3, 3SO_3$ Ppt Identical with UO_2, OK, SO_3H of Scheller, (A 1867, 144 238) (Kohlschutter, A, 1900, 311. 11) $2K_2SO_4, 3(UO_2)SO_4 + H_2O$ Sol in H_2O Insol in alcohol (Berzelius)

Does not exist (Ebelmen)

Potassium vanadium sulphate, $K_2O, V_2O_5, 2SO_3 + 6H_2O = K(VO_2)SO_4 + 3H_2O$

(Friedheim, B 24 1183)

 $= KVO_3, K_2SO_4, V_2O_5, 2SO_3 + 9H_2O$ of Munzing (Berlin, Dissert 1889). $K_2SO_4, VSO_4 + 6H_2O$ Sol in H_2O (Piccini, Z anorg 1902, 32 61) $K_2V_2(SO_4)_4 + 24H_2O$ 100 pts H_2O dissolve 198.4 pts salt at 10° Sp gr of sat solution at $4^\circ/20^\circ = 1.782$ (Piccini, Z anorg 1897, 13 446)**Potassium vanadyl sulphate,** $K_2SO_4, (VO)_2(SO_4)_2$ Very slowly sol in H_2O , still less sol in dil alcohol (Gerland) $K_2SO_4, VOSO_4 + 3H_2O$ Easily sol in H_2O Sol in alcohol + conc H_2SO_4 (Koppcl, Z anorg 1903, 35 178) $K_2SO_4, 2VOSO_4$ Very hygroscopic Very sol in H_2O but goes into solution slowly (Koppcl and Behrendt, B 1901, 34 3935)Easily sol in H_2O (Koppcl, Z anorg 1903, 35 174)**Potassium yttrium sulphate, $4K_2SO_4, Y_2(SO_4)_3$** Sol in 16 pts cold H_2O , and in 10 pts sat $K_2SO_4 + Aq$, and more abundantly if the latter solution contains ammonium salts or free acid (Berlin) $3K_2SO_4, 2Y_2(SO_4)_3$ 100 ccm cold sat

$K_2SO_4 + Aq$ dissolve an amount of this salt corresponding to 4.685 g Y_2O_3 (Cleve)

Potassium zinc sulphate, $K_2SO_4 \cdot ZnSO_4 \cdot 6H_2O$

Sol in 5 pts cold H_2O (Bucholz N J Pharm 9 26)

100 pts H_2O dissolve at

0° 10° 15° 25° 36°

12.6 18.7 22.5 28.8 39.9 pts hydrous salt,

45° 50° 58° 65° 70°

51.2 54.0 67.6 81.3 87.9 pts hydrous salt

(Tobler, A 95 193)

100 pts H_2O at 15° dissolve 14.8 pts K_2SO_4 , $ZnSO_4 \cdot 6H_2O$, sp gr of sat H_2O solution at 15° = 1.0939 (Schiff, A 109 326)

1 l H_2O dissolves 131.9 g anhydrous salt at 25° (Locke, Am Ch J 1902, 27 459)

Potassium zirconium sulphate, $2K_2O \cdot 6ZrO_3 \cdot 7SO_3 \cdot 9H_2O$

Decomp by H_2O

$3K_2O \cdot 3ZrO_3 \cdot 7SO_3 \cdot 9H_2O$ Insol in H_2O
 $Zr_2O_3 \cdot (KSO_4)_2 \cdot 8H_2O$ Ppt (Rosenheim, B 1905, 38 815)

Potassium sulphate vanadate

Very difficultly sol in H_2O Insol in alcohol (Berzelius)

Potassium sulphate antimony trifluoride

See Antimony trifluoride potassium sulphate

Praseodymium sulphate, basic, $(PrO)_2SO_4$

Insol in H_2O (Matignon, C R 1902, 134 660)

Insol in H_2O Nearly insol in dil acids (Wöhler, B 1913, 46 1730)

Praseodymium sulphate, $Pr_2(SO_4)_3$

Sol in H_2O , very hydropscopic 23.64 pts are sol in 100 pts H_2O at 0° and 17.7 pts at 20° (von Scheele, Z anorg 1898, 18 357-358)

+5 H_2O Sol in H_2O (von Scheele, Z anorg 1898, 18 357)

Difficultly sol in H_2O (Kraus, Zeit Kryst 1901, 34 400)

1.50 pts $Pr_2(SO_4)_3$ are sol in 100 pts H_2O at 85°, 1.45 pts at 90°, and 1.02 pts at 95° (Muthmann and Rolig, B 1898, 31 1729)

+8 H_2O (Kraus, Zeit Kryst 1901, 34 406)

Sol in H_2O (von Scheele, Z anorg 1898, 18 357)

Solubility in H_2O at t°

t	Pts $Pr_2(SO_4)_3$
0	19.79
18	14.10
35	10.31
55	7.09
75	4.13

(Muthmann and Rolig, B 1898, 31 1727)

+15½ H_2O Sol in H_2O (von Scheele Z anorg 1898, 18 357)

Praseodymium hydrogen sulphate, $Pr(SO_4)H$

(Brauner, Z anorg 1904, 38 330)

Solubility in boiling conc H_2SO_4 100 g of the solution contain 1.02 g of the acid sulphate (Matignon, C R 1902, 134 659)

Radium sulphate

Less sol in H_2O than corresponding Ba comp (Curie, Dissert 1903)

Rhodium sulphate, $Rh_2(SO_4)_3 \cdot 12H_2O$

Easily sol in H_2O (Berzelius)

Sl sol in, but not decomp by H_2O who not more than 16 pts H_2O are present to pt salt. Decomp by hot H_2O to—

$Rh_2(SO_4)_3$, Rh_2O_3 Insol in H_2O (Leidit C R 107 234)

Rhodium rubidium sulphate, $Rh_2(SO_4)_3 \cdot Rb_2SO_4 \cdot 24H_2O$

Sol in H_2O , m-pt, 108-109° (Piccini Z anorg 1901, 37 65)

Rhodium thallium sulphate, $Rh_2(SO_4)_3 \cdot Tl_2SO_4 \cdot 24H_2O$

Very sol H_2O (Piccini, Z anorg 1901 37 69)

Rhodium sodium sulphate, $Rh_2Na_2(SO_4)_4$

Insol in H_2SO_4 or aqua regia (Seuber and Kobbe, B 23 2560)

Rubidium sulphate, Rb_2SO_4

100 pts H_2O dissolve 42.4 pts at 10 (Bunsen)

100 cc H_2O at 17-18° dissolve 44.7 g Rb_2SO_4 (Tutton, Chem Soc 1894, 65 632)

Sat $Rb_2SO_4 + Aq$ contains at

3° 20°
27.4 32.5% Rb_2SO_4 ,

37° 170°
37.3 43.9 49.2% Rb_2SO_4
(Étard, A ch 1894, (7) 2 550)

Solubility of Rb_2SO_4 in H_2O at t°

t°	g Rb_2SO_4 per 100 g		t°	g Rb_2SO_4 per 100 g	
	H_2O	solution		H_2O	solution
0	36 4	27 3	60	67 4	40 3
10	42 6	29 9	70	71 4	41 7
20	48 2	32 5	80	75 0	42 9
30	53 5	34 9	90	78 7	44 0
40	58 5	36 9	100	81 8	45 0
50	63 1	38 7	102 4*	82 6	45 2

* B-pt at 742 4 mm

(Berkeley, calc by Seidell, Solubilities, 2nd Ed, p 587)

Sp gr of $\text{Rb}_2\text{SO}_4 + \text{Aq}$ sat at $10^\circ = 1.2978$
(Erdmann, Arch Pharm 1894, 232 16)G-equiv salt per l. at $18^\circ = 0.501$ 1.01Sp gr $6^\circ/6^\circ$ 1.05587 1.11047" $18^\circ/18^\circ$ 1.05496 1.10896" $30^\circ/30^\circ$ 1.05433 1.10810G-equiv salt per l at $18^\circ = 2.043$ 3.168Sp gr $6^\circ/6^\circ$ 1.21888 1.33276" $18^\circ/18^\circ$ 1.21613 1.32912" $30^\circ/30^\circ$ 1.21443 1.32750

(Clausen, W Ann 1914, (4) 44 1071)

10 ccm of sat $\text{Rb}_2\text{SO}_4 + \text{absolute } \text{H}_2\text{SO}_4$
contain approx 5.881 g Rb_2SO_4 (Bergius,
Z phys Ch 1910, 72 355)Insol in methyl acetate (Naumann, B
1909, 42 3790), acetone (Naumann, B 1904,
37 4329, Erdmann, C C 1899, II 1014)**Rubidium pyrosulphate, $\text{Rb}_2\text{S}_2\text{O}_7$** Decomp by H_2O **Rubidium octosulphate, $\text{Rb}_2\text{S}_8\text{O}_{25}$** Decomp by H_2O (Weber, B 17 2497)**Rubidium hydrogen sulphate, RbHSO_4** Sol in H_2O **Rubidium tin (stannic) sulphate, $\text{Rb}_2\text{Sn}(\text{SO}_4)_3$** Decomp by H_2O Sol in HCl (Wein-
land, Z anorg 1907, 54 250)**Rubidium thallic sulphate, $\text{RbTl}(\text{SO}_4)_2$**

(Marshall, C C 1902, II 1089)

 $+4\text{H}_2\text{O}$ (Fortini, Gazz ch it 1905, 35
(2) 455)**Rubidium thorium sulphate, $\text{Rb}_2\text{SO}_4 \cdot \text{Th}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$** Sl sol in H_2O (Manuelli, Gazz ch it
1903, 32 (2) 523)**Rubidium titanium sulphate, $\text{Rb}_2\text{SO}_4 \cdot \text{Ti}_2(\text{SO}_4)_3 + 24\text{H}_2\text{O}$** Sol in H_2O acidified with H_2SO_4 De-
comp in neutral aq solution (Piccini, Z
anorg 1898, 17 359)Insol in H_2O Sol in HCl Insol in
 H_2SO_4 Decomp by boiling with conc
 H_2SO_4 (Stahler, B 1905, 38 2623)**Rubidium uranyl sulphate, $\text{Rb}_2(\text{UO}_2)(\text{SO}_4)_2 + 2\text{H}_2\text{O}$** Somewhat less sol in H_2O than K salt
(Rimbach, B 1904, 37 479)**Rubidium vanadium sulphate, $\text{Rb}_2\text{V}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$** 0.177 gram mols of anhydrous salt are
sol in 1 l H_2O (Locke, Am Ch J 1901,
26 175)Insol in H_2O Insol in H_2SO_4 Decomp by boiling with
conc H_2SO_4 Sol in HCl (Stahler, B 1905, 38 3980)100 pts H_2O dissolve 2.56 pts salt at 10° Sp gr of solution at $4^\circ/20^\circ = 1.915$ (Pic-
cini, Z anorg 1897, 13 446)**Rubidium zinc sulphate, $\text{Rb}_2\text{SO}_4 \cdot \text{ZnSO}_4 + 6\text{H}_2\text{O}$** Sol in H_2O (Bunsen and Kopp, Pogg
113 337)1 l H_2O dissolves 101 g anhydrous salt
at 25° (Locke, Am Ch J 1902, 27 459)**Rubidium zirconium sulphate, $\text{Zr}_2\text{O}_3 \cdot (\text{RbSO}_4)_2 + 15\text{H}_2\text{O}$**

Ppt (Rosenheim, B 1905, 38 815)

Ruthenic sulphate, $\text{Ru}(\text{SO}_4)_2$ Deliquescent, and easily sol in H_2O
(Claus, A 59 246)**Samarium sulphate, basic, $(\text{SmO})_2\text{SO}_4$** Insol in H_2O and in cold dil H_2SO_4
(Matignon, C R 1905, 141 1231)**Samarium sulphate, $\text{Sm}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$** Difficultly sol in H_2O Much less sol than $\text{D}_{12}(\text{SO}_4)_3 + 8\text{H}_2\text{O}$
(Cleve)2.05 pts anhydrous salt are sol in 100 pts
 H_2O at 25° (Keyes and James, J Am
Chem Soc 1914, 36 635)100 g $\text{Sm}_2(\text{SO}_4)_3 + \text{Aq}$ sat at 25° contain
3.426 g anhyd $\text{Sm}_2(\text{SO}_4)_3$ (Wirth, Z anorg
1912, 76 174)Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25° n = equiv g of H_2SO_4 in 1 l of solventc = g Sm_2O_3 in 100 g of solution c_1 = g $\text{Sm}_2(\text{SO}_4)_3$ in 100 g of solution

n	c	c_1	n	c	c_1
0	2 029	3 426	2 16	1 43	2 416
0 1	2 038	3 441	6 175	0 416	0 7025
0 505	1 985	3 352	12 6	0 0656	0 1107
1 1	1 821	3 075			

(Wirth, Z anorg 1912, 76 174)

Solubility in $(\text{NH}_4)_2\text{SO}_4 + \text{Aq}$ at 25°

Solid phase	
	$\text{Sm}_2(\text{SO}_4)_3$
J 7 / 4 9 5 8 7 8 8 2 2 2 3 2 5 46 3 40 3 77 5 77 2 77 3 76 8	$\text{Sm}_2(\text{SO}_4)_3, (\text{NH}_4)_2\text{SO}_4, 7\text{H}_2\text{O}$
	$(\text{NH}_4)_2\text{SO}_4$

and James, J Am Chem Soc 1914,
36 637)Solubility in $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 25°

Pts Na_2SO_4 per 100 pts H_2O	Pts $\text{Sm}_2(\text{SO}_4)_3$ per 100 pts H_2O	Solid phase
0 1	2 0	$\text{Sm}_2(\text{SO}_4)_3$
0 5	0 11	"
1 9	0 03	$2\text{Sm}_2(\text{SO}_4)_3, 3\text{Na}_2\text{SO}_4 + 6\text{H}_2\text{O}$
6 44	0 016	"
7 00	0 008	"
9 02	0 016	"
10 51	0 012	"
11 48	0 012	"
13 58	0 010	"
14 71	0 010	"
14 47	0 009	"
20 02	0 012	"
23 42	0 012	"
23 68	0 018	"
25 93	0 015	"
27 40	0 011	"

These results seem to indicate that there is only one double salt formed by the union of $\text{Sm}_2(\text{SO}_4)_3$ with Na_2SO_4 . Formula of this salt is $2\text{Sm}_2(\text{SO}_4)_3, 3\text{Na}_2\text{SO}_4, 6\text{H}_2\text{O}$

(Keyes and James, J Am Chem Soc 1914,
36 635)**Samarium hydrogen sulphate, $\text{Sm}(\text{HSO}_4)_3$** Sl sol in H_2O (Matignon, C R 1905,
141 1230)

Ppt (Brauner, Z anorg 1904, 38 331)

Samarium sodium sulphate, $\text{Sm}_2(\text{SO}_4)_3$, $\text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ Sl sol in sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ (Cleve, Bull
Soc (2) 43 166) $2\text{Sm}_2(\text{SO}_4)_3, 3\text{Na}_2\text{SO}_4 + 6\text{H}_2\text{O}$ Only double
salt formed at 25° (Keyes and James, J
Am Chem Soc 1914, 36 365)**Scandium sulphate, basic, $\text{Sc}_2\text{O}(\text{SO}_4)_2$**

(Crookes, Roy Soc Proc 1908, 80 A, 518)

Scandium sulphate, $\text{Sc}_2(\text{SO}_4)_3$ *Anhydrous* Easily sol in H_2O $+2\text{H}_2\text{O}$ $+5\text{H}_2\text{O}$, 54.61 g of pentahydrate are sol
in 100 cc H_2O at 25° (Wirth, Z anorg 1914,
87 10)Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

$\text{H}_2\text{SO}_4 + \text{Aq}$	g $\text{Sc}_2(\text{SO}_4)_3$ in 100 g of the solution
0 00	28 52
0 5-n	29 29
1 0-n	19 87
4 86-n	8 363
9 73-n	1 315

In 22.35-n H_2SO_4 the solid phase is
 $\text{Sc}_2(\text{SO}_4)_3, 3\text{H}_2\text{SO}_4$ and 100 g sat solution
contain 0.484 g $\text{Sc}_2(\text{SO}_4)_3$

(Wirth, Z anorg 1914, 87 10)

 $+6\text{H}_2\text{O}$ Extremely sol in H_2O , but not
deliquescent**Scandium hydrogen sulphate, $\text{Sc}_2(\text{SO}_4)_3 +$
 $3\text{H}_2\text{O}$**

(Wirth)

Scandium sodium sulphate, $\text{Sc}_2(\text{SO}_4)_3$, $3\text{Na}_2\text{SO}_4 + 12\text{H}_2\text{O}$ Sol in H_2O (Cleve) $+10\text{H}_2\text{O}$ Sol in H_2O and in excess of
 $\text{Na}_2\text{SO}_4 + \text{Aq}$ (Meyers, Z anorg 1914, 86
279)**Silver (argentoargentic) sulphate, Ag_2SO_4 ,** $\text{Ag}_2\text{SO}_4 + \text{H}_2\text{O}$ Gradually sol in conc, but not attacked
by dil, $\text{HNO}_3 + \text{Aq}$ Not attacked by hot
conc H_2SO_4 (Lea, Sill Am J 144 322)**Silver sulphate, Ag_2SO_4** Sol in 200 pts cold and less than 100 pts boiling
 H_2O (Wittstein)Sol in 88 pts boiling H_2O in 87.25
pts boiling H_2O (Wenzel) in 11 at 100°
(Kremers)100 pts H_2O at 15.5° dissolve 11.0 pts Ag_2SO_4
(Ure & Di et.)Sol in 160 pts H_2O at 18.75° (Abl)11 H_2O dissolves 2.57×10^{-2} g-mol Ag_2SO_4
at 25° (Drucker, Z anorg 1901, 28 362)11 H_2O dissolves 7.707 g Ag_2SO_4 at 17°
(Euler, Z phys Ch 1904, 49 314)11 H_2O dissolves 0.0267 mol Ag_2SO_4 at
 25° (Rothmund, Z phys Ch 1909, 69 539)11 H_2O dissolves 8.35 g Ag_2SO_4 at 25°

(Hill and Simmons, Z phys Ch 1909, 67 603)

1 l H₂O dissolves 8 344 g Ag₂SO₄ at 25°
Sp gr of solution = 1 0052 (Harkins, J
Am Chem Soc 1911, 33 1812)

Solubility in H₂O at t°

t°	Pts Ag ₂ SO ₄ in 100 pts of the solution
14 5	0 730
33	0 909
51 5	1 062
75	1 237
100	1 393

(Barre, A ch 1911, (8) 24 211)

More sol in H₂SO₄+Aq than in pure H₂O
Still more sol in HNO₃+Aq and still more in
conc H₂SO₄, from which it is pptd by H₂O
(Schnaubart)

Solubility in H₂SO₄+Aq at 25°

½H ₂ SO ₄ +Aq Normality	Solubility of Ag ₂ SO ₄ g mol per litre
0 02	2 60×10 ⁻²
0 04	2 64×10 ⁻²
0 10	2 71×10 ⁻²
0 20	2 75×10 ⁻²

(Drucker, Z anorg 1901, 28 362)

Solubility of Ag₂SO₄ in acids+Aq at 25°

C = concentration of acid in acid+Aq in milliequivalents per l

S = Solubility of Ag₂SO₄ in acid+Aq in milliequivalents per l

Acid	C	S
HNO ₃	0 0	53 98
	15 89	59 86
	31 78	65 32
	63 57	75 90
H ₂ SO ₄	0 0	53 98
	29 02	54 88
	58 02	55 64
	105 26	56 82

(Swan, J Am Chem Soc 1911, 33 1814)

Solubility in HNO₃+Aq at 25°

Normality HNO ₃	Sp gr of the solution	g Ag ₂ SO ₄ dissolved per l
0 000	1 0054	8 350
1 0046	1 061	34 086
2 0452	1 1069	49 010
4 017	1 1871	71 166
4 209	1 1956	73 212
5 564	1 2456	84 609
8 487	1 3326	94 671
10 034	1 3676	90 806

(Hill and Simmons, Z phys Ch 1909, 67 603)

Sol in NH₄OH, and (NH₄)₂CO₃+Aq

100 pts H₂O dissolve 0 58 pt at 18° 100
pts (NH₄)₂SO₄+Aq (15%) dissolve 0 85 pt
Ag₂SO₄ at 18° Other sulphates have little
effect (Eder, J pr (2) 17 44)

Determinations of the solubility of Ag₂SO₄
in (NH₄)₂SO₄ at temp between 16 5° and 100°
show that no double salt is formed by these
two sulphates (Etard, A ch 1911, (8) 24.
221)

Solubility of Ag₂SO₄ in (NH₄)₂SO₄+Aq

G per 100 g H₂O

(NH ₄) ₂ SO ₄	Ag ₂ SO ₄	(NH ₄) ₂ SO ₄	Ag ₂ SO ₄
Temp = 33°		Temp = 51°	
8 85	1 101	8 90	1 362
15 90	1 331	16 27	1 680
22 22	1 500	22 43	1 887
27 25	1 585	32 10	2 061
30 80	1 619	35 38	2 095
35 88	1 627	39 03	2 082
39 46	1 600	42 37	2 055
43 22	1 557	45 05	2 026
Temp = 75°		Temp = 100°	
8 80	1 758	9 23	2 221
15 23	2 155	15 00	2 626
22 30	2 490	22 01	3 075
28 25	2 734	27 00	3 325
32 00	2 823	34 90	3 663
35 82	2 889	38 70	3 772
41 16	2 929	44 15	3 854
46 46	2 902	47 63	3 867

(Barre, A ch 1911, (8) 24 149, 202, 210)

Solubility of Ag₂SO₄ in K₂SO₄+Aq

G per 100 g H₂O

K SO ₄	Ag SO ₄	K ₂ SO ₄	Ag ₂ SO ₄
Temp = 33°		Temp = 51°	
3 22	0 863	3 20	1 023
5 62	0 940	5 61	1 127
8 37	1 046	8 40	1 247
10 41	1 117	10 55	1 340
11 80	1 177	13 16	1 450
		14 37	1 524
Temp = 75°		Temp = 100	
3 12	1 273	3 23	1 488
5 73	1 406	5 60	1 675
8 43	1 554	8 45	1 890
10 55	1 665	11 30	2 115
13 17	1 806	15 07	2 410
17 06	2 021	18 53	2 677

(Barre, A ch 1911, (8) 24 149, 202, 210)

Solubility in $K_2SO_4 + Aq$ at 25°

$\frac{1}{2}K_2SO_4 + Aq$ Normality	Solubility of Ag_2SO_4 g mol per litre
0.02	2.46×10^{-2}
0.04	2.36×10^{-2}
0.10	2.31×10^{-2}
0.20	2.32×10^{-2}

(Drucker, Z anorg 1901, 28 362)

Solubility in $Na_2SO_4 + Aq$ at t°

t°	Ag_2SO_4 in 100 pts H_2O	Na_2SO_4 in 100 pts H_2O
14.5	0.741 0.904 1.003	5.278 10.103 13.045
33	0.972 1.150 1.320 1.448 1.548 1.570 1.549 1.462 1.199 0.932	5.345 10.056 15.185 20.093 25.412 29.556 34.732 39.447 44.693 46.976
51	1.173 1.377 1.572 1.705 1.787 1.802 1.727 1.540 1.188 0.882	5.407 10.116 15.146 20.247 25.196 29.230 34.625 39.302 42.914 44.464
75	1.458 1.697 1.934 2.075 2.161 2.138 1.910 1.603 1.156	5.368 9.813 15.260 19.978 25.556 29.662 35.278 38.944 41.365
100	1.651 2.012 2.312 2.351 2.260 2.012 1.687 1.158	5.336 10.153 15.532 25.451 29.714 34.718 38.635 40.160

Up to 33° , the solubility of Ag_2SO_4 in $Na_2SO_4 + Aq$ increases with the concentration of Na_2SO_4 , above 33° the solubility of Ag_2SO_4 rises to a maximum at a certain concentration of Na_2SO_4 dependent on the temp. The

solubility curves for various temp all end at a concentration of 40% Na_2SO_4 , that is, the mixed crystals formed at this concentration are equally sol at all temp

(Barre, C R 1910, 150 1323)

Solubility in $Na_2SO_4 + Aq$ at t°

t°	100 pts H_2O dissolve	
	Na_2SO_4	Ag_2SO_4
18	0.0 0.25 0.51 0.74 1.00 1.48 2.01 2.50 3.04 4.00 4.99 10.10 13.04	0.766 0.712 0.682 0.675 0.665 0.670 0.673 0.689 0.703 0.736 0.768 0.932 1.028
33	0.0 0.25 0.51 0.75 0.98 1.50 2.01 2.48 3.00	0.917 0.861 0.835 0.825 0.816 0.820 0.832 0.849 0.867
51	0.00 0.25 0.49 0.68 1.02 1.51 1.90 2.46 2.92 3.95	1.081 1.032 1.010 0.000 0.995 1.002 1.017 1.034 1.053 1.103
75	0.00 0.20 0.47 0.80 0.98 1.52 1.96 2.50 2.98 4.08	1.267 1.215 1.208 1.206 1.210 1.222 1.238 1.269 1.296 1.366
100	0.00 0.50 1.01 1.44 1.94 3.02	1.404 1.341 1.363 1.382 1.418 1.494

(Barre, A ch 1911, (8) 24 215)

Solubility in salts + Aq at 25°

C = concentration of salt in salt + Aq in milliequivalents per l

$d_1 = \text{sp gr } 25^\circ/4^\circ \text{ of salt + Aq}$

S = solubility of Ag_2SO_4 in salt + Aq expressed in milliequivalents per l

$d_2 = \text{sp gr } 25^\circ/4^\circ \text{ of } \text{Ag}_2\text{SO}_4 + \text{salt} + \text{Aq}$

Salt	C	d_1	S	d_2
none			53 52	
KNO_3	24 914	0 9986	57 70	1 0072
	49 774	1 0002	61 13	1 0092
	99 870	1 0034	67 93	1 0034
$\text{Mg}(\text{NO}_3)_2$	24 764	0 9985	59 44	1 0073
	49 595	0 9999	64 32	1 0094
	99 460	1 0026	72 70	1 0133
AgNO_3	24 961	1 0007	39 09	1 0065
	49 86	1 0044	28 45	1 0084
	99 61	1 0112	16 96	1 0137
K_2SO_4	25 024	0 9989	50 66	1 0064
	50 044	1 0006	49 35	1 0079
	100 0	1 0041	48 04	1 0112
	200 03	1 0110	48 30	1 0180
MgSO_4	20 22	0 9984	52 21	1 0061
	50 069	1 0002	50 93	1 0079
	100 04	1 0032	49 95	1 0105
	200 05	1 0092	49 60	1 0164

(Harkins, J Am Chem Soc 1911, **33** 1813)

Solubility of Ag_2SO_4 in salts + Aq at 25°

C = concentration of salt in salt + Aq in milliequivalents per l

S = solubility of Ag_2SO_4 in salt + Aq in milliequivalents per l

Salt	C	S
KHSO_4	0 0	53 98
	52 64	52 18
	105 26	51 76
K_2SO_4	0 0	53 98
	27 18	50 90
	54 34	49 30

(Swan, J Am Chem Soc 1911, **33** 1814)

Decomp by alkali thiosulphates + Aq (Herschell)

100 ccm $\text{Ag}_2\text{SO}_4 + \text{Ag}_2\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$ sat at 17° contain 3 95 g Ag_2SO_4 and 8 30 g $\text{Ag}_2\text{C}_2\text{H}_3\text{O}_2$ and solution has sp gr = 1 0094 (Euler, C C 1904, I 1316)

Insol in liquid NH_3 (Franklin, Am. Ch J 1898 **20** 829)

Solubility in organic compds + Aq at 25°

Solvent	Mol Ag_2SO_4 sol in 1 litre
Water	0 0267
0 5-N Methyl alcohol	0 0249
" Ethyl alcohol	0 0228
" Propyl alcohol	0 0218
" Tert amyl alcohol	0 0204
" Acetone	0 0220
" Ether	0 0206
" Formaldehyde	0 0227
" Glycol	0 0259
" Glycerine	0 0263
" Mannitol	0 0297
" Glucose	0 0283
" Sucrose	0 0270
" Urea	0 0303
" Dimethylpyrone	0 0216
" Urethane	0 0227
" Formamide	0 0270
" Acetamide	0 0253
" Acetonitrile	0 0525
" Glycocoll	0 0433
" Acetic acid	0 0252
" Phenol	0 0379
" Chloral	0 0233
" Methylal	0 0205
" Methyl acetate	0 0212

(Rothmund, Z phys Ch 1909, **69** 539)

Insol in methyl acetate (Bezold, Dissert 1906, Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1904, **37** 3601), liquid methylamine (Franklin, J Am Chem Soc 1906, **28** 1420), acetone (Naumann, B 1904, **37** 4329, Eidmann, C C 1899, II 1014)

Very sol in a hot mixture of H_2SO_4 and monobrombenzene, less sol in cold (Couper, A ch (3) **52** 311)

Silver hydrogen sulphate, AgHSO_4

Decomp by H_2O , sol in H_2SO_4 (Stas) $\text{Ag}_2\text{O}, 3\text{H}_2\text{O}, 4\text{SO}_3 + 2\text{H}_2\text{O} = \text{Ag}_2\text{H}_4(\text{SO}_4)_2 + \text{H}_2\text{O}$ As above (Schultz, Pogg **133** 137) $2\text{Ag}_2\text{O}, 3\text{H}_2\text{O}, 5\text{SO}_3 + 2\text{H}_2\text{O} = \text{Ag}_4\text{H}_4(\text{SO}_4)_5 + 2\text{H}_2\text{O}$ As above (Schultz)

Silver pyrosulphate, $\text{Ag}_2\text{S}_2\text{O}_7$

Decomp by H_2O (Weber, B **17** 2497)

Silver thallic sulphate, $\text{AgTl}(\text{SO}_4)_2$

(Lepsius, Chem Ztg **1890** 1327)

Silver tin (stannic) sulphate, $\text{Ag}_2\text{Sn}(\text{SO}_4)_2 + 3\text{H}_2\text{O}$

Ppt Decomp by H_2O Sol in HCl (Weinland, Z anorg 1907, **54** 250)

Silver sulphate acetylde, $\text{Ag}_2\text{SO}_4, 2\text{Ag}_2\text{C}_2$

(Plimpton, Proc Chem Soc 1892, **8** 109)

Silver sulphate ammonia, $\text{Ag}_2\text{SO}_4 \cdot 2\text{NH}_3$

Completely sol in H_2O (Rose, Pogg 20 153)

$\text{Ag}_2\text{SO}_4 \cdot 4\text{NH}_3$ Easily sol in H_2O or $\text{NH}_4\text{OH} + \text{Aq}$ without decomp (Mitscherlich)

Silver sulphate mercuric oxide, $\text{Ag}_2\text{SO}_4 \cdot \text{HgO}$

Insol in H_2O , but decomp even in the cold
Sol in HNO_3 and H_2SO_4 (Finci, Gazz ch it 1911, 41 (2) 548)

Silver sulphate sulphide, $\text{Ag}_2\text{SO}_4 \cdot \text{Ag}_2\text{S}$

Decomp by hot H_2O or cold $\text{HCl} + \text{Aq}$
Sol in boiling $\text{HNO}_3 + \text{Aq}$ (Poleck and Thümmel, B 16 2435)

Sodium sulphate, Na_2SO_4 **Anhydrous**

1 pt Na_2SO_4 is sol in 7 367 pts H_2O at 15° (Gerlach)
in 5 52 pts H_2O at 13.3° (Poggendorf) in 10 pts H_2O at 13° and in 3 pts H_2O at 62.2° (Wenzel)
100 pts H_2O at 0° dissolve 5 155 pts Na_2SO_4 (Pfaff A 99 226) at 100.6° dissolve 45 985 pts Na_2SO_4 (Griffiths)

See below for further data

+7 H_2O Efflorescent Insol in alcohol

See below for further data

+10 H_2O

$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is sol in H_2O with absorption of heat, 20 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ mixed with 100 pts H_2O at 12.5° lower the temperature 6.8° (Rüdorff, B 2 68)

Sol in 2 33 pts H_2O at 19° or 100 pts H_2O at 19° dissolve 42 3 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ (Schiff A 109 326)

100 pts H_2O dissolve a pts Na_2SO_4 and b pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ at t°

t°	a	b	t°	a	b
0	5 02	12 17	33 88	50 04	312 11
11 67	10 12	26 38	40 15	48 78	291 44
13 30	11 74	31 33	45 04	47 81	276 91
17 91	16 73	48 28	50 40	46 82	262 35
25 05	28 11	99 48	59 79	45 42	
28 76	37 35	161 53	70 61	44 35	
30 75	43 05	215 77	84 42	42 96	
31 84	47 37	270 22	103 17	42 65	
32 73	50 65	322 12			

(Gay Lussac A ch (2) 11 312)

Maximum solubility is at 33° from experiment and theoretical considerations. At this temp $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is converted into Na_2SO_4 (Kopp A 34 271)

100 pts H_2O at t° dissolve pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$

t°	Pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	t°	Pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	t°	Pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$
2 5	11 39	37 50	294 04	75	241 68
7 5	16 38	43 75	261 04	81 25	217 20
12 5	29 03	50	285 06	87 50	220 65
18 75	70 78	56 25	248 11	93 75	225 46
25	143 38	62 5	222 22	100	241 69
31 25	479 97	68 75	242 88		

(Brandes and Furnhaber 1824)

1 pt $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is sol in 6 1 pts H_2O at 7.5° 3 44 pts at 12.5° 2 41 pts at 18.75° and 1 724 pts at 20° (Karsten.)

1 pt $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is sol in 2 86 pts cold and 0 8 pt boiling H_2O (Bergmann) in 3 pts cold and 0 5 pt boiling H_2O (Wittstein) in 4 pts cold and 1 pt boiling H_2O (Fourcroy) in 3 pts H_2O at 18.75° (Abl.)
100 pts H_2O dissolve 12 494 pts Na_2SO_4 or 35 492 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ at 15° and sp gr of solution = 1 10847 (Michel and Krafft A ch (3) 41 478)

100 pts H_2O dissolve 39 4 pts cryst salt at 15.5° 80 pts cryst salt at 100° (Ure's Dict)

100 pts H_2O dissolve pts Na_2SO_4 at t°

t°	Pts Na_2SO_4	t°	Pts Na_2SO_4
0	4 53	24 1	25 92
17 9	16 28	33	50 81

(Diacon, J B 1866 61)

Solubility of Na_2SO_4 in H_2O at various pressures and temp Pts Na_2SO_4 contained in 100 pts sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ at A pressure in atmos and t° are given

A	0°	15°	15.4°	A	15°
1	4 40	11 32	11 4	30	10 05
20	4 53	10 78	10 74	40	10 33

(Möller, Pogg 117 386)

The solubility of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ increases with the temperature from 0 to 34° . At 34° and above, it is converted into the anhydrous salt, the solubility of which is least at 103.17° , which is the boiling point of the saturated solution, and increases by cooling from that temp down to $18-17^\circ$. Below the latter temperature the anhydrous salt cannot exist in the presence of H_2O , but is converted into $\text{Na}_2\text{SO}_4 + 7\text{H}_2\text{O}$, or $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$. The solubility of $\text{Na}_2\text{SO}_4 + 7\text{H}_2\text{O}$ increases with the temperature from $0-26^\circ$, and at 27° it is converted into the anhydrous salt.

Thus there are two different rates of solubility for Na_2SO_4 for temperatures from $0-18^\circ$, three different rates from $18-26^\circ$, two from $26-34^\circ$, and only one above 34° .

1 By heating $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ to fusion and raising the heat until the liquid boils, placing in a closed vessel and cooling, the greater part of the anhydrous salt, which separates out on heating, redissolves on cooling, and the amount increases as the temp falls until 18° is reached. Below 18° $\text{Na}_2\text{SO}_4 + 7\text{H}_2\text{O}$ is formed. Saturated $\text{Na}_2\text{SO}_4 + \text{Aq}$ thus obtained contains for 100 pts HO at

18°	20°	25°	26°
53 25	52 76	51 53	51 31 pts Na_2SO_4 ,
30°	33°	34°	36°
50 37	49 71	49 53	49 27 pts Na_2SO_4

2 By allowing the boiling saturated solution free from undissolved salt to cool to 0°

with exclusion of air until crystals of $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$ are formed, then removing the greater part of the mother liquor with a warm pipette, and warming the rest of the mother liquor with the excess of crystals, the crystals dissolve in increasing quantity between 0° and $26-27^\circ$, so that at 27° the solution contains 56 pts Na_2SO_4 to 100 pts H_2O . The remaining undissolved crystals of $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$ begin to melt very slowly at 27° , more quickly at higher temperatures, and cause the separation of anhydrous crusts, and thus the strength of the solution is gradually lowered to the normal. Saturated solutions prepared in this way contain for 100 pts H_2O at

	0°	10°	13°
	19 62	30 49	34 27 pts Na_2SO_4 ,
or	44 89	78 9	92 9 pts $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$
	15°	16°	17°
	37 43	38 73	39 99 pts Na_2SO_4 ,
or	105 8	117 4	111 0 pts $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$,
	18°	19°	20°
	41 63	43 35	44 73 pts Na_2SO_4 ,
or	124 6	133 0	140 0 pts $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$,
	25°	26°	
	52 94	54 97 pts Na_2SO_4	
or	188 5	202 6 pts $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$	

3 Solutions obtained by shaking H_2O with $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ contain for 100 pts H_2O at

	0°	10°	15°
	5 02	9 00	13 20 pts Na_2SO_4 ,
or	12 16	23 04	35 96 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$,
	18°	20°	25°
	16 80	19 40	28 00 pts Na_2SO_4 ,
or	48 41	58 55	98 48 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$,
	26°	30°	
	30 00	40 00 pts Na_2SO_4 ,	
or	109 81	184 1 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$,	
	33°	34°	
	50 76	55 0 pts Na_2SO_4	
or	323 1	412 2 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	

At 34° , $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ begins to melt in its crystal H_2O . As long as there is a considerable quantity of unchanged crystals present, the solution contains 55 pts Na_2SO_4 for 100 pts H_2O , but as the hydrous salt decreases in amount and becomes converted into the anhydrous salt, the solution becomes weaker and contains only 49.53 pts Na_2SO_4 for 100 pts H_2O after warming for 6 or 8 hours at 34° . In the same way temporary solutions can be obtained at $36-40^\circ$ with 55-56 pts Na_2SO_4 to 100 pts H_2O , but this amount sinks to the normal even more quickly than at 34° .

Na_2SO_4 dehydrated at $100-150^\circ$, after the addition of $1\frac{1}{2}-1\frac{1}{2}$ pts H_2O , gives a solution between 0° and 32° of the same strength as $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, but at 34° a solution with

55 pts Na_2SO_4 to 100 pts H_2O cannot be obtained, but one with 49.53 pts is formed (Lowel, A. ch. (3) 49.32)

4 Solubility of anhydrous salt Above 34° , 100 pts H_2O dissolve at

	35°	40°	45°	50°	55°
	50 2	43 8	47 7	46 7	45 9 pts Na_2SO_4 ,
	60°	65°	70°	75°	80°
	45 3	44 8	44 4	44 0	43 7 pts Na_2SO_4 ,
	85°	90°	95°	100°	103.5°
	43 3	43 1	42 8	42 5	42 2 pts. Na_2SO_4

(Mulder)

Solubility in 100 pts H_2O at t°

t°	Pts Na_2SO_4	t°	Pts Na_2SO_4	t°	Pts Na_2SO_4
0	4 8	35	50 2	70	44 4
1	5 1	36	49 9	71	44 3
2	5 4	37	49 6	72	44 2
3	5 7	38	49 3	73	44 2
4	6 0	39	49 1	74	44 1
5	6 4	40	48 8	75	44 0
6	6 8	41	48 5	76	44 0
7	7 3	42	48 3	77	43 9
8	7 8	43	48 1	78	43 8
9	8 4	44	47 9	79	43 7
10	9 0	45	47 7	80	43 7
11	9 7	46	47 5	81	43 6
12	10 5	47	47 3	82	43 5
13	11 4	48	47 1	83	43 5
14	12 4	49	46 9	84	43 4
15	13 4	50	46 7	85	43 3
16	14 5	51	46 6	86	43 3
17	15 7	52	46 4	87	43 2
18	16 9	53	46 2	88	43 2
19	18 2	54	46 1	89	43 1
20	19 5	55	45 9	90	43 1
21	20 9	56	45 8	91	43 0
22	22 5	57	45 7	92	43 0
23	24 1	58	45 6	93	42 9
24	25 9	59	45 4	94	42 9
25	27 9	60	45 3	95	42 8
26	30 1	61	45 2	96	42 7
27	32 4	62	45 1	97	42 6
28	35 0	63	45 0	98	42 6
29	37 8	64	44 9	99	42 5
30	40 9	65	44 8	100	42 5
31	44 2	66	44 7	101	42 4
32	47 8	67	44 6	102	42 3
32.75	50 65	68	44 5	103	42 2
33	50 6	69	44 5	103.5	42 2
34	50 4				

(Mulder, Scheik Verhandel 1864. 123)

100 pts dissolve at

0°	34°	100°	120°
5	78 8(?)	42 7	41 95 pts Na_2SO_4 ,

140°	160°	180°	230°
42 0	42 9	44 25	46 4 pts Na_2SO_4

(Tilden and Shenstone, Lond. R. Soc. Proc. 35. 345)

Solubility decreases above 230° (Étard, C R 113 854)

Sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ contains at

0° 7° 13° 24° 28° 30°
4.1 6.2 9.9 19.3 25.2 29.5% Na_2SO_4

49° 62° 83° 99° 134° 150°
32.8 31.3 30.0 29.7 29.4 29.8% Na_2SO_4

190° 240° 279° 320°
29.9 30.0 24.5 17.8% Na_2SO_4
(Étard, A ch 1894, (7) 2 548)

Solubility of Na_2SO_4 in H_2O at t°
G per 100 g H_2O

t°	Na_2SO_4	Sp gr	t°	Na_2SO_4	Sp gr
0 70	4 71	1 0432	33 5	49 39	1 3307
10 25	9 21	1 0802	38 15	48 47	1 3229
15 65	14 07	1 1150	44 85	47 49	1 3136
24 90	27 67	1 2067	60 10	45 22	1 2918
27 65	34 05	1 2459	75 05	43 59	1 2728
30 20	41 78	1 2894	89 85	42 67	1 2571
31 95	47 98	1 3230	101 9*	42 18	1 2450

* B-pt

(Berkeley, Phil Trans Roy Soc 1904, 203 A, 189)

Transition point from $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ to $\text{Na}_2\text{SO}_4 = 32.5^\circ$ (Berkeley), 32.883° (Richards and Churchill, Z phys Ch 1899, 28, 314)

100 g $\text{Na}_2\text{SO}_4 + \text{Aq}$ sat at 15° contain 11.5 g anhydrous Na_2SO_4 , 21.9 g at 25° (Schreinemakers, Arch Néer Sc 1910, (2) 15 81)

1 l $\text{Na}_2\text{SO}_4 + \text{Aq}$ sat at 25° contains 1.881 mols Na_2SO_4 (Herz, Z anorg 1911, 70 127)

Solubility in H_2O at t°

t°	Mol % Na_2SO_4
62	5 39
70	5 27
72	5 25
80	5 18
120	5 04
190	5 25
192	5 27
208	5 39
241	5 39
250	5 04
279	4 12
319	2 56
252	4 9
310	3 2
340	1 8
365	0 0

(Wuite, Z phys Ch 1913, 86 364)

Supersaturated solutions of Na_2SO_4 are easily formed, when $\text{Na}_2\text{SO}_4 + \text{Aq}$ sat at its b-pt is hermetically sealed, no crystals are deposited on cooling (Lowel). Supersat $\text{Na}_2\text{SO}_4 + \text{Aq}$ may also be obtained by cooling hot sat $\text{Na}_2\text{SO}_4 + \text{Aq}$ in flasks loosely stoppered with cotton wool (Schroeder, A 109 45), or by covering the containing vessel with a glass plate, watch-glass, card, etc., or by covering the liquid itself with a layer of oil, and then allowing to cool.

Hot $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing 1 pt H_2O to 1 pt $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ does not crystallise on slowly cooling or on being quickly cooled by immersion in cold water, if it is contained in a barometer tube freed from air by boiling, or in an exhausted well-closed vessel, or in an open vessel with a layer of oil of turpentine on it (Gay-Lussac), or in a vessel containing air, either well stoppered or furnished with a loose cover (Schweigger), or in an open vessel under a bell jar full of air and closed at the bottom with a water joint, or in open bottles placed in a quiet situation, or in an open glass enclosed in a stoppered vessel, containing air and some KOH for drying, in this case $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ effloresces from the solution, and when washed down again does not cause instant crystallisation, but redissolves.

The crystallisation of a solution cooled in this way may often be brought about instantaneously, or often again after a short time, (1) by agitation, when the solution has been cooled in an open vessel, (2) by access of air caused by opening the vessel, the crystallisation taking place the more rapidly the larger the opening. In this case the crystallisation begins at the top, where the solution, the vessel, and the air come in contact, when a particle of dust falls in the liquid the crystallisation begins a little under the surface. When the solution has been cooled in vacuo, a bubble of air, hydrogen, carbonic acid, or nitrous oxide is sufficient to set up the crystallisation, (3) by contact with a solid body. The latter do not cause crystallisation when cooled in contact with the liquid, nor (excepting a crystal of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$) when they are moistened or warmed before contact with the solution.

Supersat $\text{Na}_2\text{SO}_4 + \text{Aq}$ is brought to crystallisation by addition of a crystal of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, or an isomorphous substance as $\text{Na}_2\text{SeO}_4 + 10\text{H}_2\text{O}$, or $\text{Na}_2\text{CrO}_4 + 10\text{H}_2\text{O}$. Other crystals, as $\text{MgSO}_4 + 7\text{H}_2\text{O}$, etc., have no action (Thomson, Chem Soc 35 199).

See also Hartley, Jones and Hutchinson, Chem Soc 1908, 93 825, on "Spontaneous crystallisation of sodium sulphate solutions," and de Coppet (A ch 1907, (8) 10 457) on same subject.

A more extended discussion of the phenomena and causes of supersaturation is not considered to be within the scope of this work.

$\text{Na}_2\text{SO}_4 + \text{Aq}$ sat at 15° has sp gr 1.10847 (Michel and Krafft) at 15° has sp gr 1.119 (Stolba) at 16°

has sp gr 1.1162 (Stolba) at 10° contains 29 pts Na_2SO_4 to 100 pts H_2O (supersaturated?) and has sp gr 1.1259 (Karsten)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 19.5°

% Na_2SO_4	Sp gr	% Na_2SO_4	Sp gr
2.894	1.0262	10.538	1.0977
5.589	1.0509	12.473	1.1162
7.995	1.0733		

(Kremers Pogg 95 120)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$

% $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	Sp gr	% $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	Sp gr
1.262	1.005	13.744	1.055
2.522	1.010	14.975	1.080
3.780	1.015	16.203	1.085
5.035	1.020	17.426	1.070
6.288	1.025	18.645	1.075
7.538	1.030	19.860	1.080
8.786	1.035	21.071	1.085
10.030	1.040	22.277	1.090
11.272	1.045	23.478	1.095
12.510	1.050	24.674	1.100

(Schmidt Pogg 132 132)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 19°

% $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	Sp gr	% $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	Sp gr
1	1.0040	16	1.0642
2	1.0079	17	1.0683
3	1.0118	18	1.0725
4	1.0158	19	1.0766
5	1.0198	20	1.0807
6	1.0232	21	1.0849
7	1.0278	22	1.0890
8	1.0318	23	1.0931
9	1.0358	24	1.0973
10	1.0398	25	1.1015
11	1.0439	26	1.1057
12	1.0479	27	1.1100
13	1.0520	28	1.1142
14	1.0560	29	1.1184
15	1.0601	30	1.1226

(Schieff, A 110 70)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 15°

%	Sp gr if Na_2SO_4	Sp gr if $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	%	Sp gr if $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$	%	Sp gr if $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$
1	1.0091	1.004	11	1.044	21	1.086
2	1.0182	1.008	12	1.047	22	1.090
3	1.0274	1.013	13	1.052	23	1.094
4	1.0365	1.016	14	1.056	24	1.098
5	1.0457	1.020	15	1.060	25	1.103
6	1.0550	1.024	16	1.064	26	1.107
7	1.0644	1.028	17	1.069	27	1.111
8	1.0737	1.032	18	1.073	28	1.116
9	1.0832	1.036	19	1.077	29	1.120
10	1.0927	1.040	20	1.082	30	1.125

(Gerlach, Z anal 8 287)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 24.8° a=no of g, equivalent to $\frac{1}{2}$ mol wt, dissolved in 1000 g H_2O , b=sp gr if a is $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, $\frac{1}{2}$ mol wt = 161, c=sp gr if a is Na_2SO_4 , $\frac{1}{2}$ mol wt = 71

a	b	c	a	b	c
1	1.054	1.059	4	1.163	1.213
2	1.098	1.114	5	1.188	
3	1.134	1.165	6	1.209	

(Favre and Valson, C R 79 968)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 18°

% Na_2SO_4	Sp gr	% Na_2SO_4	Sp gr
5	1.0450	15	1.1426
10	1.0915		

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 20° containing 0.5 mol Na_2SO_4 to 100 mols H_2O = 1.03466, 1.0 mol Na_2SO_4 to 100 mols H_2O = 1.06744 (Nicol, Phil Mag (5) 16 122)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 25°

Concentration of $\text{Na}_2\text{SO}_4 + \text{Aq}$	Sp gr
1-normal	1.0606
$\frac{1}{2}$ " "	1.0309
$\frac{1}{4}$ " "	1.0156
$\frac{1}{8}$ " "	1.0079

(Wagner, Z phys Ch 1890, 5 39)

Sp gr at 16°/4° of $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing 9.4043% Na_2SO_4 = 1.08655 (Schonrock, Z phys Ch 1893, 11 781)

$\text{Na}_2\text{SO}_4 + \text{Aq}$ containing 25.51% Na_2SO_4 has sp gr 20°/20° = 1.2527 $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing 10.14% Na_2SO_4 has sp gr 20°/20° = 1.0938 (Le Blanc and Rohland, Z phys Ch 1896, 19 278)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 17.5°, when p = per cent strength of solution, d = observed density, and w = volume conc in grs per cc ($\frac{\text{pd}}{100} = w$)

p	d	w
13.06	1.1226	0.14662
11.75	1.1094	0.13043
10.68	1.0990	0.11737
8.544	1.0784	0.09214
6.762	1.0615	0.07178
4.015	1.0358	0.04159
2.599	1.0225	0.02658
2.375	1.0204	0.02423
1.818	1.0154	0.01846
1.349	1.0109	0.01364
0.5204	1.0037	0.00522
0.2921	1.0014	0.00293

(Barnes, J phys Chem 1898, 2 543)

Sp gr of $\text{Na}_2\text{SO}_4 + \text{Aq}$ at 20°

Normality of $\text{Na}_2\text{SO}_4 + \text{Aq}$	% Na_2SO_4	Sp gr
0.97	12.36	1.1138
0.48	6.41	1.0570

(Forchheimer, Z phys Ch 1900, **34** 23)Sp gr of sat $\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O} + \text{Aq}$ at t°

t°	wt of 1 ccm of the solution	100 g H_2O dissolve g $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$
0	1.040	12.16
5	1.058	
10	1.078	21.04
15	1.109	35.96
18	1.137	48.41
20	1.156	58.35
25	1.209	98.48
26	1.222	109.81
30	1.287	184.1
33	1.312	323.1
34	1.317	413.2
35	1.317	

(Tschernaj, J Russ Phys Chem Soc 1914, **46** 8)Sp gr and b pt of $\text{Na}_2\text{SO}_4 + \text{Aq}$ $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing P pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ for every 100 pts H_2O has given sp gr and b pt

P	Sp gr	B pt	P	Sp gr	B pt
1	1.005	100.5°	16	1.064	101.25°
2	1.008	100.62	17	1.067	101.25
3	1.014	100.62	18	1.070	101.37
4	1.020	100.75	19	1.072	101.37
5	1.021	100.75	20	1.074	101.37
6	1.028	100.87	21	1.076	101.37
7	1.030	100.87	22	1.078	101.5
8	1.032	101.0	23	1.080	101.5
9	1.036	101.0	24	1.082	101.5
10	1.040	101.0	25	1.084	101.5
11	1.043	101.12	26	1.090	101.5
12	1.050	101.12	27	1.092	101.63
13	1.055	101.25	28	1.095	101.63
14	1.060	101.25	29	1.098	101.63
15	1.062	101.25	30	1.100	101.75

(Brandes and Gruner 1827)

Saturated solution boils at 103.17° (Löwel), 103.5° (Mulder), 105° (Kremers), 100.5° (Griffiths), 100.8° (Gerlach)Crust forms at 102.9° , highest temp, 103.2° , and solution contains 43.9 pts Na_2SO_4 to 100 pts H_2O (Gerlach, Z anal **26** 426)B-pt of $\text{Na}_2\text{SO}_4 + \text{Aq}$ containing pts Na_2SO_4 to 100 pts H_2O

B pt	Pts Na_2SO_4	B pt	Pts Na_2SO_4
100.5°	9.5	102.5°	39.0
101.0	18.0	103.0	44.5
101.5	26.0	103.2	46.7
102.0	33.0		

(Gerlach, Z anal **26** 430)M-pt of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O} = 34^\circ$ (Tilden, Chem Soc **45** 409)Sol with decomp in $\text{HCl} + \text{Aq}$ Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

1000 g of the solution contain		Solid phase
Mols H_2SO_4	Mols Na_2SO_4	
0.286	1.539	$\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$
0.338	1.671	"
0.338	1.742	"
0.884	2.256	$\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
1.576	2.363	$\text{Na}_2\text{SO}_4 + \text{Na}_3\text{H}(\text{SO}_4)_2$
1.666	2.437	"
2.611	2.091	$\text{Na}_3\text{H}(\text{SO}_4)_2 + \text{Na}_3\text{H}(\text{SO}_4)_3, \text{H}_2\text{O}$

(D'Ans, Z anorg 1906, **49** 356)Solubility of Na_2SO_4 in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

1000 g of the solution contain		Solid phase
Mol Na_2SO_4	Mol H_2SO_4	
1.55	0.08	Na_2SO_4
1.59	0.147	"
1.85	0.60	$\text{Na}_2\text{SO}_4, 10\text{H}_2\text{O}$
2.00	0.763	"
0.77	4.23	$\text{NaHSO}_4, \text{H}_2\text{O}$
0.47	4.96	"
0.32	6.61	Na_2HSO_4
0.305	6.87	"
0.07	7.18	$\text{Na}_3\text{H}(\text{SO}_4)_2$
0.79	8.78	"

(D'Ans, Z anorg 1909, **61** 92)10 ccm of sat $\text{Na}_2\text{SO}_4 + \text{absolute } \text{H}_2\text{SO}_4$ contain approx 2.999 g Na_2SO_4 (Bergius, Z phys Ch 1910, **72** 355)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25° Solid Phase, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$

Millimols H_2SO_4 in 10 ccm	Millimols Na_2SO_4 in 10 ccm
5 10	18 81
7 79	22 38
	24 65

(Herz, Z anorg 1912, **73** 276)Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

1000 g of the solution contain		Solid phase
Mols SO_2	Mols Na_2SO_4	
5 91	0 409	NaHSO_4
6 30	0 332	
6 64	0 297	
6 90	0 173	$\text{NaHSO}_4 + \text{NaH}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ $\text{NaH}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$
7 36	0 071	
7 74	0 047	$\text{NaH}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$ metastable solutions
7 82	0 044	
8 12	0 037	
8 29	0 042	
8 40	0 046	
8 70	0 076	
8 86	0 156	
8 93	0 259	
8 93	0 269	
8 93	0 273	
8 84	0 527	$\text{NaH}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$ $4 5\text{H}_2\text{SO}_4$
8 73	0 681	
8 70	0 808	
8 62	0 834	
8 62	0 844	
8 61	0 899	$\text{NaHSO}_4 + ?$?
8 87	0 445	
8 93	0 437	
9 08	0 394	$\text{Na}_2\text{SO}_4 + 4 5\text{H}_2\text{SO}_4$
9 36	0 425	
9 18	0 567	$\text{Na}_2\text{SO}_4 + 4 5\text{H}_2\text{SO}_4 + \text{NaHS}_2\text{O}_7$ NaHS_2O_7
9 42	0 728	
9 48	0 760	$\text{NaHS}_2\text{O}_7 + ?$?
9 55	0 775	
9 48	0 953	Metastable
9 85	0 787	
9 98	0 908	?
(9 77)	(1 03)	
10 16	0 797	?
10 78	0 302	

(D'Ans, Z anorg 1913, **80** 236)

Sl sol in conc $\text{HC}_2\text{H}_3\text{O}_2$ (Ure's Dict)
Not pptd by addition of glacial $\text{HC}_2\text{H}_3\text{O}_2$ to
 $\text{Na}_2\text{SO}_4 + \text{Aq}$ (Persoz)

Solubility in $\text{NaOH} + \text{Aq}$ at 25°

1000 g of the solution contain		Solid phase
Mols (NaOH) ₂	Mols Na_2SO_4	
0	1 54	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
0 074	1 41	
0 70	1 08	"
1 47	0 90	
2 02	0 59	$\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
2 82	0 24	
3 52	0 126	"
5 83	0 013	
6 62		$\text{NaOH} \cdot \text{H}_2\text{O}$

(D'Ans and Schreiner, Z anorg 1910, **67** 437)Sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$ Rapidly and abundantly sol in sat $\text{KCl} + \text{Aq}$ with pptn of K_2SO_4 $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ is sol in sat $\text{NaCl} + \text{Aq}$ without pptn. If effloresced Na_2SO_4 is used, a ppt of NaCl is caused at first, and subsequently of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ (Karsten)Sol in boiling sat $\text{NaCl} + \text{Aq}$ with pptn of NaCl , but from cold solutions the Na_2SO_4 separates out first (Vauquelin)Less sol in $\text{NaCl} + \text{Aq}$ than in H_2O (Hunt, Am J Sci (2) **25** 368)Solubility in $\text{NaCl} + \text{Aq}$ at t°

t°	g NaCl per 100 g H_2O	g Na_2SO_4 per 100 g H_2O
10	0 00	9 14
	4 28	6 42
	9 60	4 76
	15 65	3 99
	21 82	3 97
	28 13	4 15
	30 11	4 34
	32 27	4 59
	33 76	4 75
21 5	0 00	21 33
	9 05	15 48
	17 48	13 73
	20 41	13 62
	26 01	15 05
	26 53	14 44
	27 74	13 39
	31 25	10 64
	31 80	10 28
	32 10	8 43
	33 69	4 73
	34 08	2 77
	35 46	0 00
25	0 00	28 74
	2 74	26 57
	8 15	23 15
	19 86	20 52
	24 58	14 86
	31 21	9 95
	32 02	9 61

Solubility in NaCl+Aq at t° —*Continued*

t°	g NaCl per 100 g H ₂ O	g Na ₂ SO ₄ per 100 g H ₂ O
27	0 00	31 10
	2 66	28 73
	5 29	27 17
	7 90	26 02
	16 13	24 83
	18 91	21 39
	19 64	20 11
	20 77	19 29
	32 33	9 53
30	0 00	39 70
	2 45	38 25
	5 61	36 50
	7 91	35 96
	10 61	31 64
	12 36	29 87
	15 65	25 02
	18 44	21 30
	20 66	19 06
	32 43	9 06
33	0 00	48 48
	1 22	46 49
	1 99	45 16
	2 64	44 09
	3 47	42 61
	12 14	29 32
	21 87	16 83
	32 84	8 76
	33 99	4 63
	34 77	2 75
35	0 00	47 94
	2 14	43 75
	13 57	26 26
	18 78	19 74
	31 91	8 28
	35 63	0 00

At 33° and above the values represent the solubility of Na₂SO₄ in NaCl+Aq. At 10° the solid phase in contact with the solution is probably Na₂SO₄·7H₂O. Between 17° and 33° the solid phase is either Na₂SO₄·10H₂O or Na₂SO₄. An inversion of Na₂SO₄·10H₂O to Na₂SO₄ takes place at various temp below 33° depending on the amount of NaCl contained in the solution in contact with the solid sodium sulphate.

(Seidell, Am Ch J 1902, **27** 55)

Solubility in NaCl+Aq at 15°

Composition of the sat solution		Solid Phase
% by wt Na ₂ SO ₄	% by wt NaCl	
11 5	0	Na ₂ SO ₄ +10H ₂ O
7 86	5 42	"
5 87	11 51	"
5 23	15 97	"
5 26	21 03	"
5 64	23 39	Na ₂ SO ₄ , 10H ₂ O+NaCl
2 26	25 21	NaCl
0	26 3	"

(Schreinemakers and de Baat, Z phys Ch 1909, **67** 554)

Sol in sat NH₄NO₃+Aq (Margueritte, C R **38** 307)

Sol in sat KNO₃+Aq with pptn after several hours (Karsten)

Na₂SO₄+10H₂O is sol in sat NaNO₃+Aq without pptn, but if effloresced Na₂SO₄ is used, NaNO₃ is pptd at first, and subsequently Na₂SO₄+7H₂O.

The presence of CaSO₄ does not affect the solubility of Na₂SO₄ in H₂O to any great extent (Barre, A ch 1911, (8) **24** 160)

More sol in K₂SO₄, CuSO₄, MgSO₄+Aq than in H₂O (Pfaff, A **99** 226)

100 pts H₂O dissolve 20.7 pts CuSO₄ and 15.9 pts Na₂SO₄ (Rudorff, B **6** 484)

Sol in sat MgSO₄, K₂SO₄, CuSO₄+Aq, but if more Na₂SO₄ than can be dissolved is added to the CuSO₄+Aq, a large quantity of a double sulphate separates out (Karsten)

The solubility of Na₂SO₄ in K₂SO₄+Aq has been determined at 15°, 25°, 40°, 50°, 60°, 70° and 80°. From the results the conclusion is drawn that sodium and potassium sulphates form a double salt of the formula K₂Na(SO₄)₂ (Okada, Chem Soc 1915, **108** (2) 344)

See also under CuSO₄, MgSO₄, and K₂SO₄

Slowly but abundantly sol in sat ZnSO₄+Aq, with separation of a double salt after a few days

Solubility of ZnSO₄·7H₂O+Na₂SO₄·10H₂O in 100 g H₂O at t°

t	grams ZnSO ₄	grams Na ₂ SO ₄
0	40 305	7 905
5	42 285	9 515

(Koppel, Z phys Ch 1905, **52** 409)

See also under Na₂Zn(SO₄)₄+4H₂O

Solubility of $\text{Na}_2\text{SO}_4 + \text{Th}(\text{SO}_4)_2$ at 16°
Solid phase $\text{Th}(\text{SO}_4)_2$

Pts per 100 pts H_2O		Pts per 100 pts H_2O	
Na_2SO_4	$\text{Th}(\text{SO}_4)_2$	Na_2SO_4	$\text{Th}(\text{SO}_4)_2$
1 094	1 743	5 79	2 136
1 960	2 387	9 35	1 379
2 84	3 800	12 24	1 169
2 98	3 962	15 36	1 048
4 11	3 375		

(Barre, C R 1911, **150** 155)

Solubility in Na acetate + Aq at 25°

Solid phase, $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$

Composition of the solutions

% Na acetate	% Na_2SO_4	% H_2O
0	21 9	78 10
4 10	17 72	78 18
7 71	16 48	75 81
12 58	13 50	73 92
16 26	11 50	72 24
20 63	8 10	71 27

(Fox, Chem Soc 1909, **95** 888)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 829)

Alcohol precipitates $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ from the cold saturated aqueous solution (Brandes and Firnhaber)

Insol in alcohol of from 0.817 to 0.90 sp gr (Kirwan)

1000 pts alcohol of 0.872 sp gr dissolve 0.7 pt Na_2SO_4 at 12.5° of 0.905 sp gr dissolve 3.8 pts Na_2SO_4 at 12.5°

Insol in alcohol of 0.830.85 sp gr (Anthon)

From supersaturated solution in alcohol, crystals with $7\text{H}_2\text{O}$ are formed (Schiff, A **106** 11)

100 pts 10% alcohol at 15° contain 14.35 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, 20% alcohol at 15° contain 5.6 pts $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$, 40% alcohol at 15° contain 1.3% $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$ (Schiff, A **118** 365)

Very sol in abs alcohol at ord temp, somewhat more, though still exceedingly sparingly, sol in abs alcohol acidulated with H_2SO_4 (Fresenius)

Alcohol does not affect crystal H_2O of $\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$

Solubility of Na_2SO_4 in alcohol + Aq at t°

t°	% alcohol	g per 100 g solution			solid phase
		H_2O	alcohol	Na_2SO_4	
15	0 7	88 7	0 0	11 3	$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$
	9 2	85 1	8 6	6 3	"
	19 4	78 6	18 9	2 9	"
	39 7	60 0	39 5	0 5	"
	58 9	41 1	58 8	0 1	"
	72 0	28 0	72 0	0 0	"
	0 0	72 8	0 0	27 2	$\text{Na}_2\text{SO}_4 + 7\text{H}_2\text{O}$
	11 2	76 5	9 5	14 0	"
	20 6	74 3	19 2	6 5	"
	30 2	68 4	29 6	2 0	"
25	0 0	78 1	0 0	21 9	$\text{Na}_2\text{SO}_4 + 10\text{H}_2\text{O}$
	10 6	78 5	9 3	12 2	"
	24 0	72 8	22 9	4 3	"
	54 0	45 6	54 0	0 4	"
36	0 0	67 0	0 0	33 0	Na_2SO_4
	8 8	70 0	6 8	22 6	"
	12 8	71 2	10 5	18 3	"
	17 9	71 1	15 5	13 4	"
	18 1	71 0	15 7	13 3	"
	28 9	66 5	28 4	5 1	"
	48 7	50 9	48 3	0 8	"
45	0 0	67 6	0 0	32 4	"
	9 0	71 2	7 1	21 6	"
	14 5				
	20 6				
	31 6				

Between certain concentrations of alcohol, the liquid separates into two layers at 25° , 36° and 45° , of the following composition

t°	Upper Layer			Lower Layer		
	$\frac{\text{g}}{\text{H}_2\text{O}}$	$\frac{\text{g}}{\text{alcohol}}$	$\frac{\text{g}}{\text{Na}_2\text{SO}_4}$	$\frac{\text{g}}{\text{H}_2\text{O}}$	$\frac{\text{g}}{\text{alcohol}}$	$\frac{\text{g}}{\text{Na}_2\text{SO}_4}$
25	66 5	27 3	6 2	67 4	5 1	27 5
	68 1	23 9	8 0	68 5	6 0	25 5
	68 3	23 1	8 6	68 3	6 7	25 0
36	57 7	38 4	3 9	66 6	4 1	29 3
	65 0	28 3	6 7	68 8	5 9	25 3
	68 1	21 2	10 7	68 9	9 4	21 7
45	61 8	32 9	5 3			
	65 8	25 3	8 9	68 4	8 8	22 8
	66 0	24 0	10 0	68 6	10 1	21 3

(de Bruyn, Z phys Ch 1900, **32** 101)

Solubility in alcohol+Aq at 25°

Composition of the sat solution			Solid phase
% by wt H ₂ O	% by wt alcohol	% by wt Na ₂ SO ₄	
63 41	34 84	1 75	Na ₂ SO ₄ , 10H ₂ O
49 0	50 5	0 5	"
46 6	53 0	0 4	Na ₂ SO ₄ , 10H ₂ O+Na ₂ SO ₄
34 9	64 95	0 15	Na ₂ SO ₄

Schreinemakers, Z phys Ch 1909, **67** 552)

Solubility data for solution of NaCl in ethyl alcohol+Aq at 15°, 25°, and 30° are given by chreinemakers (Z phys Ch 1909, **67** 556)

Solubility in propyl alcohol+Aq at 20°

propyl alcohol	g Na ₂ SO ₄ per 100 g solution	% propyl alcohol	g Na ₂ SO ₄ per 100 g solution
12 20	1 99	56 57	0 55
19 77	1 15	60 64	0 44
55 65	0 72	62 81	0 38

(Lanebarger, Am Ch J 1892, **14** 380)

Sol in glycerine

Insol in acetone (Naumann, B 1904 **37** 4329, Eidmann, C C 1899 II, 1014), benzotrile (Naumann, B 1914, **47** 1370) methyl acetate (Naumann, B 1909, **42** 7790), ethyl acetate (Naumann, B 1910, **43** 314)

100 g H₂O dissolve 183.7 g sugar+30.5 g Na₂SO₄ at 31.25°, or 100 g sat solution contain 52.2 g sugar + 9.6 g Na₂SO₄ (Kohler, Z Ver Zuckerind, 1897, **47** 447)

Min Anhydrous, *Thenardite* +10H₂O, *Mirabilite*

Sodium hydrogen sulphate, NaHSO₄

Not deliquescent Very sol in H₂O with decomposition

Sol in 2 pts H₂O at 0° (Link), 1 pt H₂O at 100° (Schubarth) 100 pts H₂O at 15.5° dissolve 92.72 pts Sol in 2 pts H₂O at 18.75° (Abl), decomp by alcohol

Insol in liquid NH₃ (Franklin, Am Ch J 1898, **20** 829)

+H₂O Deliquescent, and decomp by the H₂O which it takes up

NaHS₂(SO₄)₂ Decomp by H₂O (Schultz)

Trisodium hydrogen sulphate, Na₃H(SO₄)₂

Sol in H₂O with decomp

+H₂O (Rose)

Sodium pyrosulphate, Na₂S₂O₇

Sol in fuming H₂SO₄ without decomp

Sodium thallic sulphate, Na₂SO₄, Tl₂(SO₄)₃

Sol in H₂O (Strecker, A **135** 207)

Sodium thorium sulphate, Na₂SO₄, Th(SO₄)₂+6H₂O

Sol in H₂O 100 pts cold sat Na₂SO₄+Aq dissolve 4 pts of this salt (Cleve)

See also under Na₂SO₄+ThSO₄

Sodium titanium sesquisulphate, Na₂Ti₂(SO₄)₄+5H₂O

Sol in H₂O (Spence, Chem Soc 1904, **86** (2) 412)

Insol in alcohol (Knecht, B 1903, **36** 169)

Sodium titanyl sulphate, Na₂TiO₂(SO₄)₂+10H₂O

Hygroscopic (Mazzuchelli and Pantanelli, C C 1909, II 420)

Sodium uranyl sulphate, Na₂(UO₂)(SO₄)₂+3H₂O

(de Coninck, C C 1905, I 919)

Sodium vanadium sulphate, Na₂V₂(SO₄)₄+24H₂O

Very sol in H₂O (Piccini, Z anorg 1897, **13** 444)

Sodium vanadyl sulphate, Na₂SO₄, VOSO₄+4H₂O

Easily sol in H₂O and alcohol + conc H₂SO₄ (Koppel, Z anorg 1903, **35** 177) Na₂SO₄, 2VOSO₄+2½H₂O Slowly sol in H₂O

Can be cryst from H₂SO₄ at 100° (Koppel)

Sodium yttrium sulphate, Na₂SO₄, Y₂(SO₄)₃+2H₂O

Quite sol in H₂O (Cleve)

The only double salt capable of existing at 25° (James and Holden, J Am Chem Soc 1913, **35** 562)

Sodium zinc sulphate, Na₂SO₄, ZnSO₄+4H₂O

Deliquescent in moist air

Decomp into constituents on dissolving in H₂O (Graham, Phil Mag **18** 417)

Solubility of Na₂Zn(SO₄)₂+4H₂O in 100 g H₂O at t°

t°	grams ZnSO ₄	grams Na ₂ SO ₄
25	26 32	23 40
30	26 475	23 445
35	26 365	23 525
40	26 68	23 63

(Koppel, Z phys Ch 1905, **52** 409)

Solubility of $\text{Na}_2\text{Zn}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{ZnSO}_4$
 $7\text{H}_2\text{O}$ in 100 g H_2O at t°

t°	grams ZnSO_4	grams Na_2SO_4	t°	grams ZnSO_4	grams Na_2SO_4
10	45 79	11 24	25	56 155	7 215
15	48 81	10 175	30	60 55	6 34
20	52 34	8 625	35	65 25	5 64

(Koppel)

Solubility of $\text{Na}_2\text{Zn}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{ZnSO}_4$
 $6\text{H}_2\text{O}$ in 100 g H_2O at t°

t°	grams ZnSO_4	grams Na_2SO_4
38	66 64	4 98
40	64 89	4 71

(Koppel)

Solubility of $\text{Na}_2\text{Zn}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
 $10\text{H}_2\text{O}$ in 100 g H_2O at t°

t°	grams ZnSO_4	grams Na_2SO_4
10	43 495	12 35
15	36 925	16 71
20	28 77	21 98
25	19 935	29 875
30	10 67	42 515

(Koppel)

Solubility of $\text{Na}_2\text{Zn}(\text{SO}_4)_2 \cdot 4\text{H}_2\text{O} + \text{Na}_2\text{SO}_4$
 (anhydrous) in 100 g H_2O at t°

t°	grams ZnSO_4	grams Na_2SO_4
35	8 725	46 61
40	9 16	43 835

(Koppel)

Sodium sulphate fluoride, Na_2SO_4 , NaF

Cryst from H_2O without decomp (Marignac, Ann Min (5) 15 236)

Sodium sulphate antimony trifluoride

See Antimony trifluoride sodium sulphate

Strontium sulphate, SrSO_4

Very sl sol in cold, and still less in boiling H_2O

1 l H_2O at 11–15° dissolves 0 066 g SrSO_4 (Brandes and Silber), 0 145 g SrSO_4 (Fresenius), 0 154–0 167 g SrSO_4 (Marignac), 0 187 g SrSO_4 (Kremers), 0 278 g SrSO_4 (Andrews)

1 l boiling H_2O dissolves 0 104 g SrSO_4 (Fresenius), 0 282 g SrSO_4 (Brandes and Silber)

When a Sr salt is precipitated by H_2SO_4 , 1 pt SrSO_4 remains dissolved in 700 pts H_2O (Marignac)

Sol in about 8000 pts H_2O (Schweitzer, J B 1877 1054)

Calculated from electrical conductivity of the solution, SrSO_4 is sol in 10,070 pts H_2O at 16 1° and 10,090 pts at 20 1° (Holleman, Z phys Ch 12 131)

1 l H_2O dissolves 107 mg SrSO_4 at 18° and not much more at higher temp (Kohlrausch and Rose, Z phys Ch 12 241)

100 g H_2O dissolve

at t°	0°–5°	10°–12°	20°	30°
g SrSO_4	0 0983	0 0994	0 1479	1 0600

at t°	50°	80°	90°	95–98°
g SrSO_4	0 1629	0 1688	0 1727	0 1789

(Wolfmann, C C 1897, I 632)

1 l H_2O dissolves 114 mg SrSO_4 at 18° (Kohlrausch, Z phys Ch 1904, 50 356), 114 3 mg at 18° (Kohlrausch, Z phys Ch 1908, 64 168)

Sol in 6895 pts cold, and 9638 pts boiling H_2O , in 11,000–12,000 pts H_2O containing H_2SO_4 , in 474 HCl +Aq containing 8 5% HCl , in 432 pts HNO_3 +Aq containing 4 8% N_2O_5 , in 7843 pts $\text{HC}_2\text{H}_3\text{O}_2$ +Aq containing 15 6% $\text{HC}_2\text{H}_3\text{O}_2$ (Fresenius)

Or, 1 l cold HCl +Aq of 8 5% dissolves 2 11 g SrSO_4 , 1 l cold HNO_3 +Aq of 4 8% N_2O_5 dissolves 2 31 g SrSO_4 , 1 l cold $\text{HC}_2\text{H}_3\text{O}_2$ +Aq of 15 6% $\text{HC}_2\text{H}_3\text{O}_2$ dissolves 0 1275 g SrSO_4 (Fresenius)

Solubility of SrSO_4 in HCl +Aq

No cc HCl + Aq containing 1 mg equiv HCl	g per 100 cc solution	
	HCl	SrSO_4
0 2	18 23	0 161
0 5	7 29	0 207
1 0	3 65	0 188
2 0	1 82	0 126
10 0	0 36	0 048

(Banthusch, J pr 1884, (2) 29 54)

Solubility of SrSO_4 in HNO_3 +Aq

No cc HNO_3 + Aq containing 1 mg equiv HNO_3	g per 100 cc solution	
	HNO_3	SrSO_4
0 2	31 52	0 381
0 5	12 61	0 307
1 0	6 30	0 217
2 0	3 15	0 138
10 0	0 63	0 049

(Banthusch, J pr 1884, (2) 29 54)

Sol in conc H_2SO_4 See under $\text{SrH}_2(\text{SO}_4)_2$
 Insol in NH_4Cl +Aq or conc $(\text{NH}_4)_2\text{SO}_4$ +Aq (Rose)

Slowly but-completely sol in NaCl +Aq (Wackenroder)

H_2O containing Na_2SO_4 dissolves less SrSO_4

than pure H_2O , H_2O containing H_2SO_4 still less (Andrews, Phil Mag Ann 7 406)

Insol in $Na_2S_2O_3 + Aq$

Insol in boiling conc $(NH_4)_2SO_4 + Aq$ (Rose, Pogg 110 292)

Sol in 16 949 pts $(NH_4)_2SO_4 + Aq$ (1 4) (Fresenius, Z anal 32 195)

Pptn is hindered by alkali metaphosphates and citrates, but not by citric acid

Decomp at ord temp, and more rapidly on boiling by alkali carbonates + Aq

Sol in $MgCl_2$ or $KCl + Aq$, solubility increasing with strength of solution, sol in $NaCl$ or $CaCl_2 + Aq$, maximum solubility occurring when the solutions are of a medium concentration The numerical results are as follows

100 pts of the salt solutions containing given pts salt dissolve pts $SrSO_4$

Salt	Pts salt	Pts $SrSO_4$
NaCl	22 17	0 1811
	15 54	0 2186
	8 44	0 1653
KCl	18 08	0 2513
	12 54	0 1933
	8 22	0 1925
$MgCl_2$	13 63	0 2419
	4 03	0 2057
	1 59	0 1986
CaCl	33 70	0 1706
	16 51	0 1853
	8 67	0 1756

(Virck, C C 1862 402)

Solubility in H_2O , and in solutions of the sulphates chlorides and nitrates of the alkalis and alkaline earths and in solutions of salts of the alkalis with strong organic acids has been determined No data in abstract (Wolfmann, Chem Soc 1898, (2) 74 220)

Solubility in H_2O is considerably decreased by the presence of K_2SO_4 (Barre, A ch 1911, (8) 24 175)

Solubility of $SrSO_4$ in $Ca(NO_3)_2 + Aq$ at ord temp

G per 100 cc sat solution

$Ca(NO_3)_2$	$SrSO_4$	$Ca(NO_3)_2$	$SrSO_4$
0 5	0 0483	4	0 1489
1	0 0619	5	0 1689
2	0 1081	6	0 1955
3	0 1275		

(Raffo and Rossi, Gazz ch it 1915, 45 (1) 45)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

100 g 95% formic acid dissolve 0 02 g $SrSO_4$ at 18 5° (Aschan, Chem Ztg 1913, 37 1117)

Insol in absolute alcohol, scarcely sol in dil alcohol

Insol in methyl acetate (Naumann, B 1909, 42 3790), acetone (Naumann, B 1904, 37 4329, Eidmann, C C 1899, II 1014)

Min Celestite

Strontium hydrogen sulphate, $SrH_2(SO_4)_2$

100 pts H_2SO_4 dissolve 2 2 pts $SrSO_4$ (Lies-Bodart and Jacquemin), 100 pts H_2SO_4 dissolve 5 68 pts (Struve, Z anal 9 34), 100 pts fuming H_2SO_4 dissolve 9 77 pts (Struve)

1 g $SrSO_4$ dissolves in 1256 g 91% $H_2SO_4 + Aq$ (Varenne and Pauleau, C R 93 1016), boiling H_2SO_4 dissolves about 15% $SrSO_4$, and still more at 100° (Schultz, Pogg 133 147)

Sol in 1519 pts 91% H_2SO_4 (Varenne and Pauleau, C R 93 1016)

100 pts H_2SO_4 (sp gr 1 843) dissolve 14 pts $SrSO_4$ at 70° (Garside, C N 31 245)

Decomp by H_2O

100 pts hot conc H_2SO_4 dissolve about 9 0 pts $SrSO_4$ (Rohland, Z anorg 1910, 66 206)

10 ccm of sat $SrSO_4 +$ absolute H_2SO_4 contain approx 2 17 g $SrSO_4$ (Bergius, Z phys Ch 1910, 72 355)

+ H_2O Decomp by H_2O

Strontium tin (stannic) sulphate, $SrSO_4$, $Sn(SO_4)_2 + 3H_2O$

Decomp by H_2O Sol in HCl (Weinland and Kuhl, Z anorg 1907, 54 249)

Strontium titanium sulphate, $SrSO_4$, $Ti(SO_4)_2$

Ppt, decomp by H_2O giving titanous acid (Weinland and Kuhl, Z anorg 1907, 54 254)

Tantalum sulphate, $3Ta_2O_5$, $SO_3 + 9H_2O$

(Hermann, J pr 70 201)

Tellurium sulphate, basic, TeO_2 , SO_3

Sol in cold dil H_2SO_4 Decomp by hot H_2O (Klein, C R 99 326)

Terbium sulphate, $Tr_2(SO_4)_3 + 8H_2O$

Sol in H_2O

Sol in H_2O , pptd by alcohol (Urbun, C R 1908, 146 127)

Thallous sulphate, Tl_2SO_4

1 pt dissolves at t° in pts H_2O , according to C = Crookes, L = Lamy

15°	18°	62°	100°	101 2°
21 1	20 8	8 7	5 4	5 22 pts H_2O
C	L	L	C	L

Solubility of Th_2SO_4 in H_2O

t°	% Th_2SO_4	t°	% Th_2SO_4
0	2.63	60	9.85
10	3.57	70	11.31
20	4.64	80	12.75
30	5.80	90	14.19
40	7.06	99.7*	15.57
50	8.44		

B - pt at 748 mm
(Berkeley, Phil Trans Roy Soc 1904, **203**
A, 189, calc by Landolt-Börnstein)

100 g H_2O dissolve 3.36 g Th_2SO_4 at 6.5° ,
4.3 g at 12° , 19.14 g at 100° (Tutton, Proc
Roy Soc 1907, **79** A, 351)

1 l H_2O dissolves 0.1928 equivalents
 Th_2SO_4 at 20° , or 48.59 g in 1 l of solution
(Noyes, J Am Chem Soc 1911, **33** 1657)

1 l H_2O dissolves 0.1083 g equiv Th_2SO_4
at 25° , or 27.28 g in 1 l of solution (Noyes)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

Strength of $\text{H}_2\text{SO}_4 + \text{Aq}$ g mols per l	g mols Th_2SO_4 per l
0.0494	0.1172
0.0987	0.1249

(Noyes, J Am Chem Soc 1911, **33** 1662)

1 l $\text{TiClO}_3 + \text{Aq}$ containing 0.1058 equiv-
alents TiClO_3 , dissolves 0.1366 equivalents
 Th_2SO_4 at 20° (Noyes)

See also TiClO_3

Solubility in salts + Aq at 25°

g mols per l	'g mols per l Th_2SO_4 dissolved
0.0996 TiNO_3	0.08365
0.0497 Na_2SO_4	0.1080
0.1988 Na_2SO_4	0.1173
0.1010 NaHSO_4	0.1161

(Noyes)

Thallous hydrogen sulphate, ThHSO_4

Sl hydroscopic

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°

1000 g of the solution contain

Mols H_2SO_4	Mols Th_2SO_4
4.55	0.56
4.79	0.55
4.89	0.59
4.92	0.66
4.78	0.75
4.26	1.01
4.03	1.08

(D'Ans, Z anorg 1910, **65** 232)

Th_2SO_4 , ThHSO_4 Sol in H_2O (Storten-
becker, R t c 1902, **21** 90)

Thallous pyrosulphate, $\text{Th}_2\text{S}_2\text{O}_7$

Decomp by H_2O (Weber, B **17** 2502)

Thallous orthosulphate, $\text{Th}_2\text{S}_2\text{O}_8$

Decomp by H_2O (Weber, B **17** 2502)

Thalic sulphate, basic, $\text{Th}_2\text{O}_3 \cdot 2\text{SO}_3 + 3\text{H}_2\text{O}$

Sol in H_2O

+5 H_2O As above (Willm, A ch (4) **5**
5)

Thalic sulphate, $\text{Th}_2(\text{SO}_4)_3 + 7\text{H}_2\text{O}$

Decomp by cold H_2O with separation of
 $\text{ThO}(\text{OH})$ (Crookes)

Thallothallic sulphate, $2\text{Th}_2\text{O}_3 \cdot 3\text{Th}_2\text{O}_3 \cdot 12\text{SO}_3 + 25\text{H}_2\text{O}$

Gradually efflorescent (Willm)

$\text{Th}_2(\text{SO}_4)_3$ (Lepsius, Chem Ztg **1890**
1327)

$\text{Th}(\text{SO}_4)_2$ (Lepsius)

Thallous uranyl sulphate, $\text{Th}_2(\text{UO}_2)(\text{SO}_4)_2 + 3\text{H}_2\text{O}$

Sl sol in cold H_2O

Easily forms supersat solutions (Kohn,
Z anorg 1908, **59** 112)

Thallium vanadium sulphate, $\text{Th}_2\text{V}_2(\text{SO}_4)_4 + 24\text{H}_2\text{O}$

100 pts H_2O dissolve 11.06 pts salt at 10°

Sp gr of solution at $4^\circ/20^\circ = 2.342$

Very sol in hot H_2O (Piccini, Z anorg
1897, **13** 446)

256 g anhydrous, or 433 g hydrated salt,
or 0.573 g mols of anhydrous salt are sol in
1 l H_2O at 25°

Melts in crystal H_2O at 48° (Locke, Am
Ch J 1901, **26** 175)

Thallous zinc sulphate, $\text{Th}_2\text{Zn}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$

1 l H_2O dissolves 86 g anhydrous salt
at 25° (Locke, Am Ch J 1902, **27** 459)

Thallothallic sulphate bromide, $\text{Th}_2\text{Br}_2\text{SO}_4$

Very sol in cold H_2O Decomp by much
 H_2O (Meyer and Goldschmidt, B 1903, **36**
242)

**Thorium sulphate, basic, $3[\text{Th}(\text{SO}_4)_2 + 2\text{H}_2\text{O}]$,
 $\text{Th}(\text{SO}_4)_2\text{O} + 2\text{H}_2\text{O}$**

Insol in H_2O , very slowly attacked by dil
acids (Demarcay)

$\text{ThO}(\text{SO}_4) + 2\text{H}_2\text{O}$ Stable in aq solution
at 100° (Hauser, B 1910, **43** 2776)

+5 H_2O Somewhat sol in hot conc
 $\text{MgSO}_4 + \text{Aq}$ (Halla, Z anorg 1912, **79** 260)

Thorium sulphate, $\text{Th}(\text{SO}_4)_2$

Anhydrous Easily sol if brought into a
large amount of H_2O , but very slowly sol if
only a little H_2O is added to the salt

100 pts H_2O dissolve about 4.86 pts $\text{Th}(\text{SO}_4)_2$ at 0° (Cleve)

When heated, a hydrous salt separates out, which redissolves on cooling (Cleve)

Solubility of anhydrous salt cannot be determined, as it begins to separate out $\text{Th}(\text{SO}_4)_2 + 9\text{H}_2\text{O}$ before a saturated solution is reached. At 0° , 100 pts H_2O dissolved 22.97 pts $\text{Th}(\text{SO}_4)_2$ in 15 minutes, at 25° , 27.00 pts $\text{Th}(\text{SO}_4)_2$ were dissolved in 5 minutes (Roozeboom, Z phys Ch 5 198)

$+2\text{H}_2\text{O}$ Shows same behaviour as anhydrous salt. 100 pts H_2O dissolved 35.50 pts $\text{Th}(\text{SO}_4)_2$ from this salt at 1° , but this is not the maximum solubility (Roozeboom)

$+4\text{H}_2\text{O}$ Pptd by alcohol from hot aqueous solution, also formed by heating $\text{Th}(\text{SO}_4)_2 + 9\text{H}_2\text{O}$ in aqueous solution above 60°

100 pts H_2O dissolve pts $\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$, calculated as $\text{Th}(\text{SO}_4)_2$, at t° . D=according to Demarcay (C R 96 1860), R=according to Roozeboom (Z phys Ch 5 202)

t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$
17	9.41 D	50	2.54 R	70	1.09 R
35	4.50 D	55	1.94 D	75	1.32 D
40	4.04 R	60	1.634 R	95	0.71 D

$+6\text{H}_2\text{O}$ Behaves as the anhydrous salt, but action is much slower

100 pts H_2O dissolve pts $\text{Th}(\text{SO}_4)_2 + 6\text{H}_2\text{O}$, calculated as $\text{Th}(\text{SO}_4)_2$, at t°

t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$
0	1.50	45	3.85
15	1.63	60	6.64
30	2.45		

(Roozeboom)

This determination gives too low figures, especially at the higher temperatures (Roozeboom)

$+8\text{H}_2\text{O}$

100 pts H_2O dissolve pts $\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$, calculated as $\text{Th}(\text{SO}_4)_2$, at t°

t	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$
0	1.00	25	1.85
15	1.38	44	3.71

(Roozeboom)

100 g $\text{Th}(\text{SO}_4)_2 + \text{Aq}$ sat with $\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$ at 30° contain 2.152 g anhydrous $\text{Th}(\text{SO}_4)_2$ (Koppel and Holzkampf, Z anorg 1910, 67 274)

100 g H_2O dissolve 1.722 g at 25° (Barre, Bull Soc 1912, (4) 11)

$+9\text{H}_2\text{O}$ Pptd by alcohol from cold

aqueous solution. Sol in about 88 pts H_2O at 0° (Cleve). Extremely slowly sol in H_2C

100 pts H_2O dissolve pts $\text{Th}(\text{SO}_4)_2 + 9\text{H}_2\text{O}$ calculated as $\text{Th}(\text{SO}_4)_2$, at t°

t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$
0	0.88	30	1.85	50	4.86
10	1.02	40	2.83	55	6.5±
20	1.25				

Above 55° , $\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$ separates out (Demarcay C R 96 1860, calculated by Roozeboom)

100 pts H_2O dissolve pts $\text{Th}(\text{SO}_4)_2 + 9\text{H}_2\text{O}$ calculated as $\text{Th}(\text{SO}_4)_2$, at t°

t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$	t°	Pts $\text{Th}(\text{SO}_4)_2$
0	0.74	30	1.995	51	5.22
10	0.98	40	2.998	55	6.76
20	1.38				

Above 60° , $\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$ separates out (Roozeboom, Z phys Ch 5 201)

For further data, see Roozeboom (Z phys Ch 5 198), where there is a full discussion of the subject

100 g sat solution of $\text{Th}(\text{SO}_4)_2 + 9\text{H}_2\text{O}$ in H_2O at 25° contain 1.593 g anhyd. sal (Wirth, Z anorg 1912, 76 174)

Solubility of $\text{Th}(\text{SO}_4)_2$ in $\text{H}_2\text{SO}_4 + \text{Aq}$ at t

t	% H_2SO_4	% ThSO_4	Solid phase
30	0.000	2.152	$\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$
	0.466	2.055	"
	0.72	2.085	"
	1.468	2.267	"
	2.983	2.311	"
	4.38	2.367	"
	4.97	2.323	"
	9.95	1.961	"
	15.03	1.484	"
	18.95	1.078	"
	23.64	0.7196	"
	32.68	0.3364	$\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$
	37.80	0.077	"
	43.28	0.0213	"
	45.69	0.0047	"
20	74.0	0.1208	"
	80.5	0.000	"
	5	1.722	$\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$
	15	0.9752	"
Boiling temp	25	0.3838	"
	40	0.0103	$\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$
	5	0.7407	"
	10	0.4808	"
	15	0.3882	"

(Koppel and Holzkampf, Z anorg 1910, 6 274)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°	
Per 100 g of solution	
g $\text{Th}(\text{SO}_4)_2$	g H_2SO_4
1 722	0 000
1 919	1 072
2 017	1 941
2 060	2 821
2 061	3 843
2 035	5 212
1 863	8 055
1 702	10 105

(Barre, Bull Soc 1912, (4) 11 647)

Solubility in $\text{H}_2\text{SO}_4 + \text{Aq}$ at 25°		
Nahty SO_4	In 100 g of the liquid are dissolved	
	g oxide	g anhydrous sulphate
1	1 015	1 593
16	1 14	1 831
32	0 9265	1 488
68	0 545	0 8751
68	0 2685	0 4312
68	0 0651	0 1045
89	0 0396	0 0636
15	0 0192	0 0308

(Wirth, Z anorg 1912, 76 186)

Solubility of $\text{Th}(\text{SO}_4)_2$ in $\text{HCl} + \text{Aq}$ at 30°		
% HCl	% $\text{Th}(\text{SO}_4)_2$	Solid phase
0 0	2 15	$\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$
4 55	3 541	"
6 95	3 431 =	"
12 14	2 811	"
15 71	2 360	"
18 33	2 199	"
20	2 13	$\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$
23 9	1 277	"

Koppel and Holzkampf, Z anorg 1910, 67 274)

Solubility of $\text{Th}(\text{SO}_4)_2$ in $\text{HNO}_3 + \text{Aq}$ at 30°		
% HNO_3	% $\text{Th}(\text{SO}_4)_2$	Solid phase
0 0	2 15	$\text{Th}(\text{SO}_4)_2 + 8\text{H}_2\text{O}$
5 17	3 68	"
10 04	4 20	"
16 68	4 84	"
21 99	4 47	"
28 33	3 96	"
28 51	3 88	"
33 17	3 34	$\text{Th}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$
38 82	2 51	"

Koppel and Holzkampf, Z anorg 1910, 67 274)

The presence of phosphoric acid increases the solubility of thorium sulphate in HCl and HNO_3 (Koppel and Holzkampf, Z anorg 1910, 67 280)

For solubility of $\text{Th}(\text{SO}_4)_2$ in $(\text{NH}_4)_2\text{SO}_4$, Li_2SO_4 , and K_2SO_4 , see respective sulphates Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Thorium hydrogen sulphate, $\text{ThH}_2(\text{SO}_4)_2$

Hygroscopic
Sol in excess of hot H_2SO_4 , insol in cold H_2SO_4 (Brauner, Z anorg 1904, 38 333)

Thulium sulphate, $\text{Tm}_2(\text{SO}_4)_3 + 8\text{H}_2\text{O}$

Insol in alcohol (James, J Am Chem Soc 1911, 33 1343)

Tin (stannic) sulphate, basic, $(\text{SnO})\text{SO}_4 + \text{H}_2\text{O}$

Easily sol in cold H_2O , but quickly decomp with separation of stannic hydroxide (Ditte, C R 104 178)

3SnO , SO_3 Easily sol in dil acids (Ditte, A ch 1882, (5) 27 159)
+ $1\frac{1}{2}\text{H}_2\text{O}$ Not decomp by cold H_2O (Ditte)

Tin (stannous) sulphate, SnSO_4

Sol in 5.3 pts H_2O at 19° , and 5.5 pts at 100° (Marignac) Solution soon decomposes with separation of a basic salt Sol in $\text{H}_2\text{SO}_4 + \text{Aq}$ (Bouquet)

Insol in acetone (Naumann, B 1904, 37 4329)

Tin (stannic) sulphate, $\text{Sn}(\text{SO}_4)_2 + 2\text{H}_2\text{O}$

Deliquescent Easily sol in H_2O , decomp by much H_2O Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Slowly sol in $\text{HCl} + \text{Aq}$ Decomp by absolute alcohol (Ditte, C R 104 178)

Titanium sulphate, $\text{Ti}(\text{SO}_4)_2 + 3\text{H}_2\text{O}$

Deliquescent, and sol in H_2O The aqueous solution is decomp on boiling (Glatzel, B 9 1833)

Titanium sesquisulphate, $\text{Ti}_2(\text{SO}_4)_3$

Very deliquescent, and easily sol in H_2O Aqueous solution is decomp by boiling (Ebelmen)

Insol in H_2O , alcohol, ether and conc H_2SO_4 Slowly sol in dil H_2SO_4 and HCl (Stahler, B 1905, 38 2624)

Not sol in alcohol (Knecht, B 1903, 36 169)
+ $8\text{H}_2\text{O}$ Sol in H_2O (Glatzel, B 9 1833)

Titanium hydrogen sesquisulphate, $3\text{Ti}_2(\text{SO}_4)_3, \text{H}_2\text{SO}_4 + 25\text{H}_2\text{O}$

Gradually sol in H_2O
Insol in 60% H_2SO_4 , alcohol, ether and glacial acetic acid (Stahler, B 1905, 38 2621)

Titanyl sulphate, (TiO)SO₄

Decomp by H₂O Slowly sol in cold, rapidly in warm HCl+Aq (Merz, J pr 99 157)

+2H₂O Sol in H₂O (Blondel, Bull Soc 1899, (3) 21 262)

2TiO₂, 3SO₃+3H₂O Sol in H₂O acidified with HCl (Blondel, Bull Soc 1899, (3) 21 262)

5TiO₂, SO₃+5H₂O (Blondel)

7TiO₂, 2SC₃+xH₂O (Blondel)

2TiO₂, SO₃+xH₂O (Blondel)

Uranous sulphate, basic, U(OH)₂SO₄+H₂O

Insol in H₂O H₂O dissolves out H₂SO₄ (Ebelmen, A ch (3) 5 217)

+5H₂O Sol in alcohol
Pptd by ether (Rosenheim, Z anorg 1901, 26 251)

Uranous sulphate, U(SO₄)₂+4H₂O

Sol in H₂O with immediate decomp Easily sol in dil H₂SO₄+Aq (Kohl-schütter, B 1901, 34 3629)

Decomp by H₂O into insol basic, and sol acid salt Sol in dil H₂SO₄ or HCl+Aq Difficultly sol in conc acids (Ebelmen, A ch (3) 5 215)

Solubility of U(SO₄)₂+4H₂O in H₂O at t°

t°	% U(SO ₄) ₂	t°	% U(SO ₄) ₂
29	9 8	48 2	8 1
37	8 3	63	7 3

(Giolitti and Bucci, Gazz ch it 1905, 35 (2) 162)

1 pt is sol in 4 23 pts H₂O at 13°, 4 3 pts at 11 3°, 4 4 pts at 9 1° (de Coninck, A ch 1903, (7) 28 12)

+8H₂O

Solubility of U(SO₄)₂+8H₂O in H₂O at t°

t°	% U(SO ₄) ₂	t°	% U(SO ₄) ₂
18	10 17	48 2	28 72
25 6	13 32	62	36 8
37	19 98	93	63 2

(Giolitti and Bucci, Gazz ch it 1905, 35 (2) 162)

Sp gr of U(SO₄)₂+Aq at t°

t	% salt	Sp gr
16	1	1 0058
16 8	2	1 0107
16	3	1 0165
17 8	4	1 0218
17 2	5	1 0272
18	6	1 0320
18 3	7	1 0379
17 4	8	1 0429
15 2	9	1 0485
15 6	10	1 0539

(de Coninck, A ch 1903, (7) 28 11)

Solubility in acids+Aq
1 pt U(SO₄)₂ is sol in pts acid at t°

t°	Acid	Concentra-tion of acid	Pts acid
9 7 9 2	HCl "	1 4 "	5 74 5 8
11 2 10 3	HNO ₃ "	1 4 "	5 4 5 53
11 4 10 7	H ₂ SeO ₄ (sp gr 1 4) "	1 4 "	4 57 4 66
15 14 2	HBr "	1 4 "	4 4 23
15 5 14 4	HC ₂ H ₃ O ₂ "	1 4 5 "	4 1 4 3
16 5 15 9	' '	1 2 '	3 72 3 85
11 7 10 9 10 1 9	H ₂ SO ₄ " " "	1 4 " " "	6 36 6 42 6 45 6 5

(de Coninck, Chem Soc 1902, 82 (2) 456)

Sp gr of U(SO₄)₂+HCl(d=1 046) at t°
d₁=Sp gr referred to H₂O
d₂=Sp gr referred to HCl

t	% salt	d ₁	d ₂
16	1	1 0525	1 0063
17	2	1 0572	1 0109
18	3	1 0619	1 0154
18 4	4	1 0667	1 0199
17 6	5	1 0714	1 0243

(de Coninck, A ch 1903, (7) 28 11)

Sp gr of U(SO₄)₂+H₂SO₄(d=1 14) at t°
d₁=Sp gr referred to H₂O
d₂=Sp gr referred to H₂SO₄

t	% salt	d ₁	d ₂
18 7	1	1 1442	1 0038
18 3	2	1 1494	1 0083
17 4	3	1 1539	1 0123
17 6	4	1 1583	1 0162
18 1	5	1 1626	1 0204

(de Coninck, A ch 1903, (7) 28 11)

1 pt is sol in 8 pts alcohol (94°)+A (1 4) at 10 4° (de Coninck)

Solubility in glycol at 14 8°=3 15% (Coninck, C C 1905, II 883)

Min Johannite sl sol in H₂G.

Uranous hydrogen sulphate, U(SO₄)₂, H₂SC+10H₂O

(Giolitti, C C 1905, II 1226)

Uranyl sulphate, basic, $3\text{UO}_3, \text{SO}_3 + 2\text{H}_2\text{O}$

(Athanasesco)
 +14H₂O Sol in H₂O (Ordway, Sil
 Am J (2) **26** 208)

4UO₃, SO₃+7H₂O (Athanasesco, C R
103 271)

UO₂, 4UOSO₄+8H₂O Less sol in min
 acids, especially dil H₂SO₄+Aq, than UOSO₄
 +2H₂O (de Coninck, C C **1901**, II 1038)

Uranyl sulphate, (UO₂)SO₄

+H₂O (de Coninck)
 +3H₂O Efflorescent Very sol in H₂O
 and alcohol

1 pt is sol in 0.6 pt cold H₂O, in 0.45
 pt boiling H₂O, in 25 pts cold absolute
 alcohol, in 20 pts boiling absolute alcohol
 (Bucholz)

Sol in 0.47 pt H₂O at 21°, and 0.28 pt
 boiling H₂O (Ebelmen)

100 pts H₂O at 15.5° dissolve 160 pts, and
 at 100°, 220 pts (Ure's Dict)

1 pt is sol in 5.3 pts H₂O at 13.2°, 5.16
 pts at 14.1°, 4.96 pts at 15.1°, 4.88 pts at
 15.5° (de Coninck, A ch 1903, (7) **28** 8)

Sp gr of (UO₂)SO₄+Aq at t°

t°	% (UO ₂)SO ₄	Sp gr
14	1	1.0062
15.5	2	1.0113
11.3	3	1.0172
10.2	4	1.0229
10.2	5	1.0280
10	6	1.0338
14	7	1.0389
15.6	8	1.0442
11	9	1.0503
10.3	10	1.0557
11.4	11	1.0612
11.6	12	1.0669

(de Coninck, A ch 1903, (7) **28** 7)

Solubility in acids +Aq

1 pt (UO₂)SO₄ is sol in
 3.4 pts conc HCl at 12.8°
 3.25 " " " 13.6°
 5.9 " HBr(d=1.21) " 12.9°
 6.1 " " " " 11.2°
 10.8 " conc HNO₃ " 12.3°
 11.2 " " " " 10.8°
 4.3 " H₂SO₄(d=1.38) " 12.7°
 4.1 " " " " 14.0°
 5.6 " aqua regia (equal vol HCl+HNO₃)
 at 15.4°
 5.47 pts aqua regia (equal vol HCl+
 HNO₃) at 16.4°
 3.7 pts selenic acid (d=1.4) at 15.3°

(de Coninck, A ch 1903, (7) **28** 8)

Sp gr of (UO₂)SO₄+H₂SO₄(d=1.168) at t°

d₁=Sp gr referred to H₂O

d₂=Sp gr referred to H₂SO₄

t°	% salt	d ₁	d ₂
20.6	1	1.1738	1.0050
22.2	2	1.1775	1.0082
21.1	3	1.1880	1.0129
22.7	4	1.1872	1.0165
22.3	5	1.1918	1.0204

(de Coninck, A ch 1903, (7) **28** 7)

1 pt is sol in 37.9 pts alcohol (85°) at
 16.7°, 38.6 pts at 15.8° (de Coninck, A
 ch 1903, (7) **28** 8)

Very sl sol in formic and glacial acetic
 acids (de Coninck, A ch 1903, (7) **28** 9)

Completely pptd from (UO₂)SO₄+Aq by
 HC₂H₃O₂ (Persoz)

Uranyl hydrogen sulphate, (UO₂)SO₄, H₂SO₄

Very deliquescent (Schultz-Sellack)
 2(UO₂)SO₄, H₂SO₄+5H₂O Very deliques-
 cent (Wyrouboff, Bull Soc Min 1909, **32**
 351)

Uranyl pyrosulphate, (UO₂)S₂O₇

Very deliquescent Hisses with H₂O
 (Schultz-Sellack)

Uranouranyl sulphate, USO₄, (UO₂)SO₄

Sol in H₂O (Ebelmen) Decomp by
 boiling (Berzelius)
 Min *Voghanate*

Uranyl sulphate ammonia, (UO₂)SO₄, 2NH₃

(v Unruh, Dissert **1909**)
 (UO₂)SO₄, 3NH₃ (v Unruh)
 (UO₂)SO₄, 4NH₃ (v Unruh)

Vanadous sulphate, V₂O₃, 4SO₃+9H₂O

Sol in H₂O (Brierlev, Chem Soc **49**
 882)

Vanadium sulphate, V₂O₅, 2SO₃=(VO₂)₂S₂O₇

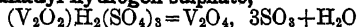
Deliquescent Easily sol in H₂O
 V₂O₅, 3SO₃ Deliquescent Sol in H₂O
 and alcohol

+3H₂O Deliquescent Very sol in H₂O,
 but decomp by boiling Sol in alcohol
 (Ditte, C R **102** 757)

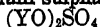
VSO₄+7H₂O Decomp by air, very un-
 stable, sol in H₂O (Piccini, Z anorg 1899,
19 204)

Vanadium sesquisulphate, V₂(SO₄)₃

Anhydrous
 Insol in H₂O
 Insol in conc H₂SO₄, but slowly sol in
 boiling dil H₂SO₄ Sol in HCl
 Insol in alcohol and ether (Stahler, B
 1905, **38** 3979)

Vanadium hydrogen sulphate,Sol in H_2O Sol in HCl Insol in 60% $H_2SO_4 + Aq$, alcohol, ether and acetic acid (Stahler, B 1905, 38 3978)**Divanadyl sulphate, $V_2O_5(SO_4)_2$** Insol in H_2O , HCl , or $H_2SO_4 + Aq$, but on heating to 400° becomes sol in H_2O if heated to 130° therewith (Gerland)+ $4H_2O$ Very slowly sol in H_2O at 10° , quickly at 60° , and still more rapidly at 100° . Deliquesces in warm moist air more quickly than it dissolves in H_2O at 10° Insol in absolute alcohol Very sol in alcohol of 0.833 sp gr (Berzelius)+ $5H_2O$ (Koppel and Behrendt, Z anorg 1903, 35 168)+ $7H_2O$, and $10H_2O$ + $13H_2O$ Efflorescent (Gerland) $2V_2O_5, 5SO_3 + 18H_2O$ (Gain, C R 1906, 143 1154) $V_2O_5, 3SO_3 + 10H_2O$ (G) $2V_2O_5, 7SO_3 + 20H_2O$ (G) $2V_2O_5, 9SO_3 + 22H_2O$ (G) $V_2O_5, 5SO_3 + 12H_2O$ (G)**Divanadyl hydrogen sulphate,**+ $2H_2O$ + $3H_2O$ Deliquescent Very slowly sol in cold H_2O or alcohol Easily sol in hot H_2O (Gerland)+ $5H_2O$ Deliquescent Insol in ether Scarcely sol in alcohol Slowly sol in cold, easily in hot H_2O , (Crow)+ $14H_2O$ Easily sol in cold H_2O or dil alcohol (Gerland) $2VO_2, 3SO_3$ Sl sol in H_2O (Koppell and Behrendt, Z anorg 1903, 35 163) $2VOSO_4, H_2SO_4 + H_2O$ Very slowly sol in H_2O (Koppel and Behrendt, Z anorg 1903, 35 163) $2VOSO_4, 3H_2SO_4 + 15H_2O$ (Gain, C R 1906, 143 1156) $2VOSO_4, 4H_2SO_4 + 16H_2O$ (G) $2VOSO_4, 5H_2SO_4 + 15H_2O$ (G) $2VOSO_4, 7H_2SO_4 + 15H_2O$ (G) $2VOSO_4, 8H_2SO_4 + 16H_2O$ (G)**Ytterbium sulphate, $Yb_2(SO_4)_3 + 8H_2O$** Quite slowly sol in H_2O even at 100° Anhydrous salt is easily sol in much H_2O , but if little H_2O is used the hydrous salt is formed, which only slowly dissolves Sol in $K_2SO_4 + Aq$ 100 pts H_2O dissolve at 0° 15 5° 35 55° 60° 44 2 34 6 19 1 11 5 10 4 pts $Yb_2(SO_4)_3$,70 80° 90 100° 7 22 6 93 5 83 4 67 pts $Yb_2(SO_4)_3$

(Cleve, Z anorg 1902, 32 143)

Yttrium sulphate, basic, $Y_2O_3, SO_3 =$ Insol in H_2O (Berzelius) $2Y_2O_3, SO_3 + 10H_2O$ (Cleve)**Yttrium sulphate, $Y_2(SO_4)_3$** Anhydrous More sol in H_2O than the hydrous salt, and more sol in cold than hot H_2O Solution sat at 0° separates $Y_2(SO_4)_3 + 8H_2O$ at 50° 100 pts H_2O dissolve 15.2 pts anhydrous salt at ord temp5.38 pts are sol in 100 pts H_2O at 25° (James and Holden, J Am Chem Soc 1913, 35 561)Easily sol in large amount of sat $K_2SO_4 + Aq$, from which $3K_2SO_4, 2Y(SO_4)_3$ is pptd on warming (Cleve and Höglund, Sv V A H Bih 1 No 8)Solubility of $Y_2(SO_4)_3$ in $Na_2SO_4 + Aq$ at 25°

Pts $Y_2(SO_4)_3$ per 100 pts H_2O	Pts Na_2SO_4 per 100 pts H_2O	Solid phase
5.61	1.29	$Y_2(SO_4)_3$
6.38	3.85	
7.40	6.21	
8.43	8.53	
5.86	7.57	
4.75	7.72	$Y_2(SO_4)_3, Na_2SO_4 + 2H_2O$
3.42	10.14	
2.36	11.36	
2.02	13.42	
1.90	14.89	
1.79	16.51	$Na_2SO_4 + 10H_2O$
1.86	18.44	
2.99	19.96	
3.04	21.05	
2.27	27.14	
1.52	28.22	
1.61	28.13	
5.38	0.0	

(James and Holden, J Am Chem Soc 1913, 35 560)

+ $8H_2O$ 100 pts H_2O dissolve 9.3 pts of cryst salt at ord temp, and 4.8 pts at 100° (Cleve, Bull Soc (2) 21 344)Less sol in H_2O containing H_2SO_4 than in pure H_2O (Berzelius)Completely pptd by $HC_2H_3O_2 + Aq$ Insol in alcohol**Yttrium hydrogen sulphate, $Y_2(SO_4H)_3$**

(Brauner, Z anorg 1904, 38 332)

Zinc sulphate, basic, $8ZnO, SO_3 + 2H_2O$ Insol in H_2O (Schindler, Mag Pharm 31 181) $6ZnO, SO_3 + 10H_2O$ Insol in H_2O (Kane, A ch 72 310) $4ZnO, SO_3 + 2H_2O$ Scarcely sol in hot or cold H_2O Sol in $ZnSO_4 + Aq$ (Kuhn, Schw J 60 337)

+3H₂O (Werner, B 1907, **40** 4443)
 +5H₂O Nearly insol in H₂O (Habermann, M **5** 432)
 +6H₂O (Kraut, Z anorg 1897, **13** 5)
 +7H₂O (Athanasesco, C R **103** 271)
 +8H₂O Extremely slowly decomp by H₂O (Reindel, J pr 1869, (1) **106** 373)
 +10H₂O (Schindler)
 3ZnO, SO₃ Insol in cold, sl sol in hot H₂O. (Vogel)
 2ZnO, SO₃ (Athanasesco)
 5ZnO, SO₃ (Pickering, Chem Soc 1907, **91** 1986)
 +4H₂O (Moody, Am J Sci 1906, [4] **22** 184)
 9ZnO, 2SO₃+12H₂O (Reindel, J pr 1869, (1) **106** 374)

Zinc sulphate, ZnSO₄

Sol in H₂O with evolution of heat
 Sol in HCl+Aq
 +H₂O (Étard)
 +2H₂O Insol in alcohol (Kuhn)
 +3½H₂O (Anthon)
 +5H₂O Insol in boiling alcohol of 0.86 sp gr (Kuhn)
 +6H₂O (Marignac)
 +7H₂O Slowly efflorescent
 M-pt of ZnSO₄+7H₂O=50° (Tilden, Chem Soc **45** 409)
 For solubility data on hydrated salts, see below

Sol in 2+ pts H₂O at ord temp and in less at 100° (Bergmann)
 100 pts H₂O at 104.4° dissolve 81.81 pts ZnSO₄ (Griffiths)
 100 pts H₂O at ord temp dissolve 140 pts ZnSO₄+7H₂O (Dumas)
 Sol in 2.29 pts H₂O at 18.75° (Abl)
 100 pts H₂O at 15.56° dissolve 140 pts ZnSO₄+7H₂O (Ures Dict)
 100 pts H₂O at 15° dissolve 140.53 pts ZnSO₄+7H₂O and has sp gr = 1.4442 (Michel and Krafft)

1 pt of the crystals dissolves in 0.923 pt H₂O at 17.5°, and forms a solution of 1.4353 sp gr (Karsten)

100 pts ZnSO₄+Aq sat at 18.20° contain 35.36 pts ZnSO₄ (v Hauer, J B **1866** 59)
 100 pts H₂O dissolve at

0°	20°	50°	75°
41.3	53.0	66.9	80.4 pts ZnSO ₄

(Tobler, J B **1855** 309)

100 pts H₂O at 20.5° dissolve 163.2 pts ZnSO₄+7H₂O (Schiff, A **109** 336)

100 pts H₂O at t° dissolve pts anhydrous ZnSO₄ and pts ZnSO₄+7H₂O

t°	Pts ZnSO ₄	Pts ZnSO ₄ +7H ₂ O	t	Pts ZnSO ₄	Pts ZnSO ₄ +7H ₂ O
0	43.02	115.22	60	74.20	313.48
10	48.36	138.21	70	79.25	369.36
20	53.13	161.49	80	84.60	442.62
30	58.40	190.90	90	89.78	533.02
40	63.52	224.05	100	95.03	653.59
50	68.75	263.84			

(Poggiale, A ch (3) **8** 467)

Solubility of ZnSO₄ in 100 pts H₂O at t°

t°	Pts ZnSO ₄	t°	Pts ZnSO ₄	t°	Pts ZnSO ₄
0	44.0	14	52.8	27	62.1
1	44.6	15	53.5	28	62.8
2	45.2	16	54.2	29	63.6
3	45.8	17	54.9	30	64.3
4	46.4	18	55.6	31	65.1
5	47.0	19	56.3	32	65.8
6	47.6	20	57.0	33	66.6
7	48.3	21	57.7	34	67.3
8	48.9	22	58.4	35	68.1
9	49.5	23	59.2	36	78.8
10	50.2	24	59.9	37	69.3
11	50.8	25	60.7	38	70.4
12	51.5	26	61.4	39	71.2
13	52.2				

Decomp into basic salt above 40°

(Mulder, Scheik Verhandel **1864** 74)

If solubility S represents number of pts anhydrous salt in 100 pts of solution, S=27.6+0.2604t from -5° to +81°, S=50.0-0.2244t from 81° to 175° (Étard, C R **106** 207)

Sat ZnSO₄+Aq contains at

1°	13°	20°	41°	49°
29.1	32.6	34.8	40.2	40.9% ZnSO ₄

55°	62°	70°	77°	100°
43.4	45.0	47.0	46.5	44.7% ZnSO ₄

111°	12°	137°	144°	169°	171°
43.0	40.7	38.0	37.4	30.0	29.0% ZnSO ₄

(Étard, A ch 1894, (7) **2** 551)

Transition point from +6H₂O to +1H₂O is 70° (Étard)

Solubility of ZnSO₄+6H₂O in H₂O at t°

t°	g ZnSO ₄ in 100 g H ₂ O
-5.0	47.08
+0.1	49.48
9.1	54.20
15.0	57.15
25.0	63.74
30.0	65.82
35.0	67.99
39.0	70.08

(Cohen Z phys Ch 1900, **34** 182)

Solubility of the hepta- and hexa-hydrates of ZnSO_4 at t°

p = wt of salt expressed in percent of solution

t°	p
0	29 43
0	29 53
0	29 49
15 00	33 66
15 88	33 85
30 70	38 46
39 92	41 36
39 95	41 37
40 73	41 43
41 49	41 70
46 40	42 68
49 97	43 51
49 99	43 41
50 00	43 50
50 02	43 51

Transition point from $+7\text{H}_2\text{O}$ to $+6\text{H}_2\text{O}$ is 39°

The formula representing the change of solubility between 0° and 39° is

$$p = 29.5 + 0.270t + 0.00068t^2$$

while the expression for the hexahydrate above 40° is

$$p = 41.35 + 0.210t + 0.00070t^2$$

(Barnes, J phys Chem 1900, 4 19)

Solubility of $\text{ZnSO}_4 + 7\text{H}_2\text{O}$ in H_2O at t°

t°	g ZnSO_4 in 100 g H_2O
-5	39 30
+0 1	41 93
9 1	47 09
15 0	50 88
25 0	57 90
35 0	66 61
39 0	70 05

(Cohen, Z phys Ch 1900, 34 182)

Solubility in H_2O at high pressures

Pressure in atm	t°	g ZnSO_4 in 100 g H_2O	Solubility at 25
1	26	57 95	57 95
500	26	58 43	57 92
500	25 8	58 32	57 91
1000	25 8	57 95	57 55
1000	25 8	57 95	57 55

(Cohen and Sinnige, Z phys Ch 1909, 67 444)

Liable to form supersaturated solutions

Sat $\text{ZnSO}_4 + \text{Aq}$ at 8° has sp gr = 1.421 (Anthon)

Sp gr of $\text{ZnSO}_4 + 7\text{H}_2\text{O}$ at 20°

$\% = \% \text{ZnSO}_4 + 7\text{H}_2\text{O}$

%	Sp gr	%	Sp gr	%	Sp gr
1	1 0057	21	1 1288	41	1 2754
2	1 0115	22	1 1355	42	1 2834
3	1 0173	23	1 1423	43	1 2917
4	1 0231	24	1 1491	44	1 3000
5	1 0289	25	1 1560	45	1 3083
6	1 0348	26	1 1629	46	1 3167
7	1 0407	27	1 1699	47	1 3252
8	1 0467	28	1 1770	48	1 3338
9	1 0527	29	1 1842	49	1 3424
10	1 0588	30	1 1914	50	1 3511
11	1 0649	31	1 1987	51	1 3599
12	1 0710	32	1 2060	52	1 3688
13	1 0772	33	1 2134	53	1 3779
14	1 0835	34	1 2209	54	1 3871
15	1 0899	35	1 2285	55	1 3964
16	1 0962	36	1 2362	56	1 4057
17	1 1026	37	1 2439	57	1 4151
18	1 1091	38	1 2517	58	1 4246
19	1 1156	39	1 2595	59	1 4342
20	1 1222	40	1 2674	60	1 4439

(Schiff, A 110 72)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 15°

$\% = \% \text{ZnSO}_4 + 7\text{H}_2\text{O}$

%	Sp gr	%	Sp gr	%	Sp gr
1	1 006	21	1 130	41	1 280
2	1 013	22	1 137	42	1 288
3	1 019	23	1 143	43	1 295
4	1 024	24	1 150	44	1 304
5	1 0288	25	1 1574	45	1 3100
6	1 035	26	1 164	46	1 320
7	1 041	27	1 171	47	1 330
8	1 047	28	1 179	48	1 337
9	1 053	29	1 185	49	1 346
10	1 0593	30	1 1933	50	1 3532
11	1 066	31	1 200	51	1 362
12	1 073	32	1 209	52	1 380
13	1 079	33	1 216	53	1 370
14	1 085	34	1 224	54	1 390
15	1 0905	35	1 231	55	1 3986
16	1 097	36	1 240	56	1 408
17	1 103	37	1 246	57	1 416
18	1 110	38	1 255	58	1 425
19	1 116	39	1 263	59	1 435
20	1 1236	40	1 2709	60	1 4451

(Gerlach, Z anal 8 288)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 23.5° a=no of g, equivalent to $\frac{1}{2}$ mol wt, dissolved in 1000 g H_2O , b=sp gr if a is $\text{ZnSO}_4 + 7\text{H}_2\text{O}$, $\frac{1}{2}$ mol wt = 143.5, c=sp gr if a is ZnSO_4 , $\frac{1}{2}$ mol wt = 80.5

a	b	c	a	b
1	1 077	1 084	7	1 368
2	1 143	1 162	8	1 400
3	1 199	1 236	9	1 428
4	1 249	1 307	10	1 453
5	1 294	1 376	11	1 476
6	1 333	1 443		

(Favre and Valson, C R 79 968)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 18°

% ZnSO_4	Sp gr	% ZnSO_4	Sp gr	% ZnSO_4	Sp gr
5	1 0509	15	1 1675	32	1 3045
10	1 1369	20	1 2313	50	1 3788

(Kohlrausch, W Ann 1879 1)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at room temp containing

7 12 16 64 23 09% ZnSO_4
1 1064 1 1953 1 2814

(Wagner, W Ann 1883, 18 271)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 19.5°

Mass of salt per unit mass of solution	Density of solution (g per cc)
0 00186	1 00179
0 00371	1 00356
0 00556	1 00530
0 00740	1 00711
0 01106	1 01065
0 01469	1 01410
0 01829	1 01753
0 02187	1 02112
0 02542	1 02446
0 02895	1 02798

(McGregor, C N 1887, 55 4)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 25°

Concentration of $\text{ZnSO}_4 + \text{Aq}$	Sp gr
1—normal	1 0792
$\frac{1}{2}$ —	1 0402
$\frac{1}{4}$ —	1 0198
$\frac{1}{8}$ —	1 0094
$\frac{1}{16}$ —	1 0047

(Wagner, Z phys Ch 1890, 5 40)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$

g salt in 100 g solution	Sp gr
24 7170	1 3152
21 4444	1 2665
17 7573	1 2145
14 0307	1 1645
9 7426	1 1106
5 1110	1 0565

(Charpy, A ch 1893, (6) 29 27)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$

g equivalents ZnSO_4 per liter	t°	Sp gr t°/t°
0 001309	13 59	1 0001126
0 002616	13 575	1 0002258
0 005212	13 573	1 0004451
0 01039	13 585	1 000886
0 09818	13 621	1 008189
0 18842	13 642	1 015587
0 1890	16 11	1 01550
2 493	15 88	1 19385

(Kohlrausch and Hallwachs, W Ann 1894, 53 27)

Sp gr of $\text{ZnSO}_4 + \text{Aq}$ at 18.5° , when p = percent strength of solution, d = observed density, and w = volume conc in grams per cc ($\frac{pd}{100} = w$)

p	d	w
29 22	1 3718	0 40057
25 14	1 3091	0 32910
21 28	1 2528	0 26659
17 08	1 1957	0 20422
11 20	1 1220	0 12567
8 44	1 0894	0 09195
6 65	1 0696	0 07112
3 82	1 0387	0 03968
3 18	1 0318	0 03281
1 46	1 0138	0 01480
0 577	1 0045	0 00580

(Barnes, J phys Chem 1898, 2 542)

Sp gr of dil $\text{ZnSO}_4 + \text{Aq}$ at 20.004°
Conc = g equiv per l at 20.004°

Sp gr compared with H_2O at $20.004^\circ = 1$.

Conc	Sp gr
0 0000	1 000,000,0
0 0001	1 000,008,6
0 0002	1 000,017,2
0 0005	1 000,043,2
0 0010	1 000,086,3
0 0020	1 000,172,3
0 0050	1 000,429,1
0 0060	1 000,514,3
1 0100	1 000,853,9

(Lamb and Lee, J Am Chem Soc 1913, 35 1690)

Sat $\text{ZnSO}_4 + \text{Aq}$ boils at 104.4° , and solution contains 45 pts ZnSO_4 to 100 pts H_2O (Griffiths)

Crust forms at 103.5° , the solution containing 68 pts ZnSO_4 to 100 pts H_2O . Highest temp observed, 105° (Gerlach, Z anal **26** 426)

B-pt of $\text{ZnSO}_4 + \text{Aq}$ containing pts ZnSO_4 to 100 pts H_2O

B pt	Pts ZnSO_4	B pt	Pts ZnSO_4
100 5°	13 1	103 0°	61 0
101 0	25 0	103 5	68 0
101 5	37 7	104 0	74 9
102 0	45 4	104 5	80 7
102 5	53 9	105 0	85 7

(Gerlach, Z anal **26** 432)

B-pt of $\text{ZnSO}_4 + \text{Aq}$

g ZnSO_4 in 100 g H_2O	Rise of the b-pt	Barometric pressure mm
2 886	0 080	743 0
6 647	0 169	"
10 139	0 266	"
13 389	0 372	"
17 713	0 461	"
22 202	0 591	"
25 199	0 690	"
--- 28 249 ---	--- 0 811 ---	"
30 470	0 899	742 0
32 89	0 995	"
35 18	1 122	"
37 36	1 240	"
39 83	1 381	"
41 30	1 459	"
44 56	1 671	"

(Kahlenberg, J phys Chem 1901, **5** 370)

1 l absolute H_2SO_4 dissolves 0.0021 mols ZnSO_4 at 25° (Bergius, Z phys Ch 1912, **72** 353)

Completely pptd from $\text{ZnSO}_4 + \text{Aq}$ by $\text{HC}_2\text{H}_3\text{O}_2$ (Persoz)

Solubility of ZnSO_4 in $\text{KOH} + \text{Aq}$

—Mols KOH to 1 mol ZnSO_4	per cent ZnO in ppt
0 25	17 11
0 50	35 10
1 00	63 08
1 62	100 00
2 00	98 49
3 00	96 79
5 00	89 76
7 00	68 87
13 20	0 00

(Linebarger, J Am Chem Soc 1895, **17** 360)

Difficultly and slowly sol in sat $\text{NH}_4\text{Cl} + \text{Aq}$, with separation of a double sulphate

Sol in considerable quantity in sat $\text{NaCl} + \text{Aq}$, without pptn at first, but finally Na_2SO_4 separates out See under NaCl

Sol in sat $\text{NaNO}_3 + \text{Aq}$ as in $\text{NaCl} + \text{Aq}$ See under NaNO_3

Sol in sat $\text{KNO}_3 + \text{Aq}$ with immediate pptn of double sulphate (Karsten) See under KNO_3

Very rapidly sol in sat $\text{K}_2\text{SO}_4 + \text{Aq}$, with separation of a double salt (Karsten) See under K_2SO_4

Abundantly in sat $\text{CuSO}_4 + \text{Aq}$

Slowly sol in sat $\text{MgSO}_4 + \text{Aq}$

Very rapidly and abundantly sol in sat $\text{NaSO}_4 + \text{Aq}$

For solubility of $\text{ZnSO}_4 + \text{Na}_2\text{SO}_4$ see under Na_2SO_4 and $\text{Na}_2\text{Zn}(\text{SO}_4)_2 + 4\text{H}_2\text{O}$

Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 830)

Insol in alcohol of 0.88 sp gr, 1000 pts alcohol of 0.905 sp gr dissolve 2 pts (Anthon)

100 pts of a saturated solution in 40% alcohol contain 3.48 pts $\text{ZnSO}_4 + 7\text{H}_2\text{O}$, 20%, 39 pts, 10%, 51.1 pts (Schiff, J B 1861 87)

100 pts absolute methyl alcohol dissolve 0.65 pt ZnSO_4 at 18° (de Bruyn, Z phys Ch **10** 783)

100 pts absolute methyl alcohol dissolve 59 pts $\text{ZnSO}_4 + 7\text{H}_2\text{O}$ at 17°

100 pts 50% methyl alcohol dissolve 15.7 pts $\text{ZnSO}_4 + 7\text{H}_2\text{O}$ at 17° (de Bruyn)

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, **37** 4329)

100 pts glycerine dissolve 35 pts ZnSO_4 at ord temp (Klever, Bull Soc 1872, (2) **18** 372)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1904, **37** 3601)

Min *Gossilarite*

Zinc hydrogen sulphate, $\text{ZnH}_2(\text{SO}_4)_2 + 8\text{H}_2\text{O}$

Somewhat difficultly sol in cold, easily in hot H_2O (v Kobell, J pr **28** 492)

Zinc sulphate ammonia, basic, 4NH_3 , 4ZnO , $\text{SO}_3 + 4\text{H}_2\text{O}$

Ppt (Schundler)

Zinc sulphate ammonia, ZnSO_4 , 2NH_3

$+ \text{H}_2\text{O}$ Decomp by H_2O into basic zinc sulphate

ZnSO_4 , $4\text{NH}_3 + 4\text{H}_2\text{O}$ Sol in H_2O (Kane, A ch **72** 304)

$+ 3\text{H}_2\text{O}$ (André, C R **100** 241)

ZnSO_4 , 5NH_3 Sol in H_2O with partial decomp (Rose, Pogg **20** 149)

Zinc sulphate cupric oxide, ZnSO_4 , $2\text{CuO} + 5\text{H}_2\text{O}$

(Mailhe, A ch 1902, (7) **27** 169)

ZnSO_4 , $3\text{CuO} + x\text{H}_2\text{O}$ (Reccour, C R 1901, **132** 1415)

+5H₂O
 2ZnSO₄, 3CuO+12H₂O (Mailhe, A ch
 1902, (7) 27 169)
 7ZnSO₄, 24CuO+xH₂O (Recoura, C R
 1901, 132 1415)

Zinc sulphate hydrazine, ZnSO₄, 2N₂H₄

Sol in NH₄OH+Aq (Franzen, Z anorg
 1908, 60 278)

Sol in NH₄OH+Aq without decomp
 (Curtius, J pr 1894, (2) 50 345)

ZnH₂(SO₄)₂, N₂H₄ 1 pt is sol in 185 pts
 H₂O at 12°. Sl sol in dil acids. Decomp
 by conc HNO₃ and by hot conc H₂SO₄
 Very sol in NH₄OH+Aq (Curtius, J
 pr 1894, (2) 50 331)

Zirconium sulphate, basic, 3ZrO₂, 2SO₃

Insol in H₂O Sol in HCl+Aq (Pay-
 kull, B 12 1719)

4ZrO₂, 3SO₃+14H₂O Ppt Difficulty sol
 in H₂O (Hauser, B 1904, 37 2024)

3ZrO₂, SO₃ Insol in boiling H₂O (Franz,
 B 3 58)

7ZrO₂, 6SO₃ Insol in H₂O (Endemann,
 J pr (2) 11 219)

ZrO₂, SO₃ Sol in very little H₂O More
 H₂O decomp into 3ZrO₂, 2SO₃ and Zr(SO₄)₂
 (Berzelius)

3ZrO₂, 4SO₃+15H₂O Sol in H₂O (Pay-
 kull)

6ZrO₂, 7SO₃+19H₂O Sol in H₂O (Pay-
 kull)

Zirconium sulphate, Zr(SO₄)₂

Anhydrous Slowly but completely sol
 in cold, quickly in hot H₂O

Sol in warm H₂SO₄, but separates on cool-
 ing. Precipitated from aqueous solution by
 alcohol

+4H₂O Easily sol in H₂O

100 pts of the solution contain 59.3 pts
 of the hydrated salt at 39.5° (Hauser, B
 1904, 37 2025)

Solubility of Zr(SO₄)₂+4H₂O in H₂SO₄+
 Aq at t°

100 g of the solution contain

t	g ZrO ₂	g SO ₃
39.5	19.5	25.46
	19.3	25.6
	19.6	25.99
	19.3	26.5
	18.8	27.0
	18.15	27.6
	17.3	25.3
	16.2	29.1
	9.6	32.3
	5.3	34.7
	3.51	36.01
	1.03	38.2
	0.46	39.8
	0.31	42.0

Solubility of Zr(SO₄)₂+4H₂O in H₂SO₄+
 Aq at t°—Continued

t°	g ZrO ₂	g SO ₃
	0.33	42.1
	0.14	46.8
	0.13	47.1
	0.15	56.7
	0.20	56.8
	0.27	57.1
	0.50	57.5
	0.60	57.8
	2.00	59.5
	3.25	60.4
	4.40	61.4
22	0.10	56.1
	0.13	46.5
	0.21	57.2

(Hauser, Z anorg 1907, 54 197)

Zirconium hydrogen sulphate, Zr(SO₄)₂, H₂SO₄+H₂O

Solubility in H₂SO₄+Aq at 39.5°

100 g of the solution contain

0.11	0.10	0.10	g ZrO ₂
81.4	81.6	81.5	g SO ₃

(Hauser, Z anorg 1907, 54 200)

+3H₂O

Solubility in H₂SO₄+Aq at t°

100 g of the solution contain

t°	g ZrO	g SO ₃
39.5	4.55	61.5
	3.25	62.5
	3.33	63.8
	3.35	63.8
	1.80	64.2
	1.60	64.6
	1.55	65.0
	1.12	66.8
	0.96	68.4
22	0.80	66.4
	0.65	67.5
	0.60	68.1

(Hauser, Z anorg 1907, 54 200)

Persulphuric acid, HSO₄

See Persulphuric acid

Pyrosulphuric acid and pyrosulphates

See under Sulphuric acid and sulphates

Sulphuric boric acid

See Borosulphuric acid

Sulphuric vanadic acid, V₂O₅, 3SO₃+3H₂O

See Sulphate, vanadium

Sulphurous acid, anhydrous, SO_2 *See Sulphur dioxide***Sulphurous acid, H_2SO_3**

Known only in aqueous solution, from which SO_2 is given off upon heating. Crystallizes in cold, with various amounts of water, forming compounds which approximate $\text{H}_2\text{SO}_3 + 8\text{H}_2\text{O}$ (Pierre, A 68 228), $\text{H}_2\text{SO}_3 + 10\text{H}_2\text{O}$ (Dopping, Bull Ac St Pétersb 7 100), $\text{H}_2\text{SO}_3 + 14\text{H}_2\text{O}$ (Schonfeld, A 95 22), $\text{H}_2\text{SO}_3 + 6\text{H}_2\text{O}$ (Roozeboom, R t c 3 29, 59, 75, 84, Geuther, A 224 218). Crystals are sol in 2 pts H_2O at 10° (Pierre).

For sp gr of solutions, etc., see sulphur dioxide

Sulphites

Normal Only the alkali sulphites are sol in H_2O , and they are insol or only sl sol in alcohol

Insol in liq NH_3 (Franklin, Am ch J 1898, 20 824)

Acid All the acid sulphites are sol in H_2O

In general it is rarely possible to determine whether the compd described is a pure chemical compound or not. It is probable that many substances described by Svennsen and others are isomorphic mixtures whose composition depends upon the temp and conc of the solution in which it was pptd (Rosenheim, Z anorg 1900, 25 72)

m sulphite, basic, $\text{Al}_2\text{O}_3, \text{SO}_2 + 4\text{H}_2\text{O}$

in H_2O , sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Fourdj Vauquelin)

$6\text{Al}(\text{OH})_3, \text{Al}_2(\text{SO}_3)_3 + 9\text{H}_2\text{O}$ Ppt (Seubert, Z anorg 1893, 4 66)

Ammonium sulphite, basic, $(\text{NH}_4)_2\text{SO}_3, \text{NH}_3 + \frac{3}{2}\text{H}_2\text{O}$

Sol in H_2O Pptd from aqueous solution by alcohol (Muspratt)

Does not exist (Marignac)

Ammonium sulphite, $(\text{NH}_4)_2\text{SO}_3$

Very hygroscopic (Divers, Chem Soc 1900, 77 336)

Insol in acetone (Eidmann, C C 1899, II 1014)

$+ \text{H}_2\text{O}$ Slowly sol in H_2O (Muspratt, A 50 268)

Sol in 1 pt H_2O at 12° (Fourcroy and Vauquelin, Crell Ann 1800 2 415)

More sol in hot H_2O with evolution of NH_3 . Sl sol in absolute alcohol (Muspratt)

Much more sol in alcohol than K_2SO_3 (Pierre)

Loses NH_3 in the air

Sol in H_2O Conc solution charged with NH_3 will deposit salt on evaporation over KOH . Dil solution decomp on evaporation (Divers, Chem Soc 1900, 77 335)

Insol in acetone (Naumann, B 1904, 37 4329)

Ammonium hydrogen sulphite, NH_4HSO_3

Insol in acetone (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329)

Ammonium pyrosulphite, $(\text{NH}_4)_2\text{S}_2\text{O}_5$

Deliquescent Very sol in H_2O and alcohol Insol in ether (Fock and Klüss, B 23 3149)

Very sol in H_2O , very hygroscopic. Aq solution is sl decomp on evaporation (Divers, Chem Soc 1900, 77 336)

Ammonium cadmium sulphite, $(\text{NH}_4)_2\text{SO}_3, \text{CdSO}_3$

Nearly insol in H_2C Partly sol in excess of $\text{H}_2\text{SO}_3 + \text{Aq}$, but separates out on boiling (Schuler, A 87 34)

Ammonium cobaltous sulphite, $(\text{NH}_4)_2\text{SO}_3, \text{CoSO}_3 + x\text{H}_2\text{O}$

Decomp on air (Berglund, B 7 469)

Ammonium cobaltocobaltic sulphite

See Cobalt sulphite, ammonium cobalt

Ammonium cuprous sulphite, $(\text{NH}_4)_2\text{SO}_3, 2\text{Cu}_2\text{SO}_3 + 2\text{H}_2\text{O}$

(Böttger, A 51 411)

$(\text{NH}_4)_2\text{SO}_3, \text{Cu}_2\text{SO}_3$ Insol in cold, decomp by boiling H_2O (Rogojski, J B 1851 366)

Decomp by warming with H_2O , in which it is insol. Sol in acids with evolution of SO_2 . (Rosenheim and Steinhäuser, Z anorg 1900, 25 99)

$+ 2\text{H}_2\text{O}$ (Commaile, J B 1867 300)

$2(\text{NH}_4)_2\text{SO}_3, \text{Cu}_2\text{SO}_3 + 3\text{H}_2\text{O}$ Very sol in H_2O . Solution decomp on standing. Decomp by acids (Rosenheim and Steinhäuser)

$5(\text{NH}_4)_2\text{SO}_3, \text{Cu}_2\text{SO}_3 + 2\text{H}_2\text{O}$ Decomp on air. Sol in H_2O with decomp (Svensson)

$6(\text{NH}_4)_2\text{SO}_3, \text{Cu}_2\text{SO}_3 + 4\text{H}_2\text{O}$ Easily decomp (Rosenheim and Steinhäuser)

$7(\text{NH}_4)_2\text{SO}_3, \text{Cu}_2\text{SO}_3 + 4\text{H}_2\text{O}$ Very sol in H_2O . Solution soon decomp (Rosenheim and Steinhäuser)

$+ 10\text{H}_2\text{O}$ Decomp on air. Sl sol in warm, less sol in cold H_2O (de Saint-Gilles)

$+ 14\text{H}_2\text{O}$ Decomp on air. Sol in H_2O , but solution decomp

Very easily sol in mother liquor (Svensson, Acta Lund 1899 13)

Ammonium cuprocupric sulphite, $(\text{NH}_4)_2\text{SO}_3, 2\text{Cu SO}_3, \text{CuSC}_3 + 5\text{H}_2\text{O}$

Insol in H_2O and weak acids. Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (de Saint-Gilles, A ch 3) 42 31)

$+ 6\frac{1}{2}\text{H}_2\text{O}$ Ppt (Rosenheim and Steinhäuser, Z anorg 1900, 25 98)

Ammonium glucinum sulphite,
 $(\text{NH}_4)_2\text{O}$, 2GfO , $3\text{SO}_2 + 4\text{H}_2\text{O}$

Ppt Very unstable in the air (Rosenheim, Z anorg 1897, **15** 310)

Ammonium gold (aurous) sulphite,
 $3(\text{NH}_4)_2\text{SO}_3 \cdot \text{Au}_2\text{SO}_3$

Very easily sol in H_2O Insol in alcohol (Haase, Z Ch **1869** 535)

Ammonium gold (aurous) sulphite ammonia,
 $(\text{NH}_4)_2\text{SO}_3$, $3\text{Au}_2\text{SO}_3$, $6\text{NH}_3 + \text{H}_2\text{O}$

Decomp by H_2O Sol in warm $\text{NH}_4\text{OH} + \text{Aq}$, but decomp by boiling

$(\text{NH}_4)\text{Au}_3(\text{SO}_3)_2$, $3\text{NH}_3 + 4\text{H}_2\text{O}$ Decomp by H_2O (Rosenheim, Z anorg 1908, **59** 201)

Ammonium iridium sulphite

See Iridosulphite, ammonium

Ammonium iron (ferrous) sulphite,
 $(\text{NH}_4)_2\text{SO}_3$, $\text{FeSO}_3 + x\text{H}_2\text{O}$

(Berglund)

Ammonium iron (ferric) sulphite sulphate,
 $\text{FeSO}_3 \cdot \text{SO}_4 \cdot \text{NH}_4 + \text{H}_2\text{O}$

Sl sol in cold H_2O Decomp by cold dil HCl (Hofmann, Z anorg 1897, **14** 287)

Ammonium magnesium sulphite,
 $(\text{NH}_4)_2\text{Mg}_3(\text{SO}_3)_4 + 18\text{H}_2\text{O}$

Very sl sol in H_2O (Fourcroy and Vauquelin)

Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$
 $+ 5\text{H}_2\text{O}$ Much more sol in H_2O than MgSO_3 (Rammelsberg)

Ammonium manganous sulphite, $(\text{NH}_4)_2\text{SO}_3$,
 MnSO_3

Relatively easily decomp by H_2O (Berglund, Bull Soc (2) **21** 213)

Not easily decomp (Gorgcu, C R **96** 376)

Ammonium mercuric sulphite, $(\text{NH}_4)_2\text{SO}_3$,
 HgSO_3

Very easily sol in H_2O , but H_2O solution gradually decomp, even in the cold

Ammonium nickel sulphite, $(\text{NH}_4)_2\text{SO}_3$,
 $3\text{NiSO}_3 + 18\text{H}_2\text{O}$

Sol in H_2O (Berglund, B **7** 469)

Ammonium platnous sulphite

See Platosulphite, ammonium

Ammonium potassium sulphite, $10(\text{NH}_4)_2\text{SO}_3$,
 $\text{K}_2\text{SO}_3 + 11\text{H}_2\text{O}$

Decomp by H_2O , etc (Hartog, C R **109** 221)

Ammonium scandium sulphate,
 $(\text{NH}_4)_2\text{SO}_3$, $\text{Sc}_2(\text{SO}_3)_3 + 7\text{H}_2\text{O}$

Insol in H_2O Difficulty sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Meyer, Z anorg 1914, **86** 281)

Ammonium silver sulphite, $(\text{NH}_4)_2\text{SO}_3$,
 Ag_2SO_3

Insol in H_2O , but gradually decomp thereby (Svensson, B **4** 714)

$6(\text{NH}_4)_2\text{SO}_3$, $\text{Ag}_2\text{SO}_3 + 19\text{H}_2\text{O}$ Sol in H_2O without decomp (Svensson)

$3(\text{NH}_4)_2\text{SO}_3$, $4\text{NH}_4\text{HSO}_3$, $\text{Ag}_2\text{SO}_3 + 18\text{H}_2\text{O}$

Easily sol in H_2O , but decomp by warming

Ammonium sodium hydrogen sulphite,
 $\text{NH}_4\text{Na}_2\text{H}(\text{SO}_3)_2 + 4\text{H}_2\text{O}$

Not deliquescent (Marignac, Ann Min (5) **12** 29)

100 pts H_2O dissolve 42.3 pts salt at 12.4° , and 48.5 pts at 15° (Schwicker, B **22** 1732)
 $+ 5\text{H}_2\text{O} = 2\text{Na}_2\text{SO}_3$, $(\text{NH}_4)_2\text{S}_2\text{O}_5 + \text{H}_2\text{O}$ (Tauber, Techn J B **1888** 444)

Ammonium tellurium sulphite, $(\text{NH}_4)_2\text{SO}_3$,
 $\text{TeSO}_3 + x\text{H}_2\text{O}$

Sol in H_2O (Berglund, B **7** 469)

Ammonium uranyl sulphite,
 $\text{NH}_4(\text{UO}_2)(\text{OH})\text{SO}_3$

Insol in pure H_2O More sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ than the K salt, and less than the Na salt (Scheller, A **144** 240)

$(\text{NH}_4)_2\text{O}$, 2UO_3 , 3SO_2

$(\text{NH}_4)_2\text{O}$, 4UO_3 , 5SO_2

$(\text{NH}_4)_2\text{O}$, 3UO_3 , 2SO_2

$(\text{NH}_4)_2\text{O}$, UO_3 , 2SO_2 (Kohlschutter, A **1900**, **311** 10)

Ammonium vanadium sulphite

See Vanadosulphite, ammonium

Ammonium vanadyl sulphite,

$(\text{NH}_4)_2\text{SO}_3$, $\text{VO}_3\text{SO}_3 + 2\text{H}_2\text{O}$

Sol in H_2O with decomp (Koppel, Z anorg 1903, **35** 184)

$(\text{NH}_4)_2\text{O}$, 3VO_3 , $2\text{SO}_2 + \text{H}_2\text{O}$ Sol in cold H_2O without decomp

Easily sol in mineral acids and alkalis

Sl sol in alcohol and ether (Koppel Z anorg 1903, **35** 182)

Ammonium zinc sulphite, $(\text{NH}_4)_2\text{SO}_3$, ZnSO_3

Sol in H_2O (Berglund, B **7** 469)

Ammonium sulphite mercuric chloride,
 $2(\text{NH}_4)_2\text{SO}_3$, HgCl_2

Sl sol in cold, decomp by boiling H_2O (de St-Giles, A ch (3) **36** 95)

Antimony sulphite, Sb_2O_3 , $3\text{SO}_2(?)$

Insol in H_2O (Berzelius)

Could not be obtained (Rohrig, J pr (2) **37** 241)

Barium sulphite, BaSO₃

Very sl sol in H₂O (Fourcroy and Vauquelin, A ch **24** 301)

Sol in about 46,000 pts H₂O at 16° (Autenrieth, Z anal 1898, **37** 294)

Sol in H₂SO₃+Aq

Insol in acetone (Naumann B 1904, **37** 4329), methyl acetate (Naumann, B 1909, **42** 3790)

Solubility in sugar+Aq at t°

Solvent	t	100 ccm of solution contain g BaSO ₃
water	20	0 01974
sucrose+Aq 10° Brix		0 01040
" " 20° "		0 00968
" " 30° "		0 00782
" " 40° "		0 00484
" " 50° "		0 00298
(sat) " 60° "		0 00223
water	80	0 00177
sucrose+Aq 10° Brix		0 00335
" " 20° "		0 00289
" " 30° "		0 00223
" " 40° "		0 00158
" " 50° "		0 00149
(sat) " 60° "		0 00112

(Rogowicz, C C **1905**, II 1223)

Barium cobaltic sulphite

See Cobaltisulphate, barium

Barium gold (aurous) sulphite, 3BaSO₃,

Au₂SO₃+xH₂O

Ppt (Haase)

Barium mercuric sulphite, BaSO₃, HgSO₃+H₂O

Ppt (Barth, Z phys Ch **9** 196)

Barium mercuric sulphite chloride,

BaSO₃, BaCl₂, 2HgSO₃+3½H₂O

(Barth, Z phys Ch 1892, **9** 208)

Bismuth sulphite, basic, Bi₂O₃, 3SO₃+5H₂O

Insol in H₂O, alcohol, or ether Sl sol in H₂SO₃+Aq (Rohrig, J pr (2) **37** 241)

(BiO)₂SO₃, 3(BiOH)SO₃+H₂O (Seubert and Elten, Z anorg 1893, **4** 72-5)

2(BiO)₂SO₃, 3(BiOH)SO₃+2H₂O (S and E)

3(BiO)₂SO₃, 7(BiOH)SO₃+10H₂O (S and E)

4(BiO)₂SO₃, (BiOH)SO₃+5H₂O (S and E)

9(BiO)₂SO₃, (BiOH)SO₃+2H₂O (S and E)

Bismuth cobaltic sulphite

See Cobaltisulphite, bismuth

Cadmium sulphite, CdSO₃

Difficultly sol in H₂O Easily sol in d acids (Rammelsberg, Pogg **67** 256)

+2H₂O Difficultly sol in H₂O Sol H₂SO₃+Aq Sol in NH₄OH+Aq Insol alcohol (Muspratt, Phil Mag (3) **30** 414)

Insol in acetone (Naumann, B 1904, **37** 4329)

Contains 2½H₂O (Deniges, Bull Soc (7) 569)

Cadmium sodium sulphite, 3CdSO₃, Na₂SO

Sol in H₂O (Berglund, B **7** 469)

Cadmium sulphite, ammonia, CdSO₃, NH

Decomp by H₂O Sol without decomp 1 hot NH₄OH+Aq (Rammelsberg, Pogg **6** 256)

Cæsium sulphite, Cs₂SO₃

Easily sol in H₂O Sl sol in alcoho (Chabré, C R 1901, **133** 297)

Cæsium hydrogen sulphite, CsHSO₃

Easily sol in H₂O Sl sol in alcoho (Chabré, C R 1901, **133** 297)

Calcium sulphite, basic, Ca₉S₅O₁₈=6CaO 5SO₂

(Schott, Dingl **202** 52)

Calcium sulphite, CaSO₃+2H₂O

Slowly effloresces Sol in 800 pts cold H₂O (Berzelius)

Insol in H₂O (Rohrig, J pr (2) **37** 230) 0 043 g is sol in 1 l H₂O at 18° (Weisberg, Bull Soc 1896, (3) **15** 1249)

CaSO₃ equiv to 78 mg CaO is sol in 1 l H₂O at 100° (Robart, C A **1913** 2500)

Very sol in H₂SO₃+Aq See CaH₂(SO₃)₂ Insol in liquid NH₃ (Franklin, Am Ch J 1898, **20** 827)

CaSO₃ equiv to 37 mg CaO is sol in 1 l 12% cane sugar+Aq at 100° (Robart, C A **1913** 2500)

0 0825 g is sol in 1 l 10% sugar +Aq at 18°, 0 0800 g is sol in 1 l 20% " +Aq at 18° (Weisberg, Bull Soc **15** 1219)

Insol in acetone (Krug and M'Elroy, Bull Soc 1909, **42** 3790, ethyl acetate (Naumann, B 1904, **37** 3601)

+½H₂O (Rammelsberg)

Calcium hydrogen sulphite, CaH₂(SO₃)₂

Known only in solution 100 ccm H₂O containing 9 g SO₂ dissolve 0 553 g CaSO₃ to form a solution of 1 06 sp gr (Gerland, J pr (2) **4** 119)

Calcium cobaltic sulphite

See Cobaltisulphite, calcium

erous sulphite, $\text{Ce}_2(\text{SO}_3)_3 + 3\text{H}_2\text{O}$

More sol in cold than hot H_2O
 Solution gradually decomposes (Berthier,
 ch (3) 7 77)

chromous sulphite, CrSO_3

Precipitate Insol in H_2O (Moberg)

chromium sulphite, basic, $\text{Cr}_2\text{O}_3, \text{SO}_2$

Colloidal modification Sol in H_2O
 $2\text{Cr}_2\text{O}_3, \text{SO}_2$ Ppt (Recoura, Bull Soc
 398, (3) 19 169)

chromic sulphite

Known only in aqueous solution, which pre-
 cipitates a basic salt on boiling
 $2\text{Cr}_2\text{O}_3, 3\text{SO}_2 + 16\text{H}_2\text{O}$ Precipitate (Dan-
 in, Chem Soc 2 205)

**chromic potassium sulphite, $\text{K}_2\text{O}, \text{Cr}_2\text{O}_3,$
 $2\text{SO}_2 + x\text{H}_2\text{O}$**

Precipitate (Berglund, B 7 470)

cobaltous sulphite, basic

Ppt Decomp by H_2O (Berthier)
 $\text{Co}(\text{OH})_2, 5\text{CoSO}_3 + 10\text{H}_2\text{O}$ Ppt (Seu-
 ert and Elten, Z anorg 1893, 4 89)
 $\text{Co}(\text{OH})_2, 10\text{CoSO}_3 + 15\text{H}_2\text{O}$ (Seubert and
 Elten)

cobaltous sulphite, CoSO_3

$+3\text{H}_2\text{O}$ Nearly insol in H_2O Sol in
 $\text{I}_2\text{SO}_3 + \text{Aq}$ (Rammelsberg)
 Partly sol in $\text{NH}_4\text{OH} + \text{Aq}$
 $+5\text{H}_2\text{O}$ Insol in H_2O Sol in $\text{H}_2\text{SO}_3 +$
 Aq (Muspratt, A 30 282)

cobaltocobaltic sulphite

See Cobaltisulphite, cobaltous

cobaltic sulphite with $3\text{M}_2\text{SO}_3$

See Cobaltisulphite, M

**cobaltous potassium sulphite, $\text{CoSO}_3, \text{K}_2\text{SO}_3,$
 $+x\text{H}_2\text{O}$**

Insol in H_2O , easily sol in $\text{HCl} + \text{Aq}$
 Schultze, J B 1864 270)

**cobaltic potassium sulphite, $\text{Co}_2(\text{SO}_3)_3,$
 K_2SO_3**

Sl sol in H_2O , easily sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ or
 $\text{HCl} + \text{Aq}$ (Schultze)

**cobaltous sodium sulphite, $3\text{CoO}, \text{Na}_2\text{O},$
 3SO_2**

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$
 Schultze)

**cobaltic sodium sulphite, $\text{Co}_2\text{O}_3, \text{Na}_2\text{O},$
 3SO_2**

Sl sol in H_2O (Schultze)

Cuprous sulphite, $\text{Cu}_2\text{SO}_3 + \text{H}_2\text{O}$

(a) *Red* Sl sol in H_2O Sol in NH_4OH
 or $\text{HCl} + \text{Aq}$ (Rogojski, J B 1851 366)
 Could not be obtained by St Gilles or
 Svensson (B 4 713)

Insol in H_2O , alcohol, or ether (Étard, C
 R 95 38)

Composition is $(\text{Cu}_2)_2\text{H}_{18}(\text{SO}_3)_3$, "Cuprous
 isosulphite," according to Étard
 $+ \frac{1}{2}\text{H}_2\text{O}$ Étard's formula, $\text{Cu}_2\text{SO}_3 + \text{H}_2\text{O}$
 is incorrect

The salt is almost colorless (Ramberg
 Z phys Ch 1909, 69 512)

(b) *White Normal salt* Insol in H_2O ,
 alcohol, or ether (Étard)

Cupric sulphite, basic, $4\text{CuO}, \text{SO}_2 + 7\text{H}_2\text{O}$

Insol in H_2O , and decomp by washing
 therewith (Millon and Commaile)

$7\text{CuO}, 4\text{SO}_2 + 8\text{H}_2\text{O}$ Sol in dil H_2SO_4 ,
 (Seubert and Elten, Z anorg 1893, 4 48)

$3\text{CuO}, 2\text{SO}_2 + 1\frac{1}{2}\text{H}_2\text{O}$ Sl sol in H_2O
 (Newbury, Am Ch J 14 232)

$7\text{CuO}, 4\text{SO}_2 + 8\text{H}_2\text{O}$, or $4\text{CuSO}_3, 3\text{Cu}(\text{OH})_2$
 $+ 5\text{H}_2\text{O}$ Sol in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (Seubert
 and Elten, Z anorg 1893, 4 50)

Cuprocupric sulphite, $\text{CuSO}_3, \text{Cu}_2\text{SO}_3 + 2\text{H}_2\text{O}$

Nearly insol in cold H_2O Decomp by
 boiling

Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$, HCl , or $\text{NH}_4\text{OH} + \text{Aq}$
 (Berthier)

Sol in very dil $\text{HNO}_3 + \text{Aq}$ (Döpping,
 J B 1851 365)

Insol in H_2SO_3 , $\text{HC}_2\text{H}_3\text{O}_2$, or Cu salts $+ \text{Aq}$
 (de St Gilles)

$+5\text{H}_2\text{O}$ Insol in H_2O Easily sol in
 $\text{H}_2\text{SO}_3 + \text{Aq}$, $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, in cupric salts
 $+ \text{Aq}$, $\text{NH}_4\text{OH} + \text{Aq}$, or $\text{HCl} + \text{Aq}$ (de St
 Gilles, A ch (3) 42 34)

Composition is $(\text{Cu})_2\text{H}_{18}(\text{SO}_3)_3 + 21\text{H}_2\text{O}$,
 "acid cuprocupric octosulphite" (Étard,
 C R 96 1475)

**Cuprous ferroferic sodium sulphite, $\text{Cu}_2\text{O},$
 $2\text{FeO}, \text{Fe}_2\text{O}_3, \text{Na}_2\text{O}, 6\text{SO}_2 + 16\text{H}_2\text{O}$**

Sol in about 1000 pts H_2O

Sol in cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$, sol in cold
 dil $\text{HCl} + \text{Aq}$ with a residue of Cu_2Cl_2
 (Stromeyer, A 109 237)

**Cuprous lithium sulphite, $\text{Cu}_2\text{SO}_3, \text{Li}_2\text{SO}_3 +$
 $2\text{H}_2\text{O}$**

Insol in H_2O , but gradually decomp
 thereby (Étard, C R 95 138)

Cupric mercuric sulphite, $\text{CuSO}_3, \text{HgSO}_3$

Sol in H_2O in all proportions, but decomp
 on boiling

Cuprous potassium sulphite, $\text{Cu}_2\text{SO}_3,$

K_2SO_3 (?)
 (Vohl, J pr 95 219)
 $+2\text{H}_2\text{O}$ Sol in H_2O with decomp

(Rosenheim and Steinhauser, Z anorg 1890, 25 96)

Cu_2SO_3 , $2\text{K}_2\text{SO}_3$ (Chevreul, Graham, etc.)

Does not exist (Svensson)

Cu_2O , $3\text{K}_2\text{O}$, $6\text{SO}_2 + 7\text{H}_2\text{O} = 4\text{KHSO}_3$,
 K_2SO_3 , $\text{Cu}_2\text{SO}_3 + 5\text{H}_2\text{O}$ Decomp by H_2O
 (Svensson, B 4 713)

Could not be obtained (Rosenheim and Steinhauser)

Cu_2O , $4\text{K}_2\text{O}$, $8\text{SO}_2 + 3\text{H}_2\text{O} = 6\text{KHSO}_3$,
 K_2SO_3 , Cu_2SO_3 Decomp by H_2O (Svensson)

Could not be obtained (Rosenheim and Steinhauser)

Cu_2SO_3 , $8\text{K}_2\text{SO}_3 + 16\text{H}_2\text{O}$ Sol in H_2O
 with decomp (Rammelsberg, Pogg 57 391)

Does not exist, according to Svensson

Cuprocupric potassium sulphite, $3\text{Cu}_2\text{SO}_3$,
 3CuSO_3 , K_2SO_3

Properties as cuprous potassium sulphite
 (Rogojski, J B 1851 367)

$2\text{Cu}_2\text{SO}_3$, CuSO_3 , $\text{K}_2\text{SO}_3 + 5\text{H}_2\text{O}$ Insol
 in H_2O and weak acids (de St-Gilles)

Cu_2SO_3 , 4CuSO_3 , $\text{K}_2\text{SO}_3 + 16\text{H}_2\text{O}$ De-
 comp by H_2O (Rosenheim and Steinhauser)

Cuprous sodium sulphite, Cu_2SO_3 , Na_2SO_3
 $+ 2\text{H}_2\text{O}$ Decomp by H_2O (Svensson, 1870)

$+ 11\text{H}_2\text{O}$ Insol in cold H_2O , but decomp
 by excess (Étard, C R 95 138)

$2\text{Cu}_2\text{SO}_3$, $3\text{Na}_2\text{SO}_3 + 29\text{H}_2\text{O}$ Insol in H_2O
 (Rosenheim and Steinhauser, Z anorg 1900, 25 94)

Cu_2SO_3 , $5\text{Na}_2\text{SO}_3 + 38\text{H}_2\text{O}$ Decomp by
 H_2O (Svensson)

Cu_2SO_3 , $7\text{Na}_2\text{SO}_3 + 19\text{H}_2\text{O}$ Completely
 sol in H_2O , but solutions decomp on stand-
 ing (Svensson)

"Cuprous sodium octosulphite,"

$(\text{Cu}_2)_3\text{H}_{10}\text{Na}_{16}\text{S}_8\text{O}_{32} + 43\text{H}_2\text{O}$ (Étard)

$5\text{Cu}_2\text{SO}_3$, $2\text{Na}_2\text{SO}_3 + 30\text{H}_2\text{O}$ Easily de-
 comp (Rosenheim and Steinhauser, Z
 anorg 1900, 25 94)

Cuprocupric sodium sulphite,

Cu_2SO_3 , 2CuSO_3 , $2\text{Na}_2\text{SO}_3 + 6\text{H}_2\text{O}$

Nearly insol in cold, decomp by hot H_2O
 (Rosenheim and Steinhauser, Z anorg 1900, 25 95)

$+ 8\text{H}_2\text{O}$ Decomp by H_2O (Rosenheim
 and Steinhauser)

Cuprocupric sodium hydrogen sulphite,

$\text{Na}_3\text{Cu}_2^+(\text{Cu}_2^+)\text{H}_2(\text{SO}_4)_3, 6\text{H}_4(\text{SO}_4) + 5\text{H}_2\text{O}$

Insol in H_2O (Étard, C R 94 1422)

$(\text{Cu}_2^+)\text{Cu}_2^+\text{Na}_3\text{H}_{18}(\text{SO}_4)_8$ (Étard)

Copper sodium sulphites

Doubtless many of the compds described
 in this class are in reality isomorphous mixtures
 whose composition depends upon the temp
 and conc of the solution in which pptd

(Rosenheim and Steinhauser, Z anorg 1900, 25 92-95)

Didymium sulphite, $\text{D}_{12}(\text{SO}_3)_3 + 3\text{H}_2\text{O}$, or
 $6\text{H}_2\text{O}$

Precipitate Insol in H_2O Sol in H_2SO_3
 $+ \text{Aq}$, from which it is reprecipitated by
 heating, redissolving on cooling (Marignac,
 A ch (3) 38 167)

Erbium sulphite, $\text{Er}_2(\text{SO}_3)_3 + 3\text{H}_2\text{O}$

Precipitate

Glucinum sulphite, basic, 2GlSO_3 , $9\text{Gl}(\text{OH})_2$
 $+ 6\text{H}_2\text{O}$

Ppt (Seubert, Z anorg 1893, 4 52)

GlSO_3 , GlO Decomp by H_2O or alcohol
 (K and M)

3GlSO_3 , GlC Sol in alcohol (K and M)

Glucinum sulphite, GlSO_3

Decomp by H_2O or alcohol (Krüss and
 Moraht, B 23 734)

Glucinum potassium sulphite,

2GlSO_3 , $\text{K}_2\text{SO}_3 + 9\text{H}_2\text{O}$

Unstable in the air (Rosenheim, Z anorg
 1897, 15 310)

Gold (aurous) potassium sulphite, Au_2SO_3 ,
 $3\text{K}_2\text{SO}_3$

Very sol in H_2O , insol in alcohol (Haase)

Gold (auric) potassium sulphite, Au_2O_3 ,
 $5\text{K}_2\text{O}$, $8\text{SO}_2 + 5\text{H}_2\text{O} = 5\text{K}_2\text{SO}_3$, $\text{Au}_2(\text{SO}_3)_3$
 $+ 5\text{H}_2\text{O}$

Sol in H_2O with decomp

Decomp by acids, insol in alkalies
 (Fremy, A 79 46)

Gold (auric) potassium sulphite,
 $\text{Au}_2(\text{SO}_3)_3$, $5\text{K}_2\text{SO}_3 + 10\text{H}_2\text{O}$

(Rosenheim and Hertzmann, Z anorg 1908,
 59 199)

Gold (auric) potassium sulphite ammonia,
 $\text{Au}_2(\text{SO}_3)_3$, $3\text{K}_2\text{SO}_3$, $4\text{NH}_3 + 4\text{H}_2\text{O}$

As the corresponding NH_4 salt (Rosen-
 heim and Hertzmann, Z anorg 1908, 59
 202)

Gold (aurous) sodium sulphite, Au_2SO_3 ,
 $3\text{Na}_2\text{SO}_3 + 3\text{H}_2\text{O}$

Sol in less than 1 pt H_2O Insol in alcohol
 (Hasse)

$+ 5\text{H}_2\text{O}$ (Himly)

Gold (auric) sodium sulphite,

$\text{Au}_2(\text{SO}_3)_3$, $5\text{Na}_2\text{SO}_3 + 28\text{H}_2\text{O}$

As K salt (Rosenheim and Hertzmann,
 anorg 1908, 59 199)

Sold (aurous) sulphite ammonia, $3Au_2O_3$, $4SO_2$, $8NH_3+4H_2O$

Sl sol in H_2O with decomp Decomp by acids

Sl sol in cold, more easily in hot NH_4OH + Aq Decomp by boiling (Hasse, Zeit Ch **869** 535)

Sold (auric) sulphite ammonia, $Au_3(SO_3)_2$, $4NH_3+4H_2O$

Ppt Decomp in moist air and in neutral solution (Herzmann, Z anorg 1908, **59** 98)

ndium sulphite, $2In_2O_3$, $3SO_2+8H_2O$
Insol in H_2O (Bayer, A **158** 372)

ridium sulphite, $Ir_2(SO_3)_3+6H_2O$

Scarcely sol in H_2O , easily sol HCl + Aq Birnbaum, A **136** 179)

ridyl sulphite, $(IrO)SO_3+4H_2O$

Insol in H_2O Sol in HCl or H_2SO_4 + Aq Birnbaum)

ridous potassium sulphite, IrO , $3K_2O$, $5SO_2(?)$

Sl sol in H_2O , more sol in KOH + Aq Easily sol in HCl + Aq (Claus, J pr **42** 59)

ridous sulphite potassium chloride

See Iridosulphite, potassium

ridium sulphite with M_2SO_3

See Iridosulphite, M

ron (ferrous) sulphite, $FeSO_3+2\frac{1}{2}H_2O$

Very sl sol in H_2O Easily sol in H_2SO_3 + Aq Insol in alcohol, but sol therein in presence of SO_2 (Muspratt)

ron (ferric) sulphite, Fe_2O_3 , SO_2+6H_2O

Very sl sol in H_2O Sol in acids (Koene) $2Fe_2O_3$, $3SO_2$ Deliquescent, decomp by H_2O into SO_2 and above comp $3Fe_2O_3$, $8O_2+7H_2O$ Ppt

ron (ferroferric) potassium sulphite, $FeSO_3$, $(FeO)_2SO_3$, $2K_2SO_4$

Ppt (Berglund)

ron (ferric) potassium sulphite, K_2O , Fe_2O_3 , $3SO_3+2H_2O$

Sol in H_2SO_3 + Aq (Koene, Pogg **63** 53)

Fe_2O_3 , $2K_2O$, $3SO_2+5H_2O$ Ppt (Muspratt, Phil Mag (3) **30** 414)

ron (ferric) potassium sulphite sulphate, $FeSO_3SO_3K$

Sl sol in cold H_2O

Sol in 20% HCl decomp on boiling Hofmann, Z anorg , **14** 300

$Fe(SO_3)_2SO_3K_3$ Almost insol in cold H_2O Decomp by boiling with dil acids (Hofmann)

$Fe_2(SO_3)_4SO_3K_4+5H_2O$ Insol in cold H_2O , sol in cold 20% HCl + Aq, decomp on boiling with H_2O (Hofmann)

Iron (ferric) sodium sulphite sulphate, $Fe(SO_3)_2SO_3Na_3+6H_2O$

Almost insol in H_2O

Decomp by boiling with dil acids (Hofmann, Z anorg 1897, **14** 289)

Iron (ferric) sodium hydrogen sulphite sulphate, $FeSO_4(SO_3)_4H_2Na_2+2H_2O$

Only very sl sol in H_2O (Hofmann)

Lanthanum sulphite, $La_2(SO_3)_3+4H_2O$

Precipitate (Cleve)

Lead sulphite, $PbSO_3$

Insol in H_2O Decomp by acids Sl sol in H_2SO_3 + Aq (Rohrig, J pr (2) **37** 233)

Lithium sulphite, $Li_2SO_3+6H_2O$

Sol in H_2O , precipitated from aqueous solution by abs alcohol (Danson, Chem Soc **2** 205) Sol in H_2SO_3 + Aq

+ H_2O Sl sol in alcohol, and still less sol in ether (Rohrig, J pr (2) **37** 225) + $2H_2O$ (Rohrig)

Lithium potassium sulphite, $LiKSO_3+\frac{1}{2}H_2O$

Easily sol in H_2O (Rohrig, J pr (2) **37** 251)

Lithium sodium sulphite, $6Li_2SO_3$, $Na_2SO_3+8H_2O$

Sol in H_2O (Rohrig)

Magnesium sulphite, $MgSO_3+6H_2O$

Sol in 20 pts cold and in less hot H_2O (Foureroy and Vauquelin)

Sol in 80 pts cold, and in 120 pts boiling H_2O (Hager, C C **1875** 135)

More easily sol in H_2SO_3 + Aq Insol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 828)

Precipitated from aqueous solution by alcohol

+ $3H_2O$ (Rohrig, J pr (2) **37** 234)

Manganous sulphite, $MnSO_3+2H_2O$

Insol in H_2O , alcohol, or ether Easily sol in acids, also in H_2SO_3 + Aq

Insol in acetone (Naumann, B 1904, **37** 4329)

+ $2\frac{1}{2}H_2O$ (Rammelsberg)
+ $3H_2O$ Sol in 10,000 pts cold, and 5000 pts hot H_2O , more sol in conc Mn salts + Aq, sol in 1000 pts H_2CO_3 + Aq 100 pts H_2SO_3 + Aq dissolve 15-17 pts (Gorgeu, C R **96** 341)

Salt with $2\frac{1}{2}\text{H}_2\text{O}$ is the only one which exists (Rohrig, J pr (2) 37 2)

Manganous potassium sulphite, $2\text{MnSO}_3 \cdot \text{K}_2\text{SO}_3$

Insol in H_2O , even when boiling (Gorgeu, C R 96 376)

$\text{MnSO}_3 \cdot \text{K}_2\text{SO}_3$ Sol in H_2O (Gorgeu)

Manganous sodium sulphite, $\text{MnSO}_3 \cdot \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$

Insol in hot H_2O , but decomp by cold H_2O (Gorgeu)

$4\text{MnSO}_3 \cdot \text{Na}_2\text{SO}_3$ Insol in H_2O (Gorgeu)

Mercuric sulphite, $2\text{HgO} \cdot \text{SO}_2$

Insol in H_2O Sol in HCl , alkali sulphites with subsequent decomp, and in $\text{KCN} + \text{Aq}$ (de St-Gilles, A ch (3) 36 80)

HgSO_3 Decomp by cold H_2O (de St-Gilles)

Does not exist (Divers and Shimidzu, Chem Soc 49 553)

$\text{HgO} \cdot 2\text{SO}_2 + \text{H}_2\text{O}$ Sol in H_2O , but decomp by boiling (de St-Gilles) Exists only in aqueous solution (Divers and Shimidzu)

Mercuriomercuric sulphite, $\text{Hg}_3(\text{SO}_3)_2 + 2\text{H}_2\text{O} = \text{Hg}_2\text{SO}_3 \cdot \text{HgSO}_3$

Very efflorescent Insol in H_2O Decomp by hot H_2O Insol in dil HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$

$+4\text{H}_2\text{O}$ Very efflorescent

Hypomercurosic sulphite, $\text{Hg}_4(\text{SO}_3)_2 + \text{H}_2\text{O}$

Insol in H_2O , but easily decomp on standing therewith Almost absolutely insol in dil HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$ (Divers and Shimidzu)

Mercuric oxy sulphite, $\text{Hg}(\text{SO}_2\text{OHgO})_2 \cdot \text{Hg} + \text{H}_2\text{O}$

Insol in H_2O Decomp by hot H_2O Insol in dil HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$ Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Divers and Shimidzu)

Mercuric potassium sulphite, basic,

$\text{K}_2\text{O} \cdot 2\text{HgO} \cdot 2\text{SO}_2$

(Barth, Z phys Ch 1892, 9 210)

$\text{K}_2\text{O} \cdot 3\text{HgO} \cdot 3\text{SO}_2$ Insol in H_2O Partly sol in $\text{KOH} + \text{Aq}$ (Barth)

Mercuric potassium sulphite, $\text{HgSO}_3 \cdot \text{K}_2\text{SO}_3 + \text{H}_2\text{O}$

Sl sol in cold H_2O Decomp on boiling (de St-Gilles, A ch (3) 36 90)

Mercuric potassium sulphite mercuric chloride, $\text{K}_2\text{Hg}(\text{SO}_3)_2 \cdot \text{HgCl}_2$

Decomp by H_2O (Barth, Z phys Ch 1892, 9 206)

Mercuric silver sulphite, $\text{HgSO}_3 \cdot \text{Ag}_2\text{SO}_3 + 2\text{H}_2\text{O}$

Decomp rapidly, insol in H_2O (Barth, Z phys Ch 9 195)

Mercuric sodium sulphite, $\text{HgSO}_3 \cdot \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$

Sol in H_2O (de St-Gilles)

Sol in 25 pts cold H_2O , and decomp on heating (Divers and Shimidzu)

$+2\text{H}_2\text{O} = \text{Na}_2(\text{SO}_3)_2 \cdot \text{Hg} + 2\text{H}_2\text{O}$ (Barth, Z phys Ch 9 193)

$2\text{HgSO}_3 \cdot \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$ Much more sol in H_2O than the above comp especially on heating (de St-Gilles)

Does not exist (Divers and Shimidzu)

Mercuric strontium sulphite, $\text{HgSO}_3 \cdot \text{SrSO}_3 + 2\text{H}_2\text{O}$

Ppt (Barth)

Mercuric sulphite ammonium bromide,

$\text{HgSO}_3 \cdot \text{NH}_4\text{Br}$

As NH_4Cl comp (Barth, Z phys Ch 1892, 9 215)

Mercuric sulphite ammonium chloride,

$\text{HgSO}_3 \cdot \text{NH}_4\text{Cl}$

As K salt (Barth)

Mercuric sulphite potassium chloride,

$\text{HgSO}_3 \cdot \text{KCl}$

Sol in H_2O (Barth)

Mercuric sulphite sodium chloride, $\text{HgSO}_3 \cdot \text{NaCl} + \text{H}_2\text{O}$

Sol in H_2O (Barth)

Nickel sulphite, basic, $2\text{NiSO}_3 \cdot \text{Ni}(\text{OH})_2 + 6\text{H}_2\text{O}$

Ppt (Seubert and Elten, Z anorg 1893, 4 91)

Nickel sulphite, $\text{NiSO}_3 + 4\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{HCl} + \text{Aq}$ with evolution of SO_2 (Muspratt, A 50 259)

$+6\text{H}_2\text{O}$ Insol in H_2O Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Rammelsberg, Pogg 67 391)

Nickel sulphite ammonia, $\text{NiSO}_3 \cdot 3\text{NH}_3 + 3\text{H}_2\text{O}$

Sol in little H_2O Decomp by much H_2O or heat (Rammelsberg, Pogg 67 245)

Osmious sulphite, OsSO_3

Insol in H_2O Easily sol in $\text{HCl} + \text{Aq}$ without evolution of SO_2 Very slowly decomp by $\text{KOH} + \text{Aq}$ (Claus)

Osmious potassium sulphite, $\text{OsSO}_3 \cdot 2\text{K}_2\text{SO}_3 \cdot 2\text{KHSO}_3 + 4\text{H}_2\text{O}$

Nearly insol in H_2O

Ammonium potassium sulphite chloride, $\text{OsO}_2 \cdot 2\text{SO}_3 \cdot 6\text{KCl}$

Easily sol in H_2O

Alloyed sodium sulphite, $\text{PdSO}_3 \cdot 3\text{Na}_2\text{SO}_3 + 2\text{H}_2\text{O} = \text{Na}_6\text{Pd}(\text{SO}_3)_4 + 2\text{H}_2\text{O}$

Sol in hot H_2O Sol in $\text{NaOH} + \text{Aq}$ or $\text{I}_2\text{SO}_3 + \text{Aq}$ (Wohler and Frerichs, A 174 99)

Alloyed sulphite, $\text{PtO}_2 \cdot 2\text{SO}_3$

Easily sol in H_2O or alcohol (Dobereiner, pr 15 315)

Formula is PtSO_3 (Gmelin)
 $\text{PtSO}_3 \cdot \text{H}_2\text{SO}_3$ (Birnbaum, A 139 172)

Alloyed potassium sulphite, $\text{PtO}_2 \cdot \text{SO}_3 \cdot \text{K}_2\text{SO}_3 + \text{H}_2\text{O}$

Sol in $\text{KOH} + \text{Aq}$ (Birnbaum, A 139 73)

Alloyed sodium sulphite, $\text{PtO}_2 \cdot \text{SO}_3 \cdot 2\text{Na}_2\text{SO}_3 + 2\text{H}_2\text{O}$

Sol in H_2O (Birnbaum)

Alloyed sulphite with M_2SO_3

See Platosulphite, M

Alloyed sulphite ammonium chloride
See Chloroplatosulphite, ammonium

Potassium sulphite, $\text{K}_2\text{SO}_3 + 2\text{H}_2\text{O}$

Somewhat deliquescent Sol in 1 pt cold, and still less hot H_2O (Fourcroy and Vauquelin, A ch 24 254)

Insol in liquid NH_3 (Franklin, Am Ch 1898, 20 829)

Very slightly soluble in alcohol Insol in thyl acetate (Casasaca, C R 30 821)

Potassium hydrogen sulphite, KHSO_3

Sol in H_2O Insol in absolute alcohol

Potassium pyrosulphite, $\text{K}_2\text{S}_2\text{O}_5$

Slowly sol in H_2O Very sl sol in alcohol, insol in ether (Muspratt, A 50 259)

Potassium rhodium sulphite, $3\text{K}_2\text{SO}_3 \cdot \text{Rh}_2(\text{SO}_3)_3 + 6\text{H}_2\text{O}$

See Rhodosulphite, potassium

Potassium ruthenium sulphite,

$\text{O}[\text{Ru}(\text{SO}_3)_4\text{K}_6]_2 + 2\text{H}_2\text{O}$

Ppt (Miolati, C C 1901, I 501)

Potassium sodium sulphite, KNaSO_3

Sol in H_2O (Spring, B 7 1161)

+1, and $2\text{H}_2\text{O}$ (Schwicker, B 22 1731)

Isomeric salts, KSO_3Na and NaSO_3K Barth, Z phys Ch 9 176)

Potassium sodium hydrogen sulphite, $\text{KNa}_2\text{H}(\text{SO}_3)_2 + 4\text{H}_2\text{O}$

Easily sol in H_2O , 100 pts H_2O dissolve 69 pts salt at 15° (Schwicker, B 22 1731)

$\text{K}_2\text{NaH}(\text{SO}_3)_2 + 3\text{H}_2\text{O}$ (Schwicker)

Potassium uranyl sulphite, $\text{K}(\text{UO}_2)(\text{OH})\text{SO}_3$

Insol in H_2O , but sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Scheller)

$\text{K}_2\text{O} \cdot 2\text{UO}_3 \cdot 3\text{SO}_2$ (Kohlschütter, A 1900, 311 10 *et seq*)

$\text{K}_2\text{O} \cdot 4\text{UO}_3 \cdot 5\text{SO}_2$ (K)

$\text{K}_2\text{O} \cdot 3\text{UO}_3 \cdot 2\text{SO}_2$ (K)

$\text{K}_2\text{O} \cdot \text{UO}_3 \cdot 2\text{SO}_2$ (K)

Potassium vanadium sulphite

See Vanadosulphite, potassium

Potassium vanadyl sulphite, $\text{K}_2\text{SO}_3 \cdot \text{VO}_2\text{SO}_3 + 5\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O without decomp and can be recryst therefrom (Koppel and Behrendt, B 1901, 34 3932)

$\text{K}_2\text{O} \cdot 3\text{VO}_2 \cdot 2\text{SO}_2$ Sol without decomp in cold and hot H_2O

Insol in alcohol and ether (Koppel, Z anorg 1903, 35 182)

Potassium zinc sulphite, $\text{K}_2\text{SO}_3 \cdot 3\text{ZnSO}_3 + 7\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O with decomp (Berglund, Acta Lund 1872)

Rhodium sulphite, $\text{Rh}_2(\text{SO}_3)_3 + 6\text{H}_2\text{O}$

Sol in H_2O Insol in alcohol (Claus)

Rhodium sodium sulphite

See Rhodosulphite, sodium

Ruthenium sulphite, $\text{Ru}_2(\text{SO}_3)_3$

Colloidal substance, sol in a large quantity of H_2O (Lucchesi, Gazz ch it 1900, 30 (2) 71)

Ruthenium sodium sulphite, $\text{Na}_7\text{Ru}(\text{SO}_3)_5 + 2\text{H}_2\text{O}$

Ppt (Miolati, C C 1901, I 501)

Samarium sulphite, $\text{Sm}_2(\text{SO}_3)_3$

Amorphous precipitate (Cleve)

Scandium sulphite, $\text{Sc}_2(\text{SO}_3)_3$

Insol in cold H_2O Sl sol in hot H_2O Sol in excess of sodium sulphite when heated (Crookes, Phil Trans 1910, 210 A 363)

$+6\text{H}_2\text{O}$ Very sl sol in H_2O

Decomp by boiling with H_2O with separation of H_2SO_3 (R J Meyer, Z anorg 1914, 86 281)

Selenium sulphite, SeSO_3

Correct composition for "selenium sulphoxide" (Divers, Chem. Soc 49 583)

Silver sulphite, Ag_2SO_3

Very sl sol in cold H_2O Decomp on heating

Solubility in H_2O is $< 1/20,000$ (Bau-bigny, C R 1909, 149 858)

Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, and alkali sulphites + Aq Insol in $\text{H}_2\text{SO}_3 + \text{Aq}$ Decomp by strong acids, but not by acetic acid (Berthier, A ch (3) 7 82)

Easily sol in alkali thiosulphates + Aq (Herschel)

Cold $\text{NaHSO}_3 + \text{Aq}$ dissolves a considerable amount of Ag_2SO_3 (Rosenheim and Steinhäuser, Z anorg 1900, 25 78)

Practically insol in $\text{HNO}_3 + \text{Aq}$ or dil $\text{AgNO}_3 + \text{Aq}$, also in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Divers, Chem Soc 49 579)

Silver sodium sulphite, $\text{Ag}_2\text{SO}_3, \text{Na}_2\text{SO}_3 + \text{H}_2\text{O}$

Decomp by H_2O (Svensson, B 4 714)

Sodium sulphite, Na_2SO_3

100 pts dissolve at 0° , 14.1 pts, at 20° , 25.8 pts, at 40° , 49.5 pts Na_2SO_3 (Kremers Pogg 99 50) Maximum solubility is at 33° (Mitscherlich)

Solubility in 100 pts H_2O at t°

t	Pts Na_2SO_3
60 4	28 29
59 8	28 29
59 8	28 65
59 8	28 75
37 0	28 01
37 0	28 07
47 0	28 19
47 0	28 07
55 6	28 21
84 0	28 26

The temp at which $\text{Na}_2\text{SO}_3 + 7\text{H}_2\text{O}$ changes into Na_2SO_3 is about 21.6°

(Hartley and Barrett, Chem Soc 1909, 95 1183)

See also $+7\text{H}_2\text{O}$

Sp gr of sat solution at $15^\circ = 1.21$ (Greenish and Smith, Pharm J 1901, 66 774)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Insol in alcohol

Insol in ethyl acetate (Casaseca, C R 30 821), methyl acetate (Naumann, B 1909, 42 3790)

Insol in benzonitrile (Naumann, B 1914, 47 1370)

$+7\text{H}_2\text{O}$ Decomp slowly on a.ir.

Sol in 4 pts H_2O at 15° with absorption of heat (Dumas), and in 1 pt boiling H_2O (Fourcroy)

Solubility in 100 pts H_2O at t°

t°	Pts Na_2SO_3
37 2	44 08
33 5	39 64
29 0	34 99
23 5	29 92
18 2	25 31
10 6	20 01
5 9	17 61
2 0	14 82
-1 9	13 09

Supersolubility curves have also been plotted for ice and $\text{Na}_2\text{SO}_3 + 7\text{H}_2\text{O}$

(Hartley and Barrett, Chem Soc 1909, 95 1181)

$+10\text{H}_2\text{O}$ Efflorescent Somewhat less sol than above salt (Muspratt)

Sodium hydrogen sulphite, NaHSO_3

More difficulty sol in H_2O than NaHCO_3 , and is precipitated by alcohol from aqueous solution (Muspratt)

Insol in acetone. (Eidmann, C C 1899, II 1014, Naumann, B 1904, 37 4329) methyl acetate (Naumann, B 1909, 42 3790)

$+4\text{H}_2\text{O}$ (Clark)

Sodium pyrosulphite, $\text{Na}_2\text{S}_2\text{O}_5$

Decomp gradually on the air

Sodium uranyl sulphite, $\text{Na}(\text{UO}_2)(\text{OH})\text{SO}_3$

Sl sol in H_2O More sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ than the K salt (Scheller)

$\text{Na}_2\text{O}, 2\text{UO}_3, 3\text{SO}_2$

$\text{Na}_2\text{O}, 3\text{UO}_3, 2\text{SO}_2$ (Kohlschütter A 1900, 311 10 et seq)

Sodium vanadyl sulphite, $\text{N}_2\text{O}, 2\text{SO}_2, \text{VO}_2 + 5\text{H}_2\text{O}$

Sol in H_2O with decomp

$\text{Na}_2\text{O}, 2\text{SO}_2, 3\text{VO}_2 + 4\text{H}_2\text{O}$ Sol in cold H_2O , decomp on heating (Koppel, B 1901, 34 3933)

Sodium zinc sulphite, $\text{Na}_2\text{SO}_3, 3\text{ZnSO}_3 + 7\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O with decomp (Berglund, Acta Lund, 1872)

Sodium sulphite silver chloride, $3\text{Na}_2\text{SO}_3, \text{AgCl} + 21\text{H}_2\text{O}$

Sol in H_2O (Svensson)

Strontium sulphite, SrSO_3

Precipitate Almost insol in H_2O Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Muspratt)
 Sol in about 30,000 pts H_2O at 16–18°
 Autenrieth, Z anal 1898, **37** 293)
 Abundantly sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Rohrig)

Tellurium sulphite, TeSO_3

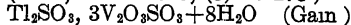
Correct composition of "tellurium sulphoxide" (Divers, Chem Soc **49** 583)

Thallous sulphite, Tl_2SO_3

Sl sol in cold, easily in hot $\text{H}_2\text{SO}_3 + \text{Aq}$
 Rohrig, J pr (2) **37** 229)
 100 pts H_2O dissolve 3.34 pts at 15.5°
 Easily sol in hot H_2O , insol in alcohol
 Seubert and Elten, Z anorg **2** 434)

Thallous vanadyl sulphite, $2\text{Tl}_2\text{SO}_3$,

(Gain, A ch 1908, (8) **14** 278)

**Thorium sulphite, $\text{Th}(\text{SO}_3)_2 + \text{H}_2\text{O}$**

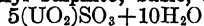
Precipitate (Cleve)

Tin (stannous) sulphite, $5\text{SnO} \cdot 2\text{SO}_2 + x\text{H}_2\text{O}$

Ppt Partly sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Rohrig,
 J pr (2) **37** 249)
 $+ 20\text{H}_2\text{O}$ (Rohrig)
 $8\text{SnO} \cdot 2\text{SO}_2 + 20\text{H}_2\text{O}$
 $11\text{SnO} \cdot 2\text{SO}_2 + 20\text{H}_2\text{O}$ (Rohrig)

Uranous sulphite, basic, $\text{U}(\text{OH})_2\text{SO}_3 + \text{H}_2\text{O}$

Insol in H_2O Easily sol in acids Sol
 in $\text{H}_2\text{SO}_3 + \text{Aq}$, but is soon decomp (Rammelsberg)

Uranyl sulphite, basic, $3\text{UO}_2(\text{OH})_2$,

(Seubert and Elten, Z anorg 1893, **4** 80)

Uranyl sulphite, $(\text{UO}_2)\text{SO}_3 + 4\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ or alcoholic solution of SO_2 (Rohrig, J pr (2) **37** 240)

Vanadyl sulphite, $3\text{VO}_2 \cdot 2\text{SO}_2 + 4\frac{1}{2}\text{H}_2\text{O}$

Decomp slowly on standing
 Sol in H_2O without apparent decomp
 (Koppel, Z anorg 1903, **35** 186)
 $2\text{V}_2\text{O}_4 \cdot 3\text{SO}_2 + 10\text{H}_2\text{O}$ Sol in H_2O , aq
 sol decomp on boiling giving off SO_2 and
 forming $\text{V}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ (Gün, C R 1906, **143**
 324)

Vanadyl zinc sulphite, $\text{ZnO} \cdot 3\text{VO}_2 \cdot 2\text{SO}_2$

Decomp slowly in the air
 Sol in H_2O without decomp (Koppel, Z
 anorg 1903, **35** 183)

Ytterbium sulphite, $\text{Yb}_2(\text{SO}_3)_3 + 9\text{H}_2\text{O}$

Insol in H_2O (Cleve, Z anorg 1902, **32**
 143)

Yttrium sulphite, $\text{Y}_2(\text{SO}_3)_3 + 3\text{H}_2\text{O}$

Sl sol in H_2O (Cleve)

Zinc sulphite, basic, $2\text{ZnSO}_3 \cdot 3\text{Zn}(\text{OH})_2$

(Seubert, Arch Pharm **229** 321)
 $\text{ZnSO}_3, \text{Zn}(\text{OH})_2 + \text{H}_2\text{O}$ (Seubert)

Zinc sulphite, $\text{ZnSO}_3 + 2$, and $2\frac{1}{2}\text{H}_2\text{O}$

Very sl sol in H_2O 100 pts H_2O dissolve
 0.16 pt $\text{ZnSO}_3 + 2\text{H}_2\text{O}$ (Henston and Tich-
 borne, Brit Med J **1890** 1063)
 Easily sol in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Koene)
 Sol in $\text{NH}_4\text{OH} + \text{Aq}$
 Insol in alcohol
 Decomp into basic salt by boiling H_2O
 (Seubert, Arch Pharm **229** 1)

Zinc sulphite ammonia, $\text{ZnSO}_3 \cdot \text{NH}_3$

Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$
 (Rammelsberg, Pogg **67** 255)

Zirconium sulphite

Insol in H_2O Somewhat sol in $\text{H}_2\text{SO}_3 +$
 Aq , from which it is pptd on boiling Sol
 in $(\text{NH}_4)_2\text{SO}_3 + \text{Aq}$, from which Zr hydroxide
 is pptd on boiling (Berzelius)
 $\text{Zr}(\text{SO}_3)_2 + 7\text{H}_2\text{O}$ Ppt (Venable, J Am
 Chem Soc 1895, **17** 449)

Sulphuryl bromide, SO_2Br_2

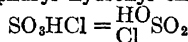
(Odling, Chem Soc **7** 2)
 Does not exist (Sestini, Bull Soc **10**
 226, Melsens, C R **76** 92, Michaelis)

Sulphuryl chloride, SO_2Cl_2

Decomp by H_2O and alcohol
 Decomp by moist air, water, or abs
 alcohol, more rapidly by alkalis, HCl , SO_2 ,
 etc (Schiff, A **102** 111)
 $+ \text{H}_2\text{O}$ Only sl sol in H_2O at 0° with
 slow decomp (Baeyer, B 1901, **34** 737)
 $+ 15\text{H}_2\text{O}$ Sl sol in H_2O at 0° and stable
 therein for several hours (Baeyer)

Dissulphuryl chloride (Pyrosulphuryl chloride), $\text{S}_2\text{O}_5\text{Cl}_2$

Decomp slowly with H_2O (Rose, Pogg
44 291)
 Sol in CCl_4 and CHCl_3 , miscible with
 liquid SO_2

Sulphuryl hydroxyl chloride,

Decomp on moist air, and violently with
 H_2O Not miscible with CS_2 Decomp with
 alcohol

Sulphuryl titanium chloride, $\text{SO}_2, \text{TiCl}_4 = \text{TiCl}_3\text{OSO}_2\text{Cl}$

Slowly deliquescent (Clausnitzer, B **11**
 2011)

Disulphuryl chloride stannic oxychloride,
 $5\text{S}_2\text{O}_5\text{Cl}_2, 4\text{SnOCl}_2$

Sol in a little H_2O , but decomp by more H_2O (Rose, Pogg 44 320)

Sulphuryl fluoride, SO_2F_2

1 pt is sol in 10 pts H_2O at 9° 3 vol are sol in 1 vol alcohol at 9° , insol in conc H_2SO_4 at 66° , sol in aq solution of KOH , $\text{Ca}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$ and in alcoholic solution of alkalis (Moissan, C R 1901, 132 377)

Sulphuryl hydroxyl fluoride, HSO_3F

Violently decomp by H_2O (Thorpe and Kirwan, Z anorg 3 63)

Sulphuryl peroxide, SO_4

See Sulphur heptoxide

Sulphydic acid

See Hydrogen Sulphide

Sulphydroxyl

See Sulphhydroxyl

Tantalalic acid, $\text{H}_4\text{Ta}_2\text{O}_7$ (?)

Sol in HF (Rose), and $\text{KH}_2(\text{C}_2\text{O}_4)_2 + \text{Aq}$ (Gahn, Schw J 16 437) At the instant of precipitation is sol in various acids (Rose)

Aluminum tantalate

Insol in H_2O (Berzelius)

Ammonium hexatantalate, $(\text{NH}_4)_2\text{H}_7\text{Ta}_7\text{O}_{19} + \text{H}_2\text{O}$

Somewhat sol in H_2O (Rose, Pogg 102 57)

Barium hexatantalate, $\text{Ba}_4\text{Ta}_6\text{O}_{19} + 6\text{H}_2\text{O}$

Sl sol in H_2O (Rose)

Cesium tantalate, $4\text{Cs}_2\text{O}, 3\text{Ta}_2\text{O}_5 + 14\text{H}_2\text{O}$

Completely sol in a small amount of hot H_2O (E F Smith, J Am Chem Soc 1908, 30 1666)

$7\text{Cs}_2\text{O}, 6\text{Ta}_2\text{O}_5 + 38\text{H}_2\text{O}$ Pptd from its aqueous solution by alcohol (Smith)

Ferrous tantalate, $\text{Fe}(\text{TaO}_3)_3$

Min *Tantalite*

$5\text{FeO}, 4\text{Ta}_2\text{O}_5$ Min *Taprochite*

Magnesium hexatantalate, $\text{Mg}_4\text{Ta}_6\text{O}_{19} + 9\text{H}_2\text{O}$

Ppt (Rose, Pogg 102 61)

$4\text{MgO}, \text{Ta}_2\text{O}_5$ Insol in H_2O (Joly, C R 81 266)

Mercurous tantalate, $5\text{Hg}_2\text{O}, 4\text{Ta}_2\text{O}_5 + 5\text{H}_2\text{O}$

Decomp by warm $\text{HNO}_3 + \text{Aq}$ (1 21 sp gr) with separation of Ta_2O_5 (Rose, Pogg 102 64)

Potassium tantalate, KTaO_3

Insol in H_2O Sol in $\text{KOH} + \text{Aq}$ (Marignac, A ch (4) 9 249)

Potassium hexatantalate, $\text{K}_3\text{Ta}_6\text{O}_{19} + 16\text{H}_2\text{O}$

Sol without decomp in moderately warm H_2O Decomp by boiling (Marignac, A ch (4) 9 259)

Rubidium tantalate, $4\text{Rb}_2\text{O}, 3\text{Ta}_2\text{O}_5 + 14\text{H}_2\text{O}$

Sol in H_2O (E F Smith, J Am Chem Soc 1908, 30 1666)

Silver tantalate, $4\text{Ag}_2\text{O}, 3\text{Ta}_2\text{O}_5$

Completely sol in $\text{NH}_4\text{OH} + \text{Aq}$ $\text{HNO}_3 + \text{Aq}$ dissolves Ag_2O , and Ta_2O_5 separates out (Rose, Pogg 102 64)

Sodium tantalate, NaTaO_3

Insol in H_2O (Rose)

Sodium hexatantalate, $\text{Na}_3\text{Ta}_6\text{O}_{19} + 25\text{H}_2\text{O}$

1 pt salt dissolves in 493 pts H_2O at 13.5° , and in 162 pts at 100° Very slightly sol in alcohol Insol in alkaline solutions (Rose)

Pertantalalic acid

See Pertantalalic acid

Tantalum, Ta

Not attacked by HCl , HNO_3 , aqua regia, or hot conc H_2SO_4 Easily sol in a mixture of HNO_3 and HF (Berzelius, Pogg 4 6, Rose) Also sol in HF alone (Berzelius)

Not attacked by alkali hydrates + Aq Insol in single acids and in aqua regia Oxidized by a mixture of HF and aqua regia (Moissan, C R 1902, 134 211)

Pure Ta is insol in boiling H_2SO_4 , HNO_3 , HCl , aqua regia or mixtures of these acids, slowly sol in $\text{HF} + \text{Aq}$ (v Bolton, Zeit Elektrochem 1905, 11 45)

Tantalum bromide, TaBr_5

Decomp by H_2O (Rose)

Tantalum dichloride, $\text{TaCl}_2 + 2\text{H}_2\text{O}$

Sol in H_2O when freshly prepared (Chabrie, C R 1907, 144 805)

Tantalum pentachloride, TaCl_5

Takes up H_2O from the air without deliquescing Decomp by H_2O Sol in H_2SO_4 Sol in cold $\text{HCl} + \text{Aq}$ to a cloudy liquid, which gelatinises after a time Not completely sol in boiling $\text{HCl} + \text{Aq}$, and the solution does not gelatinise by the subsequent addition of water, but all goes into solution Partly sol in $\text{KOH} + \text{Aq}$ Insol in $\text{K}_2\text{SO}_3 + \text{Aq}$ Sol in absolute alcohol

Tantalum pentafluoride, TaF₅

Very hygroscopic, sol in H₂O (Ruff, B 1909, 42 494)

Tantalum fluoride with MF

See Fluotantalate, M

Tantalum hydroxide, Ta₂O₅, xH₂O

See Tantallic acid

Tantalum nitride, TaN

Not sol in any acids, except a mixture of HF and HNO₃ (Rose, Pogg 100 146)
Ta₂N₅ (Joly, Bull Soc (2) 25 506)

Tantalum dioxide, Ta₂O₃(?)

Sol in HF with evolution of hydrogen (Hermann, J pr (2) 5 69)

Tantalum tetroxide, Ta₂O₄

Not attacked by any acid, not even a mixture of HNO₃ and HF (Berzelius, Pogg 4 20)

Decomp by HCl (Smith, Z anorg 1894, 7 98)

Tantalum pentoxide, Ta₂O₅

Insol in any acid, even boiling H₂SO₄ or in HF (Berzelius)

Sol in fused KHSO₄, 10 pts being necessary to dissolve 1 pt Ta₂O₅

Tantalum silicide, TaSi₂

Insol in most inorganic acids Sol in HF and in HF+HNO₃

Decomp by fused alkali hydroxides (Hönigschmid, M 1907, 28 1027)

Tantalum sulphide, Ta₂S₄

Not attacked by HCl+Aq Oxidised by boiling with HNO₃+Aq, more rapidly with aqua regia Attacked by H₂SO₄ on heating Not completely sol in HF or a mixture of HF and HNO₃

Telluretted hydrogen, TeH₂

See Hydrogen telluride

Telluric acid, H₂TeO₄

Insol in H₂O, cold conc HCl, hot HNO₃, or boiling KOH+Aq, but when heated with H₂O is gradually converted into H₂TeO₄+2H₂O and dissolved

+2H₂O Very slowly sol in cold H₂O, but sol in hot H₂O in every proportion Insol in absolute alcohol, sol in dil alcohol according to the amount of H₂O present Sol in acids and alkalis Insol in alcohol or ether

Insol in alcohol, sol in NaOH+Aq (Mylius, B 1901, 34 2216)

Stable in the air

Sol in H₂O, pptd by HNO₃ (Staudenmaier, Z anorg 1895, 10 191)

Solubility in H₂O

Solid phase	Temp	% H ₂ TeO ₄	Mols H ₂ O to 1 mol H ₂ TeO ₄	Mols H ₂ TeO ₄ to 100 mols H ₂ O
H ₂ TeO ₄ +6H ₂ O	0°	13 92	66 2	1 51
"	5°	17 84	49 2	2 03
"	10°	26 21	30 2	3 31
"	15°	32 79	21 9	4 55
H ₂ TeO ₄ ·2H ₂ O	10°	25 29	31 7	3 15
"	18°	28 90	26 2	3 82
"	30°	33 36	21 4	4 67
"	40°	36 38	18 8	5 33
"	60°	43 67	14 2	7 04
"	80°	51 55	10 07	9 93
"	100°	60 84	6 89	14 52

(Mylius, B 1901, 34 2211)

+6H₂O Obtained from solutions at 0° (Staudenmaier, Z anorg 1895, 10 191)

Allotelluric acid, H₂TeO₄

Miscible with H₂O

Sol in alcohol, pptd by NaOH+Aq but sol in excess (Mylius, B 1901, 34 2216)

Tellurates

Neutral alkali salts are sol in H₂O, the acid salts are only sl sol therein, but dissolve in HCl+Aq

Aluminum tellurate

Ppt Sol in excess of aluminum salts+Aq (Berzelius)

Ammonium tellurate, (NH₄)₂TeO₄

Slowly but completely sol in H₂O Sl sol in NH₄OH+Aq or NH₄Cl+Aq Sl sol in alcohol (Berzelius)

(NH₄)₂O, 2TeO₃ Sl sol in H₂O, but more sol than the corresponding K salt

(NH₄)₂O, 4TeO₃ Very sl sol in H₂O Insol in alcohol (Berzelius)

Barium tellurate, BaTeO₄+3H₂O

Sl sol in cold, more in boiling H₂O Easily sol in HNO₃+Aq (Berzelius)

BaH₂(TeO₄)₂+2H₂O More sol in H₂O than BaTeO₄ Decomp by H₂O (Berzelius)

BaO, 4TeO₃ More sol in H₂O than either BaTeO₄ or BaH₂(TeO₄)₂ (Berzelius)

Bismuth tellurate, Bi₂TeO₅+2H₂O

Min Montanite Sol in HCl+Aq with evolution of Cl

Cadmium tellurate, CdTeO₄

Ppt Sol in HCl+Aq (Oppenheim)

Cesium hydrogen tellurate, CsHTeO₄+½H₂O

1 pt is sol in 30 pts H₂O (Norris, Am Ch J 1901, 26 321)

Calcium tellurate, CaTeO_4 Ppt Sol in hot H_2O (Berzelius)**Chromic tellurate, $\text{Cr}_2(\text{TeO}_4)_3$**

Ppt Sol in excess of Cr salts + Aq

Cobaltous tellurate

Ppt (Berzelius)

Cupric tellurate, CuTeO_4

Ppt (Berzelius)

 CuO , 2TeO_3 Ppt (B) Cu_2TeO_6 Insol in H_2O Sol in HCl , HNO_3 , NH_4OH , KCN and acetic acid (Hutchins, J Am Chem Soc 1905, 27 1181)**Glucinum tellurate, GlTeO_4** Insol in H_2O **Iron (ferrous) tellurate, FeTeO_4** Ppt Min *Ferrotellurate***Iron (ferric) tellurate, $\text{Fe}_2(\text{TeO}_4)_3$**

Ppt Sol in ferric salts + Aq (Berzelius)

Lead tellurate, basicNot completely insol in H_2O **Lead tellurate, PbTeO_4** Somewhat sol in H_2O PbO , 2TeO_3 More sol than PbTeO_4 PbO , 4TeO_3 Sl sol in H_2O Sol in HNO_3 + Aq, less sol in $\text{HC}_2\text{H}_3\text{O}_2$ + Aq (Berzelius)**Lithium tellurate, $\text{Li}_4\text{TeO}_6 + x\text{H}_2\text{O}$** Sl sol in H_2O with decomp (Mylius, B 1901, 34 2209)**Magnesium tellurate, MgTeO_4** Ppt More sol in H_2O than the Ba, Sr or Ca salts MgTe_2O_7 More sol in H_2O than MgTeO_4 **Manganous tellurate**

Ppt

Mercurous tellurate, basic, $3\text{Hg}_2\text{O}$, 2TeO_3

Ppt (Hutchins, J Am Chem Soc 1905, 27 1178)

Mercurous tellurate, Hg_2TeO_4 Ppt Min *Magnobite***Mercuric tellurate, HgTeO_4** Ppt Very easily decomp by H_2O (Hutchins, J Am Chem Soc 1905, 27 1179)+ $2\text{H}_2\text{O}$ Slowly decomp by cold H_2O Rapidly decomp by boiling H_2O (Hutchins) Hg_2TeO_6 Insol in H_2O Unchanged by boiling with H_2O Sol in HNO_3 , but more readily sol in HCl (Hutchins)**Mercuric tellurate**

Ppt (Berzelius)

Mercurous hydrogen tellurate, $\text{HgHTeO}_4 + 3\text{H}_2\text{O}$ Stable in the air if protected from the light
Insol in H_2O Decomp by boiling H_2O or by an excess of cold conc HgNO_3 + Aq
Sol in dil HNO_3 or dil acetic acid (Hutchins, J Am Chem Soc 1905, 27 1177)**Nickel tellurate**

Ppt

Potassium tellurate, $\text{K}_2\text{TeO}_4 + 5\text{H}_2\text{O}$ Deliquesces Sol in H_2O Very sl sol in H_2O containing KOH 100 g H_2O dissolve at

0°	20°	30°
8 82	27 53	50 42 g K_2TeO_4

(Rosenheim and Weinheber, Z anorg 1911, 69 264)

Insol in alcohol (Berzelius)

 K_2O , 2TeO_3 Insol in H_2O , acids, or alkalies (B) $\text{KHTeO}_4 + \frac{1}{2}\text{H}_2\text{O}$ Sl sol in cold, more sol in hot H_2O (Berzelius) K_2O , $3\text{TeO}_3 + 5\text{H}_2\text{O}$ Much more sol in hot than in cold H_2O (Hutchins, J Am Chem Soc 1905, 27 1174) K_2O , 4TeO_3 Insol in H_2O , HCl , or HNO_3 + Aq Sol by long heating with conc HNO_3 + Aq KHTeO_4 , $\text{H}_2\text{TeO}_4 + \frac{1}{2}\text{H}_2\text{O}$ Sl sol in H_2O **Rubidium tellurate, $\text{Rb}_2\text{TeO}_4 + 3\text{H}_2\text{O}$** Sol in about 10 pts H_2O (Norris, Am Ch J 1901, 26 322)**Rubidium hydrogen tellurate, $\text{RbHTeO}_4 + \frac{1}{2}\text{H}_2\text{O}$** Sol in about 20 pts cold H_2O Sl more sol in hot H_2O (Norris, Am Ch J 1901, 26 320)**Silver tellurate, $3\text{Ag}_2\text{O}$, TeO_3** Sol in NH_4OH + Aq $3\text{Ag}_2\text{O}$, 2TeO_3 Insol in boiling H_2O + $3\text{H}_2\text{O}$ Ppt Unchanged by cold H_2O Gradually decomp by boiling H_2O (Hutchins, J Am Chem Soc 1905, 27 1169) Ag_2TeO_4 Decomp by H_2O into $3\text{Ag}_2\text{O}$, TeO_3 Sol in NH_4OH + Aq+ $2\text{H}_2\text{O}$ Insol in hot and cold H_2O Sol in NH_4OH , KCN , $\text{Na}_2\text{S}_2\text{O}_3$, HNO_3 , H_2SO_4 and $\text{HC}_2\text{H}_3\text{O}_2$ + Aq Decomp by conc HNO_3 , H_2SO_4 or acetic acid (Hutchins, J Am Chem Soc 1905, 27 1165)

Ag_2TeO_7 Ppt
 Ag_2O , 4TeO_3 Ppt
 Could not be obtained (Hutchins, J Am Chem Soc 1905, 27 1168)

Sodium tellurate, $\text{Na}_2\text{TeO}_4 + 2\text{H}_2\text{O}$

Very sl sol in hot or cold H_2O . When heated to drive off $2\text{H}_2\text{O}$ becomes insol in H_2O , but sol in dil $\text{HNO}_3 + \text{Aq}$ (Berzelius).
 1 pt is sol in about 130 pts H_2O at 18° , 50 pts H_2O at 100°
 $+4\text{H}_2\text{O}$ 1 pt is sol in about 70 pts H_2O at 18° , 40 pts H_2O at 50° (Mylius, B 1901, 34 2209)

$\text{Na}_2\text{Te}_2\text{O}_7 + 4\text{H}_2\text{O} = \text{NaHTeO}_4 + 1\frac{1}{2}\text{H}_2\text{O}$
 Slowly but completely sol in H_2O . Sl sol in $\text{Na}_2\text{C}_2\text{H}_3\text{O}_2 + \text{Aq}$. Insol in alcohol (Berzelius)

Na_2O , 4TeO_3 Insol in H_2O , acids, or alkalies, except by long boiling with $\text{HNO}_3 + \text{Aq}$

$+x\text{H}_2\text{O}$ (a) Slowly sol in H_2O (β)
 Insol even in boiling H_2O

$\text{Na}_4\text{TeO}_6 + 8\text{H}_2\text{O}$ Very sol in H_2O but with decomp (Mylius)

Strontium tellurates

Resemble Ca salts

Thallous tellurate, Tl_2TeO_4

Sl sol in H_2O (Dennis, J Am Chem Soc 1898, 18 975)

Thorium tellurate

Ppt Insol in excess of thorium salts $+ \text{Aq}$

Uranium tellurate, $\text{U}_2(\text{TeO}_4)_3(?)$

Ppt Insol in H_2O or $\text{UO}_2(\text{NO}_3)_2 + \text{Aq}$

Yttrium tellurate

Ppt Insol in H_2O or Yt salts $+ \text{Aq}$

Zinc tellurate, Zn_3TeO_6

Insol in H_2O

Sol in HNO_3 , HCl , H_2SO_4 and acetic acid (Hutchins, J Am Chem Soc 1905, 27 1181)

Zirconium tellurate

Ppt (Berzelius)

Tellurium, Te

Insol in H_2O or $\text{HCl} + \text{Aq}$. Sl sol in hot conc H_2SO_4 , but separates out on cooling. Sol in boiling conc H_2SO_4 . Easily oxidised by HNO_3 or aqua regia. Sol in boiling very conc $\text{KOH} + \text{Aq}$, separating out again on cooling.

Not attacked by boiling conc $\text{HNO}_3 + \text{Aq}$, according to Hartung-Schwartzkoff (Ann Min (4) 19 345)

Sol in warm conc $\text{KCN} + \text{Aq}$

Insol in liquid NH_3 (Franklin, Am Ch J 1893, 20 830)

100 pts methylene iodide dissolve 0.1 pt Te at 12° (Retgers, Z anorg 3 343)
 $\frac{1}{2}$ cm oleic acid dissolves 0.0014 g Te in 6 days (Gates, J phys Ch 1911, 15 143)

A colloidal solution of Te in H_2O can be obtained. It exists in two modifications, a brown and a blue-gray. Both can be diluted with H_2O or concentrated by boiling without decomp. They are, however, decomp by electrolytes, especially NH_4Cl (Gutbier, Z anorg 1902, 32 53)

Tellurium dibromide, TeBr_2

Decomp on air or by H_2O (Rose, Pogg 21 443)

Conc tartaric acid dissolves partly without decomp (Brauner, M 1891, 12 34)

Tellurium tetrabromide, TeBr_4

Sol in a little, but decomp by much H_2O . Completely sol in tartaric acid $+ \text{Aq}$ (1:1) (Brauner, M 1891, 12 34)

Tellurium hydrogen bromide, $\text{TeBr}_4, \text{HBr} + 5\text{H}_2\text{O}$

Fumes in the air. Deliquescent. Stable in an atmos of HBr (Metzner, C R 1897, 124 1951)

Tellurium dichloride, TeCl_2

Decomp on air, or by H_2O or $\text{HCl} + \text{Aq}$ (Rose, Pogg 21 443)

Tellurium tetrachloride, TeCl_4

Extremely deliquescent. Decomp by cold H_2O , with separation of oxychloride and tellurous acid. Sol in hot H_2O with decomp. Sol in dil $\text{HCl} + \text{Aq}$ without decomp (Rose, Pogg 21 443)

Insol in sulphur chloride and in CS_2 (Lenher, J Am Chem Soc 1902, 24 188)

Tellurium hydrogen chloride, $\text{TeCl}_4, \text{HCl} + 5\text{H}_2\text{O}$

Easily decomp (Metzner, C R 1897, 125 24)

Tellurium chloride with MCl

See Chlorotellurate, M

Tellurium tetrachloride ammonia,

$\text{TeCl}_4, 3\text{NH}_3$

Decomp by H_2O (Metzner, C R 1897, 124 33)

$\text{TeCl}_4, 4\text{NH}_3$ Not deliquescent. Decomp by H_2O (Espenschied, J pr 80 480)

Tellurium tetrachloride sulphur trioxide,

$\text{TeCl}_4, \text{SO}_3$

Ppt ((Prandtl, Z anorg 1909, 62 247)
 $\text{TeCl}_4, 2\text{SO}_3$. Decomp by moisture. On heating at 120° , it gives $\text{TeCl}_4, \text{SO}_3$ (Prandtl)

Tellurium tetrafluoride, TeF_4

(Metzner, C R 1897, 125 25)
 $+\text{H}_2\text{O}$ (Hogbom, Bull Soc (2) 35 60)

Tellurium hexafluoride, TeF_6

Decomp by H_2O slowly but completely
 (Prideaux, Chem Soc 1906, 39 322)

Tellurium zirconium fluoride,
*See Fluozirconate, tellurium***Tellurium dioxide, TeI_2**

Insol in H_2O (Rose, Pogg 21 443)

Tellurium tetraiodide, TeI_4

Insol in cold, decomp by hot H_2O or alcohol Sol in HI , but only sol in $\text{MI}+\text{Aq}$ (Berzelius)

Data on solubility of TeI_4 in $\text{HI}+\text{I}+\text{Aq}$ are given by Menke (Z anorg 1912, 77 283)

Tellurium hydrogen iodide, TeI_4 , $\text{HI}+8\text{H}_2\text{O}$, and $+9\text{H}_2\text{O}$

Deliquescent (Metzner, A ch 1898, (7) 15 203)

Tellurium nitride,

Two forms

ble at ord temp

stable at ord temp

— Fischer, B 1910, 43 1472)

Not attacked by H_2O or dil acetic

Insol in liquid NH_3 Decomp by $\text{KOH}+\text{Aq}$ (Metzner, A ch 1898, (7) 15 203)

Tellurium monoxide, TeO

Sl sol in cold dil HCl or $\text{H}_2\text{SO}_4+\text{Aq}$ Easily oxidised by HNO_3+Aq or aqua regia Decomp immediately by boiling conc $\text{HCl}+\text{Aq}$ Slowly decomp by $\text{KOH}+\text{Aq}$ (Divers and Shmosé, Chem Soc 35 563)

Tellurium dioxide, TeO_2

Very sl sol in H_2O Sl attacked by acids Sl sol in NH_4OH or alkali carbonates $+\text{Aq}$ Easily sol in NaOH or $\text{KOH}+\text{Aq}$ Not sol in less than 150,000 pts H_2O Easily sol in warm dil HNO_3+Aq Sol in warm $\text{H}_2\text{SO}_4+\text{Aq}$ (Klein and Morel, Bull Soc (2) 43 203)

20% $\text{H}_2\text{SO}_4+\text{Aq}$ dissolves on warming about 0 7%, 30% $\text{H}_2\text{SO}_4+\text{Aq}$, about 0 85%, 50% $\text{H}_2\text{SO}_4+\text{Aq}$, about 4 4%

These solutions are supersat and TeO_2 separates from the more dil acids on standing (Brauner, M 1891, 12 34)

Min Tellurite

Tellurium dioxide hydrobromic acid, TeO_2 , 3HBr

(Ditte, C R 83 336)

Tellurium dioxide hydrochloric acid, TeO_2 , 2HCl

(Ditte, C R 83 336)
 TeO_2 , 3HCl (Ditte)

Tellurium trioxide, TeO_3

Insol in cold or hot H_2O , cold $\text{HCl}+\text{Aq}$, or cold or hot HNO_3+Aq Insol in moderately conc $\text{KOH}+\text{Aq}$, but, when the $\text{KOH}+\text{Aq}$ is very conc, is sol if boiling

Tellurium oxide, 2TeO_2 , TeO_3

"Tellurium tellurate"
 (Metzner, A ch 1898, (7) 15 203)

Tellurium oxybromide

Insol in H_2O (Ditte, A ch (5) 10 82)

Tellurium oxybromide sulphur trioxide, TeOBr_2 , 2SO_3

Deliquescent (Prandtl, Z anorg 1909, 62 247)

Tellurium oxychloride, TeOCl_2

Insol in H_2O (Ditte)

Tellurium oxyfluoride, TeF_4 , $\text{TeO}_2+2\text{H}_2\text{O}$

Sol in H_2O containing HNO_3 Decomp by H_2O

2TeF_4 , $3\text{TeO}_2+6\text{H}_2\text{O}$ Decomp by H_2O (Metzner, C R 1897, 125 25)

Tellurium sulphide, TeS

Insol in CS_2 , very unstable (Snelling, J Am Chem Soc 1912, 34 802)

Tellurium disulphide, TeS_2

Insol in H_2O or dil acids Sol in alkali hydrates or sulphides $+\text{Aq}$

CS_2 dissolves out S, so that the substance is probably a mixture (Becker, A 180 257)

Tellurium trisulphide, TeS_3

Insol in H_2O Sol in $\text{K}_2\text{S}+\text{Aq}$

Tellurium sulphoxide, TeSO_3

Decomp by H_2O Sol in H_2SO_4 (Wcber, J pr (2) 25 218)

Is tellurium sulphite (Divers, Chem Soc 49 583)

Tellurous acid, H_2TeO_3

Appreciably sol in H_2O and acids Sol in alkali hydrates or carbonates $+\text{Aq}$

Tellurites

The neutral and acid tellurites of the alkali metals are sol in H_2O Ba, Sr Ca, and Mg tellurites are sl sol, and the other salts insol in H_2O Most tellurites are sol in $\text{HCl}+\text{Aq}$

Aluminum tellurite

Ppt Insol in Al salts + Aq (Berzelius)

Ammonium tellurite, $(\text{NH}_4)\text{HTeO}_3$, $\text{H}_2\text{TeO}_3 + 3\frac{1}{2}\text{H}_2\text{O}$

Sol in H_2O , from which it is precipitated by NH_4Cl + Aq or alcohol (Berzelius)

Barium tellurite, BaTeO_3

Sl sol in H_2O when prepared in the moist way (Berzelius)

BaO , 4TeO_2

Cadmium tellurite

Ppt Sol in HNO_3 , and HCl + Aq (Oppenheim)

Calcium tellurite, CaTeO_3

Sl sol in cold, more sol in hot H_2O (Berzelius)

CaO , 4TeO_2

Chromium tellurite

Ppt Sol in excess of chromic salts + Aq

Cobaltous tellurite

Ppt

Cupric tellurite

Insol in H_2O (Berzelius)

Glucinum tellurite

Insol in H_2O

Indium tellurite, $\text{In}_2(\text{TeO}_3)_2$, $2\text{In}(\text{OH})_3$

Ppt (Renz, Dissert 1902)

Ferrous tellurite

Ppt

Ferric tellurite

Ppt

Lead tellurite, PbTeO_3

Ppt Easily sol in acids (Berzelius)

Lithium tellurite, Li_2TeO_3

Sol in H_2O (Berzelius)
 Li_2O , 2TeO_2 Decomp by cold H_2O into Li_2TeO_3 and Li_2O , 4TeO_2 (B)
 Li_2O , 4TeO_2 Sol in hot, much less in cold H_2O (B)

Magnesium tellurite, MgTeO_3

Precipitate Much more sol in H_2O than the Ba, Sr, or Ca salt (Berzelius)

Manganous tellurite

Ppt

Mercurous tellurite

Ppt

Mercuric tellurite

Ppt

Nickel tellurite

Ppt

Potassium tellurite, K_2TeO_3

Not deliquescent Slowly sol in cold, more quickly in boiling H_2O (Berzelius)
 K_2O , 2TeO_2 Completely sol in boiling H_2O , from which K_2O , 4TeO_2 crystallises (B)
 K_2O , $4\text{TeO}_2 + 4\text{H}_2\text{O}$ Decomp by cold H_2O into K_2O , TeO_2 , and K_2O , 2TeO_2 , which dissolve, and H_2TeO_3 , which is insol (B)

Potassium hexatellurite, K_2O , $6\text{TeO}_2 + 2\text{H}_2\text{O}$

Not decomp by, but sl sol in H_2O (Klein and Morel, C R 100 1140)

Silver tellurite, Ag_2TeO_3

Ppt Sol in NH_4OH + Aq (Berzelius)
The freshly pptd salt is insol in H_2O , sol in HNO_3 , H_2SO_4 , acetic and tartaric acid, decomp by HCl (Lenher, J Am Chem Soc 1913, 35 727)
 AgHTeO_3 Insol in H_2O Sol in HNO_3 + Aq (Rose, Pogg 18 60)

Sodium tellurite, Na_2TeO_3

Slowly sol in cold, more quickly in hot H_2O Precipitated from aqueous solution by alcohol (Berzelius)
 Na_2O , 2TeO_2 Decomp by H_2O as K salt (B)
 Na_2O , $4\text{TeO}_2 + 5\text{H}_2\text{O}$ As above (B)

Strontium tellurite, SrTeO_3

Resembles Ba salt
 $\text{SrH}_2\text{Te}_4\text{O}_{10}$ Very sl sol in H_2O , more easily in HNO_3 + Aq

Thorium tellurite

Precipitate Insol in H_2O or Th salts + Aq

Stannous tellurite

Pptd in presence of 60,000 pts H_2O (Fischer)

Uranium tellurite, $\text{U}_2(\text{TeO}_3)_2$

Ppt Insol in U salts + Aq

Yttrium tellurite

Precipitate

Zinc tellurite, ZnTeO_3

Ppt

Zirconium tellurite

Ppt

Terbium, Tb

Metal has not been isolated
Has been decomp into two or more elements by Kruss (Z anorg 4 27)

Terbium chloride, $TbCl_3 \cdot 6H_2O$

Sol in H_2O , very hygroscopic, sol in alcohol (Urban, C R 1908, **146** 128)

Terbium hydroxide

Sol in dilute acids Decomposes NH_4 salts + Aq

Terbium oxide, Tb_2O_3

Sol in dil acids, even after ignition

Terbium peroxide, Tb_4O_7

Sol in HNO_3 and in hot HCl (Urban, C R 1907, **146** 127)

Tetramine chromium compounds

See—

Bromotetramine chromium compounds

Chlorotetramine chromium compounds

Iodotetramine chromium compounds

Tetramine cobaltic compounds,

See—

Bromotetramine cobaltic compounds

Carbonatotetramine cobaltic compounds

Chlorotetramine cobaltic compounds

Croceocobaltic compounds

Fuscocobaltic compounds

Flavocobaltic compounds

Iodotetramine cobaltic compounds

Nitratotetramine cobaltic compounds

Praseocobaltic compounds

Roseotetramine cobaltic compounds

Sulphatotetramine cobaltic compounds

See also under octamine cobaltic salts for many tetramine salts as yet unclassified

Tetramine cobaltic nitrite with MnO_2 ,

See Diamine cobaltic nitrite

Tetrathionic acid, $H_2S_4O_6$

Known only in aqueous solution

Dil solution can be boiled without decompose
Conc solution decompose by boiling

Addition of H_2SO_4 or HCl makes solution more stable (Fordos and Gélis, C R **15** 920)

Tetrathionates

Tetrathionates are all easily sol in H_2O , but insol in alcohol

Barium tetrathionate, $BaS_4O_6 + 2H_2O$

Very sol in H_2O , but precipitated by addition of alcohol

Cadmium tetrathionate

Deliquescent Solution in H_2O gradually decomposes (Kessler, Pogg **74** 249)

Cæsium tetrathionate, $Cs_2S_4O_6$

(J Meyer, B 1907, **40** 1361)

Cuprous tetrathionate, $Cu_2S_4O_6$

Decomp by H_2O (Chancel and Diacon, C R 1863, **56** 711)

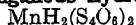
Cupric tetrathionate, CuS_4O_6

Sol in H_2O

Decomp by long boiling (Curtius and Henkel, J pr 1883, (2) **37** 148)

Lead tetrathionate, $PbS_4O_6 + 2H_2O$

Sol in H_2O

Manganous hydrogen tetrathionate,

Deliquescent Very sol in H_2O and alcohol (Curtius and Henkel, J pr (2) **37** 148)

Nickel tetrathionate ammonia, $NiS_4O_6, 6NH_3$

Ppt Decomp by H_2O Insol in alcohol (Ephraim, B 1913, **46** 3109)

Potassium tetrathionate, $K_2S_4O_6$

Soluble in H_2O Insol in alcohol

Difficultly sol in H_2O (Kessler, Pogg 1847, **74** 254)

Rubidium tetrathionate, $Rb_2S_4O_6$

Not hygroscopic (J Meyer, B 1907, **40** 1356)

Sodium tetrathionate, $Na_2S_4O_6$

Sol in H_2O Precipitated therefrom by a great excess of alcohol (Kessler, J pr **95** 13)

+ $2H_2O$ (Berthelot, A ch (b) **17** 450)

Strontium tetrathionate, $SrS_4O_6 + 6H_2O$

Sol in H_2O (Kessler, Pogg **74** 255)

More sol in H_2O than Ba salt

Zinc tetrathionate

Sol in H_2O (Fordos and Gélis)

Zinc hydrogen tetrathionate, $ZnH_2(S_4O_6)_2$

Extremely sol in H_2O and alcohol (Curtius and Henkel, J pr (2) **37** 147)

Zinc tetrathionate ammonia, $ZnS_4O_6, 3NH_3$

Ppt (Ephraim, B 1915, **48** 641)

Thallic acid**Potassium thallate**

Known only in aqueous solution (Carstanjen, J pr **101** 55)

Does not exist (I epsius, Chem Ztg **1890**, 1327)

Thallium, Tl

Not attacked by pure H_2O Easily sol in dil H_2SO_4 or HNO_3 +Aq Difficultly sol in HCl +Aq Absolute alcohol dissolves considerable quantity in a short time, also methyl alcohol, and acetic ether (Bottger)

Not easily attacked by HF +Aq (Kuhlmann)

Insol in liquid NH_3 (Franklin, Am Ch J 1893, 20 830)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0424 g Tl in 6 days (Gates, J phys Chem 1911, 15 143)

Thallium arsenide, $TlAs$

Decomp by H_2SO_4 (Carstanjen)

Thalious azomide, TlN_3

Sl, sol in H_2O

0.1712 pt is sol in 100 pts H_2O at 0° ,

0.1965 pt is sol in 100 pts H_2O at 5° ,

0.3 pt is sol in 100 pts H_2O at 16°

Insol in abs alcohol and ether

(Curtius, J pr 1898, (2) 58 284)

Thallothallic azomide, TlN_3 , TlN_3

Explosive Decomp by hot H_2O and by acids (Dennis, J Am Chem Soc 1896, 18 973)

Thalious bromide, $TlBr$

Nearly insol in cold, sl sol in boiling H_2O (Willm, Bull Soc (2) 2 89)

1 l H_2O dissolves 0.00869 g mol $TlBr$ at 68.5° (Noyes, Z phys Ch 6 248)

Sl sol in H_2O 0.48×10^{-2} g is dissolved in a liter of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

1 l H_2O dissolves 420 mg $TlBr$ at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

238 mg $TlBr$ are contained in 1 l sat solution at 0.13° , 289 mg at 9.37° , 423 mg at 18° , 579 mg at 25.68° (Kohlrausch, Z phys Ch 1908, 64 168)

Solubility of $TlBr$ in $Tl(NO_3)_3$ +Aq at 68.5°

g mols per l		g mols per l	
$TlNO_3$	$TlBr$	$TlNO_3$	$TlBr$
0	0.00869	0	2.469
0.0163	0.00410	4.336	1.164
0.0294	0.00289	7.820	0.821
0.0955	0.00148	25.400	0.420

(Noyes, Z phys Ch 1890, 6 248)

Insol in acetone (Naumann, B 1904, 37 4329), pyridine (Naumann, B 1904, 37 4610), acetone (Eidmann, C C 1899, II 1014)

Thallic bromide, $TlBr_3$

Deliquescent Easily sol in H_2O and alcohol (Willm)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ H_2O Very unstable Sol in H_2O ,

alcohol and ether (Meyer, Z anorg 1900, 24 353)

+ $4H_2O$ Very sol in H_2O (Thomas, C R 1902, 134 546)

Thallothallic bromide, $TlBr_3$, $TlBr_3$

Decomp by H_2O (Meyer, Z anorg 1900, 24 354)

$3TlBr$, $TlBr_3$ Decomp by H_2O into $TlBr$ and $TlBr_3$

Thallic hydrogen bromide, $TlBr_3$, HBr

Very sol in H_2O (Thomas, C R 1902, 134 546)

Thallic bromide ammonia, $TlBr_3$, $3NH_3$

Decomp by H_2O

Thallium bromochloride, $TlClBr$

Decomp by H_2O (Thomas, C R 1901, 132 1489)

$TlClBr_2$ + $4H_2O$ Ppt

$TlCl_2Br$ + $4H_2O$ Ppt Decomp by H_2O (Thomas, C R 1902, 134 546)

$Tl_3Cl_2Br_4$ Decomp by H_2O , H_2SO_4 or HNO_3 (Thomas, C R 1900, 131 894, C R 1901, 132 1489)

$Tl_4Cl_3Br_3$ Sol in H_2O (Thomas, C R 1901, 132 82)

$TlClBr_3$, $3TlCl$ Cryst from H_2O containing HNO_3 (Cushmann, Am Ch J 1900, 24 222)

$TlCl_3$, $3TlBr$ Sol in H_2O without decomp (Cushmann)

$TlBr_3$, $3TlCl$ Decomp by H_2O (Cushmann)

$TlBr_3$, $TlCl$ Sol in H_2O with decomp (Cushmann)

$TlCl_3$, $2TlBr$, $TlCl$ Sol in H_2O (Meyer, Z anorg 1900, 24 355-360)

$TlBr_3$, $2TlCl$, $TlBr$ Ppt Decomp by H_2O (Meyer)

($TlCl_3$, $TlCl$), $2(TlBr_3$, $TlBr$) Ppt (Meyer)

$2(TlCl_3$, $TlCl$), ($TlBr_3$, $TlBr$) Ppt Decomp by hot H_2O (Meyer)

Thallium bromofluoride, $TlFBr_2$

Decomp in moist air

Sol in abs alcohol (Gewecke, A 1909, 366 233)

Thallium bromofluoride ammonia,

$TlFBr_2$, $4NH_3$

Decomp by moisture

Difficultly sol in abs alcohol (Gewecke, A 1909, 366 234)

Thalious chloride, $TlCl$

Solubility in pts H_2O at t° , according to H=Hebberling, C=Crookes, L=Lamy

0°	15°	16°	16.5°
504	283.4	377	359 pts H_2O ,
H	C	H	H
	100°	100°	100°
	about 50	52.5	63 pts H_2O
	L	C	H

1 l H₂O dissolves 0.0161 g mol TiCl₃ at 25° (Noyes, Z phys Ch 6 249)

3.26 × 10² grams are dissolved in 1 liter of sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

1 l H₂O at 25° dissolves 0.01606 g mol TiCl₃ (Geffcken, Z phys Ch 1904, 49 296)

Solubility in H₂O at t°

100 cc sat solution contain at

t°	0°	10°	20°	30°	40°	50°
g TiCl ₃	0.17	0.24	0.34	0.46	0.60	0.80

t°	60°	70°	80°	90°	99.3°
g TiCl ₃	1.02	1.29	1.60	1.97	2.41

(Berkeley, Trans Roy Soc 1904, 203, A, 208)

1 l H₂O dissolves 3.040 TiCl₃ at 18° (Kohlrausch, Z phys Ch 1904, 50 356)

2.27 g are dissolved in 1 l of sat solution at 9.54°, 3.05 g at 17.7°, 3.97 g at 25.76° (Kohlrausch, Z phys Ch 1908, 64 168)

0.01629 mol is sol in 1 l H₂O at 25° (Hill, J Am Chem Soc 1910, 32 1385)

0.01607 g equiv is sol in 1 l H₂O at 25° (Bray and Winninghoff, J Am Chem Soc 1911, 33 1665)

Much less sol in H₂O containing HCl or HNO₃

Solubility in HCl + Aq at 25° 1 l dissolves g mol TiCl₃

g HCl added	TiCl ₃	g HCl added	TiCl ₃
	0.01610	0.1468	0.00316
283	0.00836	1.000	0.00200
560	0.00565		

(Noyes, Z phys Ch 6 249)

Solubility in HCl + Aq at 25°

Concentration of HCl equivalents per liter	Solubility of TiCl ₃ equivalents per liter
0	0.01612
0.025	0.00869
0.05	0.00585
0.10	0.00384
0.20	0.00254

(Noyes, Z phys Ch 1892, 9 614)

Solubility in HNO₃ + Aq at 25°

Normality HNO ₃	Sp gr of the solution	g TiCl ₃ dissolved per l
0.000	0.996	3.952
0.4977	1.0184	5.937
1.0046	1.0359	6.883
2.0452	1.0705	8.143
4.017	1.1362	9.926

(Hill and Simmons, Z phys Ch 1909, 67 605)

Nearly insol in NH₄OH + Aq
More sol in K₂CO₃ + Aq than in H₂O
3.86 g TiCl₃ are sol in 1 l H₂O at 25° 21.84 g TiCl₃ are sol in 1 l 5N-K₂CO₃ + Aq at 25° (Spencer and Le Pla, C C 1908, II 198)

Solubility in KNO₃ + Aq at 25°

Concentration of KNO ₃ miliequivalents per l	Solubility of TiCl ₃ miliequivalents per l
10	16.07
20	17.16
50	18.26
100	19.61
300	23.13
1000	30.72

(Bray and Winninghoff, J Am Chem Soc 1911, 33 1670)

Solubility in K₂SO₄ + Aq at 25°

Concentration of K ₂ SO ₄ miliequivalents per l	Solubility of TiCl ₃ miliequivalents per l
10	16.07
20	17.79
50	19.42
100	21.37
300	26.00
1000	34.16

(Bray and Winninghoff, J Am Chem Soc 1911, 33 1670)

Solubility in Ti₂SO₄ + Aq at 25°

Concentration of Ti ₂ SO ₄ miliequivalents per l	Solubility of TiCl ₃ miliequivalents per l
10	16.07
20	10.34
50	6.77
100	4.68

(Bray and Winninghoff, J Am Chem Soc 1911, 33 1670)

Solubility of TiCl₃ in salts + Aq at 25°

Salt	Concentration of salt g equiv per l	TiCl ₃ dissolved g equiv per l
NH ₄ Cl	0.025	0.00872
	0.05	0.00593
	0.2	0.00271
CaCl ₂	0.025	0.00899
	0.05	0.00624
	0.10	0.00417
	0.20	0.00284

Solubility of TiCl_3 in salts + Aq at 25° —
Continued

Salt	Concentration of salt g equiv per l	TiCl_3 dissolved g equiv per l
CdCl_2	0 025	0 01040
	0 05	0 0078
	0 10	0 00578
	0 20	0 00425
CuCl_2	0 025	0 00905
	0 05	0 00614
	0 10	0 00422
	0 20	0 00291
MgCl_2	0 025	0 00904
	0 05	0 00618
	0 10	0 00413
	0 20	0 00275
MnCl_2	0 025	0 00898
	0 05	0 00617
	0 10	0 00412
	0 20	0 00286
KCl	0 025	0 00872
	0 05	0 00593
	0 1	0 00399
	0 2	0 00265
NaCl	0 025	0 00869
	0 05	0 00592
	0 10	0 00395
	0 20	0 00271
ZnCl_2	0 025	0 00899
	0 05	0 00627
	0 10	0 00412
	0 20	0 00281
TiClO_3	0 025	0 00897
TiNO_3	0 025	0 00883
	0 05	0 00626
	0 10	0 00423

(Noyes, Z phys Ch 1892, 9 609)

Solubility of TiCl_3 in salts + Aq at 25°

Salt	Mols TiCl_3 sol in 1 liter of				
	0 5-N solution	N solution	2-N solution	3-N solution	4-N solution
H_4NO_3	0 02587	0 03121	0 03966		
HNO_3	0 02566	0 03077	0 03904		
H_2NO_3	0 02564	0 03054	0 03851	0 04544	0 05128
HNO_3	0 02542	0 03035	0 03755	0 04438	
ClO_3	0 02370				
HClO_3	0 02320	0 02687	0 03060	0 03303	0 03850

(Geffcken, Z phys Ch 1904, 49 295)

Insol in alcohol Easily sol in hot
[gCl_2 + Aq (Carstanjen)]Solubility of TiCl_3 in $\text{HC}_2\text{H}_3\text{O}_2$ + Aq at 25°
(g equiv per l)

Acid	TiCl_3
0 000	0 01629
0 5134	0 01580
1 013	0 01495
2 016	0 0132
4 180	0 0099
8 130	0 0054
11 49	0 0026
14 31	0 0012
16 01	0 0005

(Hill, J Am Chem Soc 1910, 32 1189)

Insol in pyridine (Naumann, B 1904, 37 4610), acetone (Naumann, B 1904, 37 4329)

Thallic chloride, TiCl_3 *Anhydrous*Easily sol in H_2O and in most ord sol-
ventsIn contact with moist air, it rapidly be-
comes hydrated (Thomas, C R 1902, 135 1053)Difficultly sol in methyl acetate (Nau-
mann, B 1909, 42 3790)

Very sol in acetone (Renz, B 1902, 35 1110)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

+ H_2O Deliquescent, and very easily sol
in H_2O (Werther)Deliquescent, and very easily sol in H_2O
(Werther)+ $4\text{H}_2\text{O}$ 86.2 pts are sol in 100 pts H_2O
at 17° Sp gr of sat aq solution at 17° =
1.85 (Thomas, C R 1902, 135 1052)Very hygroscopic (Meyer, Z anorg
1900, 24 336)Very sol in alcohol and ether (Meyer, Z
anorg 1900, 24 338)+ $7\frac{1}{2}\text{H}_2\text{O}$ Deliquescent (Werther)**Thallothallic chloride, 3TiCl_3 , TiCl_3** 1 pt dissolves in pts H_2O at t° , according
to C = Crookes, H = Hebbeling, L = Lamy

15°	17°	100°	100°
380 1	346	52 9	20-25 pts H_2O
C	H	C	L

Sl decomp by dissolving (Lamy)

**Thallic hydrogen chloride, TiCl_3 , HCl +
 $3\text{H}_2\text{O}$**

Very hygroscopic

Decomp by H_2O (Meyer, Z anorg 1900,
24 337)**Thallium tungsten chloride, $\text{Ti}_3\text{W}_3\text{Cl}_3$** Nearly insol in H_2O Sol in a hot mixture of equal pts H_2O and
conc HCl

Sl sol in conc HCl
 Nearly insol in most organic solvents
 (Olsson, B 1913, **46** 575)

Thallic zinc chloride, 2TiCl_3 , $\text{ZnCl}_2 + 6\text{H}_2\text{O}$
 Can be cryst from H_2O (Gewecke, A 1909, **366** 224)

Thallic chloride ammonia, TiCl_3 , 3NH_3
 Decomp by H_2O Sol in $\text{HCl} + \text{Aq}$ (Willm)

Thallium chlorofluoride, TlFCl_2
 Very hygroscopic
 Decomp by moist air
 Easily sol in abs alcohol (Gewecke, A 1909, **366** 230)
 $+3\text{H}_2\text{O}$ Not hygroscopic
 Decomp by H_2O , alcohol and ether (Gewecke)

Thallium chlorofluoride ammonia, TlFCl_2 , 4NH_3
 Decomp by H_2O
 Difficultly sol in abs alcohol and in ether

—**oride**,

231)

le, TlF

pts H_2O at 15° , and in much
 of H_2O Difficultly sol in alcohol
 mer, W A B **52** 2 644)
 $\frac{1}{2}\text{H}_2\text{O}$ Deliquescent (Willm)

Thallic fluoride, TlF_3
 Insol in H_2O and cold $\text{HCl} + \text{Aq}$ (Willm)
 Cannot be obtained in pure state (Gewecke, A 1909, **366** 218)

Thallic hydrogen fluoride, TlF , HF
 Sol in 1 pt H_2O (Buchner)

Thallic tungstyl fluoride,
 See Fluoxytungstate, thallic

Thallic vanadium fluoride
 See Fluovanadate, thallic

Thallic vanadyl fluoride
 See Fluoxylvanadate, thallic

Thallic hydroxide, TlOH
 Sol in H_2O and alcohol

Solubility of TlOH in H_2O at t°

t°	g equiv TlOH per l	Sp gr $15^\circ/4^\circ$
0	1 151	1 231
18 5	1 554	1 317
19 5	1 582	1 322
29	1 803	1 342
23 1	1 861	1 377
33 1	1 967	1 400
36	2 075	1 417
40	2 240	1 446
44 5	2 442	
54 1	2 940	
59 4	3 281	
64 6	3 601	
78 5	4 673	
90 0	5 705	
99 2	6 708	

(Bahr, Z anorg 1911, **71** 87)

The solubility of Tl_2O in H_2O at these temperatures is the same as that of $\text{TlOH} + \text{H}_2\text{O}$ (Willm, Bull Soc (2) **5** 354)

Thallic hydroxide, Tl_2O_3 , $\text{H}_2\text{O} = \text{TlO}(\text{OH})$
 Insol in H_2O Sol in dil acids and ammonium salts + Aq Insol in caustic alkali solutions
 $\text{Tl}(\text{OH})_3$ Easily sol in dil HCl or H_2SO_4 + Aq (Carnegie, C N **60** 113)

Thallic iodide, TlI

Very sl sol in H_2O
 1 pt TlI is sol in pts H_2O at t° C = according to Crookes, H = according to Hebbeling, L = according to Lamy, W = according to Werther
 35° 15° 16° $16-17^\circ$ 19° 4°
 20,000 4450 16,000 11,676 14,654 pts H_2O ,
 W C L H W

20° 23° 45° 100° 100°
 11,954 10,482 5407 842 804 pts H_2O
 W W W C H

Sol in 17,000 pts H_2O at 20° (Long, Z anal **30** 342)

Sat solution at 20° contains 636 mg or 1.92×10^{-4} g mol TlI per l (Böttger, Z phys Ch 1903, **46** 603)

1 l H_2O dissolves 56 mg TlI at 18° (Kohlrausch, Z phys Ch 1904, **50** 356)

36.2 mg are dissolved in 1 l of sat solution at 9° , 56 mg at 18° , 84.7 mg at 26° (Kohlrausch, Z phys Ch 1908, **64** 168)

Solubility in H_2O at $25^\circ = 1.76 \times 10^{-4}$ mol per litre (Spencer, Z phys Ch 1912, **80** 708)

Not decomp by dil H_2SO_4 , HCl , or alkalis + Aq Decomp by hot dil HNO_3 + Aq , and cold conc HNO_3 Sol in aqua regia

Also less sol in acetic acid than in H_2O (Carstanjen)

Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Werther) Not holly insol in $\text{NH}_4\text{OH} + \text{Aq}$, and solubility increased by presence of $(\text{NH}_4)_2\text{SO}_4$ or H_2Cl (Baubigny, C R 113 544)

Sol in 13,000 pts $\text{NH}_4\text{OH} + \text{Aq}$ ($6\frac{1}{2}$ or $\frac{1}{2}\%$ NH_3) **Sol** in 17,000 pts $\text{NH}_4\text{OH} + \text{Aq}$ ($\frac{1}{4}\%$ NH_3) (Long)

Insol in dil $\text{KI} + \text{Aq}$ (1% KI) (Baugny)

Much more insol in $\text{KI} + \text{Aq}$ than in H_2O , pt dissolves in 75,000 pts dil $\text{KI} + \text{Aq}$ (amy)

Nearly insol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$, and absolutely insol therein in presence of Pb salts (Verner C N 53 51)

Sol in 56,336 pts 85% alcohol at 13° (Werther) **Sol** in 18,934 pts 98% alcohol 19° (Hebberling)

When TII is shaken with alcohol of 78°B vol $\text{H}_2\text{O} + 3$ vols 98% alcohol at 22° , and t stand with TII for 24 hours, and then vaporated to $\frac{1}{3}$ vol, there is shown no ppt of $\text{NH}_4\text{SH} + \text{Aq}$ (Baubigny)

Sol in 260,000 pts 90% alcohol, and 7,000 pts 50% alcohol at 20° (Long)

Insol in methylene iodide (Retgers, Z org 3 343)

Insol in acetone (Naumann, B 1904, 37 329, Eidmann, C C, 1899, II 1014)

Insol in pyridine (Naumann, B 1904, 4601)

thallous iodide, TII_3

Sol in alcohol

Decomp slowly in the air (Wells, Z org 1894, 6 313)

Sol in ether

thallothallous iodide, $\text{TI}_3\text{I}_4 = 5\text{TII}, \text{TII}_3$

Sol in H_2O (Jorgensen, J pr (2) 6 82)

thallium nitride

Very unstable (Franz Fischer, B 1901, 3 1470)

thallous oxide, TI_2O

Deliquescent **Sol** in H_2O

See Thallous hydroxide

thallous oxide, TI_2O_3

Insol in H_2O Not attacked by cold H_2SO_4 **Sol** in hot H_2SO_4 **Sol** in cold $\text{HCl} + \text{Aq}$

Insol in alkalis + Aq (Werther, J pr 1 385)

black modification

Less sol in dil acids than the brown modification Solution is accompanied by slight reduction to thallous salt

More sol in 10% HCl than in 10% H_2SO_4 or HNO_3

More sol in conc than in dil acids (Rabe, anorg 1906, 48 431)

Brown modification

Easily sol in dil mineral acids on warming, with slight reduction to thallous salt

More sol in conc acid (Rabe)

Thallium dioxide, TI_2O_2

Insol in H_2O (Piccini, Gazz ch it 17 450)

Thallic oxide ammonia, $\text{TI}_2\text{O}_3, 6\text{NH}_3$

Decomp by much H_2O **Insol** in alcohol (Carstanjen)

Thallic oxyfluoride, TIOF

Insol in H_2O Slowly decomp by boiling with H_2O

Sol in mineral acids Almost insol in HF (Gewecke, A 1909, 366 226)

Thallium phosphide (?)

Ppt (Crookes)

Thallous selenide, TI_2Se

Insol in H_2O Scarcely attacked by cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$, but dissolves when heated (Carstanjen)

Thallothallous selenide

Not attacked by cold conc or boiling dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Conc H_2SO_4 decomposes (Carstanjen)

Thallous sulphide, TI_2S

Insol in H_2O , $(\text{NH}_4)_2\text{S} + \text{Aq}$, $\text{NH}_4\text{OH} + \text{Aq}$, $\text{KCN} + \text{Aq}$, and in alkali carbonates, and hydrates + Aq Difficultly sol in a solution of oxalic acid or acetic acid (Crookes) Easily sol in HNO_3 , and $\text{H}_2\text{SO}_4 + \text{Aq}$ Difficultly sol in $\text{HCl} + \text{Aq}$ (Willm)

Sol in H_2O

0.21×10^{-4} g is dissolved in 1 l sat solution at 20° (Bottger, Z phys Ch 1903, 46 603)

Insol in acetone (Naumann, B 1904, 37 4329)

Thallic sulphide, TI_3S_3

Insol in H_2O **Insol** in cold, sol in warm dil $\text{H}_2\text{SO}_4 + \text{Aq}$ without separation of S **Sol** in other dilute acids with separation of S (Carstanjen)

Thallium pentasulphide, TI_2S_5

Ppt (Hofmann, B 1903, 36 3092)

Thallothallous sulphide, $5\text{TI}_2\text{S}, 3\text{TI}_3\text{S}_3$

Very slowly decomp by cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$

$\text{TI}_2\text{S}, \text{TI}_3\text{S}_3$ (Carstanjen)

$\text{TI}_2\text{S}, 2\text{TI}_3\text{S}_3$ Decomp by dil acids (Schneider, J pr (2) 10 55)

Thallium telluride, TI_2Te

(Fabre, C R 105 673)

Thio-

For compounds with prefix thio-, see also under sulpho-

Thioantimonic acid

See Sulphantimonic acid

Thioarsenic acid

See Sulpharsenic acid

Thiomolybdic acid

See Sulphomolybdic acid.

Thionamic acid, $\text{NH}_3\text{SO}_2 = \text{NH}_2\text{SO}(\text{OH})$

Very deliquescent, and sol in H_2O
 H_2O solution decomp gradually (Rose, Pogg 33 275, 42 425)

Ammonium thionamate, $\text{NH}_2\text{SO}(\text{ONH}_4)$

Deliquescent Sol in H_2O , easily decomp when in solution (Rose)

Very sol in alcohol with decomp Sl sol in dry ether (Divers and Ogawa, C C 1900, I 1259)

Dithionic acid

See Dithionic acid

Trithionic acid

nd.

acid

Pentathionic acid

See Pentathionic acid

Thionyl bromide, SOBr_2

Unstable
 Decomp by H_2O (Besson, C R 1896, 122 322)

Thionyl bromochloride, SOClBr

Decomp slowly in the cold, rapidly at 115°
 Decomp by H_2O (Besson C R 1896, 122 321)

Thionyl chloride, SOCl_2

Sol in CHCl_3 , and C_6H_6 (Oddo, Gazz ch 1899, 29 (2) 318)

Thionyl fluoride, SOF_2

Decomp by H_2O
 Sol in AsCl_3 , C_6H_6 , ether and oil of turpentine (Moissan, C R 1900, 130 1439)

Thiophosphamic acid, $\text{H}_2\text{PNH}_2\text{O}_2\text{S}$ (?)

Known only in its salts (Gladstone and Holmes, Chem Soc (2) 3 1)

Cadmium thiophosphamate, $\text{CdPNH}_2\text{O}_2\text{S}$

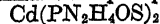
Sol in dil acids, and $\text{NH}_4\text{OH} + \text{Aq}$ and H)

Lead —, $\text{PbPNH}_2\text{O}_2\text{S}$

Ppt Sol in dil $\text{HNO}_3 + \text{Aq}$ (Gladst and Holmes, Chem Soc (2) 3 1)

Thiophosphodiamic acid, $\text{H}_2\text{PN}_2\text{H}_4\text{OS}$

Known only in solution, which soon composes (G and H)

Cadmium thiophosphodiamate,

Insol in H_2O , sol in dil acids, and $\text{NH}_4 + \text{Aq}$ (G and H)

Cupric —, $\text{Cu}(\text{PN}_2\text{H}_4\text{OS})_2$

Insol in H_2O , dil HCl , or $\text{NH}_4\text{OH} + \text{A}$
 Sol in $\text{KCN} + \text{Aq}$ (Gladstone and Holm Chem Soc (2) 3 1)

Lead —, $\text{Pb}(\text{PN}_2\text{H}_4\text{OS})_2$

Insol in H_2O Sol in dil $\text{HNO}_3 + \text{Aq}$

Nickel —, $\text{Ni}(\text{PN}_2\text{H}_4\text{OS})_2$

Sol in dil acids, and $\text{NH}_4\text{OH} + \text{Aq}$ (Gladstone and Holmes, Chem Soc (2) 3 1)

Zinc —, $\text{Zn}(\text{PN}_2\text{H}_4\text{OS})_2$

Ppt Sol in dil acids, and $\text{NH}_4\text{OH} + \text{A}$ (Gladstone and Holmes)

Thiophosphonitrile, PSN

Not decomp by cold H_2O Slowly decomp by boiling H_2O Easily decomp by boiling, dil HCl (Stock, B 1906, 39 1974)

Thiophosphoric acid, $\text{H}_3\text{PSO}_3 = \text{PS}(\text{OH})_3$

Known only in its salts

Ammonium magnesium thiophosphate,

Sl sol in cold H_2O (Kubierschky, J pr (2) 31 100)

Barium —, $\text{Ba}_3(\text{PSO}_3)_2$

Insol in H_2O (Wurtz, A ch (3) 20 473)

Cobalt —

Insol in H_2O , but partially decomp when boiled therewith (Wurtz)

Cupric —

Insol in H_2O , very easily decomp (Wurtz)

Ferric —

Insol in H_2O (Wurtz)

Magnesium —, $\text{Mg}_3(\text{PSO}_3)_2 + 20\text{H}_2\text{O}$

Sl sol in cold H_2O (Kubierschky, J pr (2) 31 99)

- Nickel thiophosphate**
Insol in H_2O , but decomp when boiled therewith (Wurtz)
- Potassium —, K_2PSO_3**
Very sol in H_2O Known only in aqueous solution (Wurtz)
- Sodium —, $\text{Na}_2\text{PSO}_3 + 12\text{H}_2\text{O}$**
Easily sol in boiling H_2O Cryst out on cooling (Wurtz, A ch (3) 20 472)
Insol in alcohol
- Strontium —**
Insol in H_2O (Wurtz)
- Dithiometaphosphoric acid**
- Ammonium dithiometaphosphate, $\text{NH}_4\text{PS}_2\text{O}$**
Decomp by H_2O (Stock, B 1906, 39 1990)
- Monothioorthophosphoric acid**
- Monoammonium monothioorthophosphate, $\text{O P}(\text{SNH}_2)(\text{OH})_2$**
Sol in H_2O
Insol in alcohol (Stock, B 1906, 39 1990)
- Triammonium monothioorthophosphate, $\text{SNH}_4\text{PO}(\text{ONH}_2)_2$**
(Stock)
- Dithioorthophosphoric acid**
- Ammonium dithiophosphate, $(\text{NH}_4)_3\text{PS}_2\text{O}_2 + 2\text{H}_2\text{O}$**
Sl efflorescent Sol in H_2O (Kubierschky, J pr (2) 31 93)
- Ammonium magnesium —, $\text{NH}_4\text{MgPS}_2\text{O}_2 + 6\text{H}_2\text{O}$**
Sl sol in cold, H_2O (Kubierschky)
- Barium —, $\text{Ba}_3(\text{PS}_2\text{O}_2)_2 + 8\text{H}_2\text{O}$**
Precipitate (Kubierschky, J pr (2) 31 103)
 $+ 18\text{H}_2\text{O}$ As the trithio compound Ephraim, B 1910, 43 287)
- Calcium —**
Very easily decomposed (Kubierschky)
- Sodium —, $\text{Na}_3(\text{PS}_2\text{O}_2)_2 + 11\text{H}_2\text{O}$**
Very sol in H_2O (Kubierschky, J pr (2) 31 93)
- Trithioorthophosphoric acid**
- Ammonium trithioorthophosphate, $(\text{NH}_4)_3\text{PS}_3\text{O} + \text{H}_2\text{O}$**
(Stock, B 1906, 39 1985)
- Barium trithioorthophosphate, $\text{Ba}_3(\text{PS}_2\text{O})_2 + 20\text{H}_2\text{O}$**
Decomp by H_2O and dil acids
Sol in conc HNO_3 with oxidation of the sulphur to H_2SO_4 (Ephraim, B 1910, 43 286)
- Magnesium —, $\text{Mg}_3(\text{PS}_2\text{O})_2 + 20\text{H}_2\text{O}$**
Decomp by H_2O and dil acids (Ephraim)
- Thiophosphorous acid**
- Ammonium thiophosphite (?), $(\text{NH}_4)_4\text{P}_2\text{S}_2\text{O}_3 + 3\text{H}_2\text{O}$**
Sol in H_2O (Lemoine, C R 98 45)
 $+ 6\text{H}_2\text{O}$
- Sodium thiophosphite (?), $\text{Na}_4\text{P}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O} = \text{P}_2\text{O}_3, 2\text{Na}_2\text{S} + 5\text{H}_2\text{O}$**
Sol in H_2O (Lemoine, C R 98 45)
 $\text{Na}_4\text{P}_2\text{S}_2\text{O}_4 + 4\text{H}_2\text{O} = \text{P}_2\text{O}_3, 3\text{Na}_2\text{O}, 2\text{H}_2\text{S} + 2\text{H}_2\text{O}$ Sol in H_2O (Lemoine, l c)
- Thiophosphoryl triamide, $\text{PS}(\text{NH}_2)_3$**
Rapidly decomp by H_2O Scarcely sol in alcohol, ether, or CS_2 (Chevrier, C R 66 748)
- Metathiophosphoryl bromide, PS_2Br**
Decomp by H_2O Insol in ether (Michaels, A 164 9)
- Orthothiophosphoryl bromide, PSBr_3**
Slowly decomp by cold, rapidly by hot H_2O but volatile with only partial decomp with steam Easily sol in ether, CS_2 , PCl_3 , PBr_3
Decomp by cold alcohol Forms hydrate $\text{PSBr}_3 + \text{H}_2\text{O}$ (Michaels, A 164 9)
- Pyrothiophosphoryl bromide, $\text{P}_2\text{S}_4\text{Br}_4$**
Decomp by H_2O and alcohol Sol in CS_2 and ether (Michaels)
- Thiophosphoryl phosphorus bromide, $\text{PSBr}_3, \text{PBr}_3$**
Decomp by H_2O into PSBr_3 (Michaels)
- Thiophosphoryl dibromochloride, PSClBr_2**
Decomp by H_2O and alkalis
Fumes in the air (Besson, C R 1896, 122 1059)
- Thiophosphoryl bromodichloride, PSCl_2Br**
Decomp by H_2O and alkalis Reacts violently with HNO_3 (Besson, C R 1896, 120 1058)
- Thiophosphoryl chloride, PSCl_3**
Very slowly decomp by H_2O , and may be distilled with steam without much decomp
Decomp by alcohol Miscible with CS_2 (Baudrimont, J pr 87 301)
Sol in CCl_4 and C_6H_6 (Oddo, Gazz ch it 1899, 29 (2) 318)

Thiophosphoryl pentachloride, PS_2Cl_5 (?)

Decomp by H_2O Sol in alkalis with residue of S Attacked violently by HNO_3 , alcohol, ether, oil of turpentine Miscible with CS_2 (Gladstone, Chem Soc 3 5)

Thiophosphoryl fluoride, PSF_3

Slowly sol in H_2O with decomp Sl sol in ether

Insol in H_2SO_4 , CS_2 , or benzene (Thorpe and Rodger, Chem Soc 55 306)

More sol in KOH or NaOH + Aq than in H_2O

Thiophosphoryl iodide, P_2SI_2

Very sol in CS_2 Unstable when heated Fumes in the air (Besson, C R 1896, 122 1201)

Thiosulphuric (formerly Hyposulphurous) acid, $\text{H}_2\text{S}_2\text{O}_3$

Known only in aqueous solution, which is extremely unstable, and decomposes very quickly after its formation The time before decomposition is exactly proportional to the ratio of the weight of H_2O to the weight of $\text{H}_2\text{S}_2\text{O}_3$ present, i e, if one solution contains twice as much H_2O for a given amt of $\text{H}_2\text{S}_2\text{O}_3$ as a second solution, the first solution will decompose in twice the length of time The length of time is about 20 secs at 10° , and 2 secs at 50° for conc solutions, to 120 secs at 10° and 12 secs at 50° for very dilute solutions (See Landolt (B 16 2958) for further figures, also Winkelmann (B 18 406)

Thiosulphates

The thiosulphates of the alkalis and of Ca and Sr are easily sol in H_2O , Ba and Sr salts are sl sol and the other salts insol The salts of the metals dissolve in alkali thiosulphates + Aq All are insol in alcohol

Double Salts of Thiosulphuric acid It is impossible to determine whether substances of this class are true chem individuals Many described by Svensson and others are doubtless isomorphous mixtures, whose comp depends on the temp and conc of the solution in which pptd (Rosenheim, Z anorg 1900 25 72)

Ammonium thiosulphate, $(\text{NH}_4)_2\text{S}_2\text{O}_3$

Very deliquescent Very sol in H_2O Not deliquescent (Fock and Kluss, B 1889, 22 3099)

Crystallises with $\frac{1}{2}\text{H}_2\text{O}$ (Rammelsberg, Pogg 56 298) Anhydrous (Arppe, A 96 113)

Insol in alcohol (Arppe)

Sol in acetone (Eidmann, C C 1899, II 1014)

Difficultly sol in acetone (Naumann, B 1904, 37 4328)

Ammonium cadmium thiosulphate,

$3(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{CdS}_2\text{O}_3 + 3\text{H}_2\text{O}$
Can be recryst from warm H_2O (Fock and Kluss, B 23 1758)
+ H_2O (F and K)
 $(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{CdS}_2\text{O}_3$ (F and K)

Ammonium cuprous thiosulphate,

$(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$
Less sol in H_2O than $2(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 1\frac{1}{2}\text{H}_2\text{O}$ (Rosenheim and Steinhauser Z anorg 1900, 25 91)
 $2(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 1\frac{1}{2}\text{H}_2\text{O}$ Very sol in H_2O Insol in alcohol (Rosenheim and Steinhauser)

Ammonium cuprous thiosulphate cuprous iodide, $7(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3, 8\text{CuI} + 4\text{H}_2\text{O}$

Insol in H_2O (Brun, C R 1892, 114 668)
Could not be obtained (Rosenheim and Steinhauser, Z anorg 1900, 25 107)

Ammonium cuprous sodium thiosulphate ammonia, $3\text{Cu}_2\text{S}_2\text{O}_3, 4\text{Na}_2\text{S}_2\text{O}_3, (\text{NH}_4)_2\text{S}_2\text{O}_3, 6\text{NH}_3$

Ppt When drv is fairly stable in the air Partially decomp by H_2O
Sol in dil H_2SO_4 or acetic acid (Shinn, J Am Chem Soc 1904, 26 948)

Ammonium lead thiosulphate, $2(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{PbS}_2\text{O}_3 + 3\text{H}_2\text{O}$

Easily and completely sol in cold H_2O , but deposits PbS_2O_3 by standing or warming (Rammelsberg, Pogg 56 312)

Ammonium magnesium thiosulphate,

$(\text{NH}_4)_2\text{Mg}(\text{S}_2\text{O}_3)_2 + 6\text{H}_2\text{O}$
Very deliquescent, and sol in H_2O (Kessler, Pogg 74 283)
Not deliquescent (Fock and Kluss B 23 540)

Ammonium mercuric thiosulphate, $4(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{HgS}_2\text{O}_3 + 2\text{H}_2\text{O}$

Sol in H_2O , from which it is precipitated by alcohol Extremely easily decomp (Rammelsberg, Pogg 56 318)

Ammonium potassium thiosulphate,

$\text{NH}_4\text{KS}_2\text{O}_3$
Sol in H_2O (Fock and Kluss, B 23 536)

Ammonium silver thiosulphate, $2(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Ag}_2\text{S}_2\text{O}_3 + x\text{H}_2\text{O}$

Easily sol in H_2O Somewhat sol in alcohol (Herschel, Edinb Phil J 1 395)
 $(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{Ag}_2\text{S}_2\text{O}_3 + x\text{H}_2\text{O}$ Nearly insol in H_2O , sol in NH_4OH + Aq, from which it is reprecipitated by an acid (Herschel)

Ammonium zinc thiosulphate,
 $(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{ZnS}_2\text{O}_3 + \text{H}_2\text{O}$

Very sol in H_2O (Rosenheim and Davidsohn, Z anorg 1904, **41** 238)

Ammonium thiosulphate ammonium cuprous bromide, $\text{CuBr}, \text{NH}_4\text{Br}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim, Z anorg 1900, **25** 107)

The double salts of ammonium thiosulphate with silver and copper haloids are true chemical compounds and may be recryst from H_2O without decomp (Rosenheim, Z anorg 1900, **25** 100)

Ammonium thiosulphate ammonium silver bromide, $\text{AgBr}, \text{NH}_4\text{Br}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim)

Ammonium thiosulphate ammonium cuprous chloride, $\text{CuCl}, \text{NH}_4\text{Cl}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O and in $\text{NH}_4\text{OH} + \text{Aq}$ (Rosenheim)

Ammonium thiosulphate ammonium silver chloride, $\text{AgCl}, \text{NH}_4\text{Cl}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in cold H_2O and $\text{NH}_4\text{OH} + \text{Aq}$
Decomp by boiling with H_2O and by dil acids (Rosenheim)

Ammonium thiosulphate ammonium cuprous cyanide

Composition not constant (Rosenheim)

Ammonium thiosulphate ammonium silver cyanide

Composition not constant (Rosenheim)

Ammonium thiosulphate ammonium cuprous iodide, $\text{CuI}, \text{NH}_4\text{I}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim)

Ammonium thiosulphate ammonium cuprous iodide, $4(\text{NH}_4)_2\text{S}_2\text{O}_3, \text{NH}_4\text{I}, \text{CuI}$

Very sol in H_2O Decomp by boiling (Brun, C R 1892, **114** 668)

Ammonium thiosulphate ammonium silver iodide, $\text{AgI}, \text{NH}_4\text{I}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim)

Ammonium thiosulphate ammonium cuprous sulphocyanide, $\text{CuSCN}, \text{NH}_4\text{SCN}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim)

Ammonium thiosulphate ammonium silver sulphocyanide, $\text{AgSCN}, \text{NH}_4\text{SCN}, 4(\text{NH}_4)_2\text{S}_2\text{O}_3$

Sol in H_2O (Rosenheim)

Ammonium thiosulphate cuprous iodide,
 $(\text{NH}_4)_2\text{S}_2\text{O}_3, 2\text{CuI} + \text{H}_2\text{O}$

Insol in H_2O (Brun, C R 1892, **114** 668)

Could not be obtained (Rosenheim and Steinhäuser)

Barium thiosulphate, $\text{BaS}_2\text{O}_3 + \text{H}_2\text{O}$

Sl sol in H_2O (Rose, Pogg **21** 437)

Insol in alcohol

1 pt cannot be dissolved in 2000 pts H_2O

Sol in dil $\text{HCl} + \text{Aq}$ without decomposition (Herschel, **1819**)

Pptd from $\text{BaS}_2\text{O}_3 + \text{Aq}$ by dil alcohol (Sobrero and Selmi, A ch (3) **28** 211)

Insol in acetone (Naumann, B 1904, **37** 4329)

Barium bismuth thiosulphate, $\text{Ba}_3[\text{Bi}(\text{S}_2\text{O}_3)_2]_2$

Sol in H_2O with decomp (Hauser, Z anorg 1903, **35** 9)

Barium cadmium thiosulphate, $2\text{BaS}_2\text{O}_3, \text{CdS}_2\text{O}_3 + 8\text{H}_2\text{O}$

Sl sol in H_2O (Fock and Klüss, B **23** 1761)

$3\text{BaS}_2\text{O}_3, \text{CdS}_2\text{O}_3 + 8\text{H}_2\text{O}$ Sl sol in H_2O

Barium cuprous thiosulphate

Easily sol in hot, difficultly sol in cold H_2O (Cohen, Chem Soc **51** 38)

$2\text{BaS}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 7\text{H}_2\text{O}$ Nearly insol in H_2O (Vortmann, M **9** 165)

Barium gold thiosulphate

Sl sol in H_2O Insol in alcohol (Fordos and Gélys)

Barium lead thiosulphate

Difficultly sol in H_2O (Rammelsberg, Pogg **56** 313)

Barium thiosulphate chloride, $\text{BaS}_2\text{O}_3, \text{BaCl}_2 + 2\text{H}_2\text{O}$

Sol in H_2O (Fock and Klüss, B **23** 3001)

Bismuth caesium thiosulphate, $\text{Cs}_3\text{Bi}(\text{S}_2\text{O}_3)_2$

Sol in H_2O

Insol in alcohol (Hauser, Z anorg 1903, **35** 8)

Bismuth potassium thiosulphate, $\text{K}_3\text{Bi}(\text{S}_2\text{O}_3)_2 + \frac{1}{2}\text{H}_2\text{O}$

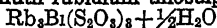
Solubility in H_2O

100 cc of the sat solution contain 3.5 g at 2° , 7.0 g at 18° At 18° the solution decomposes

More sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ than in pure H_2O

Insol in alcohol (Hauser, Z anorg 1903, **35** 5)

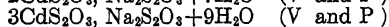
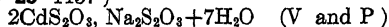
$+ \text{H}_2\text{O}$ Sol in H_2O Insol in alcohol (Carnot, C R **83** 390)

Bismuth rubidium thiosulphate,Sol in H_2O

Insol in acid alcohol (Hauser, Z anorg 1903, 35 7)

+ H_2O Sol in H_2O (Hauser, Z anorg 1903, 35 8)**Bismuth sodium thiosulphate,**Very sol in H_2O , and also in alcohol (Carnot, C R 83 338) $\text{Na}_3\text{Bi}(\text{S}_2\text{O}_3)_3$ Decomp by H_2O Easily sol in 50% alcohol (Hauser, Z anorg 1903, 35 3)**Cadmium thiosulphate, $\text{CdS}_2\text{O}_3 + 2\text{H}_2\text{O}$** Sol in H_2O Insol in alcohol (Vortmann and Padberg, B 22 2638)**Cadmium potassium thiosulphate, $3\text{CdS}_2\text{O}_3, 5\text{K}_2\text{S}_2\text{O}_3$**

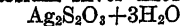
Cannot be recryst without decomp (Fock and Klüss, B 23 1753)

 $\text{CdS}_2\text{O}_3, 3\text{K}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Can be crystallised from H_2O without decomp (F and K)**Cadmium sodium thiosulphate, $\text{CdS}_2\text{O}_3, 3\text{Na}_2\text{S}_2\text{O}_3 + 16\text{H}_2\text{O}$** Not deliquescent Sol in H_2O (Jochum, C C 1885, 642)+ $9\text{H}_2\text{O}$ (Vortmann and Padberg, B 22 2639)+ $3\text{H}_2\text{O}$ Deliquescent (Fock and Klüss, B 23 1157)**Cadmium strontium thiosulphate, $\text{CdS}_2\text{O}_3, 3\text{SrS}_2\text{O}_3 + 10\text{H}_2\text{O}$**

(Fock and Klüss, B 23 1763)

Cæsium thiosulphate, $\text{Cs}_2\text{S}_2\text{O}_3$ Easily sol in H_2O (Chabrie, C R 1901, 133 297)+ $2\text{H}_2\text{O}$ Very hygroscopic (J Meyer, B 1907, 40 1360)**Cæsium cuprous thiosulphate, $\text{Cs}_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$** Easily sol in H_2O with decomp (J Meyer, B 1907, 40 1361)**Cæsium lead thiosulphate, $\text{Cs}_2\text{S}_2\text{O}_3, \text{PbS}_2\text{O}_3 + 2\text{H}_2\text{O}$**

Not hygroscopic

 $2\text{Cs}_2\text{S}_2\text{O}_3, \text{PbS}_2\text{O}_3 + 3\text{H}_2\text{O}$ Hygroscopic (J Meyer)**Cæsium magnesium thiosulphate, $\text{Cs}_2\text{S}_2\text{O}_3, \text{MgS}_2\text{O}_3 + 6\text{H}_2\text{O}$** Easily sol in H_2O (Meyer)**Cæsium silver thiosulphate, $2\text{Cs}_2\text{S}_2\text{O}_3, \text{Ag}_2\text{S}_2\text{O}_3 + 3\text{H}_2\text{O}$** 

Not hygroscopic

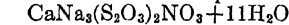
Decomp by hot H_2O (J Meyer)**Calcium thiosulphate, $\text{CaS}_2\text{O}_3 + 6\text{H}_2\text{O}$** Sol in 1 pt H_2O at 3° Aqueous solution saturated at 10° has sp gr 1.300 Solution with sp gr 1.11437 at 15.5° contains 0.2081 of its weight in CaS_2O_3

Decomp on heating Insol in alcohol (sp gr 0.8234) (Herschel, A ch 14 355)

100 g sat solution contains 29.4 g CaS_2O_3 at 9° , and 34.7 g CaS_2O_3 at 25° (Kremann and Rodemund, M 1914, 35 1065)**Solubility of $\text{CaS}_2\text{O}_3 + \text{Na}_2\text{S}_2\text{O}_3$ in H_2O**

t°	$\text{Na}_2\text{S}_2\text{O}_3$ %	CaS_2O_3 %	Solid phase
9	0	29.4	$\text{CaS}_2\text{O}_3, 6\text{H}_2\text{O}$
	11.04	22.64	" + $\text{Na}_2\text{S}_2\text{O}_3, 5\text{H}_2\text{O}$ $\text{Na}_2\text{S}_2\text{O}_3, 5\text{H}_2\text{O}$
	25.21	15.84	
	31.01	7.70	
25	0	34.7	$\text{CaS}_2\text{O}_3, 6\text{H}_2\text{O}$
	9.24	29.69	"
	15.67	21.41	
	18.34	25.18	
	28.24	21.14	" + $\text{Na}_2\text{S}_2\text{O}_3, 5\text{H}_2\text{O}$ $\text{Na}_2\text{S}_2\text{O}_3, 5\text{H}_2\text{O}$
	30.19	20.33	
	31.24	18.43	
	35.04	11.61	"

(Kremann and Rodemund, M 1914, 35 1065)

Calcium lead thiosulphate, $2\text{CaS}_2\text{O}_3, \text{PbS}_2\text{O}_3 + 4\text{H}_2\text{O}$ Decomp by H_2O (Rammelsberg)**Calcium potassium thiosulphate, $\text{CaS}_2\text{O}_3, 3\text{K}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$** Sol in H_2O (Fock and Klüss, B 24 3016)**Calcium silver thiosulphate, $2\text{CaS}_2\text{O}_3, \text{Ag}_2\text{S}_2\text{O}_3 + x\text{H}_2\text{O}$** Easily sol in H_2O , less sol in alcohol
 CaS_2O_3 - S H_2O Sol in H_2O , abundantly in $\text{NaOH} + \text{Aq}$ (Herschel, 1819)**Calcium sodium thiosulphate nitrate,**

(Kremann and Rodemund, M 1914, 35 1065)

Cobaltous thiosulphate, $\text{CoS}_2\text{O}_3 + 6\text{H}_2\text{O}$ Sol in H_2O (Rammelsberg)**Cobaltous sodium thiosulphate, $2\text{CoS}_2\text{O}_3, 5\text{Na}_2\text{S}_2\text{O}_3 + 25\text{H}_2\text{O}$** Efflorescent Sol in H_2O (Jochum)

Could not be obtained by Vortmann and Padberg

$\text{CoS}_2\text{O}_3, 3\text{Na}_2\text{S}_2\text{O}_3 + 15\text{H}_2\text{O}$ Sol in H_2O
(Vortmann and Padberg, B 22 2641)

Cuprous thiosulphate, $\text{Cu}_2\text{O}, 3\text{S}_2\text{O}_2 + 2\text{H}_2\text{O} = \text{Cu}_2\text{H}_4(\text{S}_2\text{O}_3)_2$

Sl sol in H_2O Abundantly sol in $\text{Na}_2\text{S}_2\text{O}_3$ + Aq, NH_4Cl + Aq, NH_4OH + Aq, or $(\text{NH}_4)_2\text{CO}_3$ + Aq Sol in HCl or HNO_3 + Aq (v Hauer, W A B 13 443)

Cuprous hydrazine thiosulphate,

$\text{Cu}_2\text{S}_2\text{O}_3, (\text{N}_2\text{H}_4)_2\text{H}_2\text{S}_2\text{O}_3 + \frac{1}{2}\text{H}_2\text{O}$

Insol in H_2O , sol in NH_4OH + Aq and in dil acids (Ferratini, C C 1912, I 1281)

Cupric lead thiosulphate, $\text{Pb}(\text{CuS}_2\text{O}_3)_2$

+ $3\text{H}_2\text{O}$ (?)

Very sol in H_2O and quickly decomp (Girard, C C 1904, I 253)

Cuprous mercurous thiosulphate, $5\text{Cu}_2\text{S}_2\text{O}_3, 3\text{Hg}_2\text{S}_2\text{O}_3$

Insol or sl sol in cold, decomp by boiling H_2O HNO_3 + Aq dissolves out Cu (Rammelsberg, Pogg 56 319)

Cuprous potassium thiosulphate, $\text{Cu}_2\text{S}_2\text{O}_3, \text{K}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$

Sl sol in H_2O , decomp on heating with optn of CuS Easily sol in $\text{K}_2\text{S}_2\text{O}_3$ + Aq (Rammelsberg, Pogg 56 321)

$\text{Cu}_2\text{S}_2\text{O}_3, 2\text{K}_2\text{S}_2\text{O}_3$ Very sol in cold H_2O , nsol in $\text{K}_2\text{S}_2\text{O}_3$ + Aq (Cohen, Chem Soc 51 39)

+ $3\text{H}_2\text{O}$ Scarcely sol in cold, sol with sl decomp in hot H_2O Sol in HCl + Aq with evolution of SO_2

$\text{Cu}_2\text{S}_2\text{O}_3, 3\text{K}_2\text{S}_2\text{O}_3 + 3\text{H}_2\text{O}$ More sol in H_2O than $\text{Cu}_2\text{S}_2\text{O}_3, \text{K}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Solution s not decomp by boiling Sol in excess of NH_4OH + Aq (Rammelsberg)

Cuprous rubidium thiosulphate, $\text{Rb}_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$

Ppt (J Meyer, B 1907, 40 1357)
 $2\text{Rb}_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Ppt (J Meyer)
 $3\text{Rb}_2\text{S}_2\text{O}_3, \text{Cu}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Ppt (J Meyer)

Cuprous silver sodium thiosulphate ammonia, $\text{Cu}_2\text{S}_2\text{O}_3, 2\text{Ag}_2\text{S}_2\text{O}_3, 5\text{Na}_2\text{S}_2\text{O}_3, 6\text{NH}_3$

Ppt Becomes dark when exposed to light Decomp by H_2O Sol in NH_4OH + Aq Shinn, J Am Chem Soc 1904, 26 949)

Cuprous sodium thiosulphate, $2\text{Cu}_2\text{S}_2\text{O}_3, 7\text{Na}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$

Ppt from aqueous solution by alcohol Jochum, C C 1885 642)
+ $12\text{H}_2\text{O}$ Sol in very dil HCl + Aq (Jochum)

$\text{Cu}_2\text{S}_2\text{O}_3, 3\text{Na}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Sol in H_2O , insol in alcohol (Rammelsberg)

+ $6\text{H}_2\text{O}$ (Jochum)

$3\text{Cu}_2\text{S}_2\text{O}_3, 2\text{Na}_2\text{S}_2\text{O}_3 + 8\text{H}_2\text{O}$ Decomp by H_2C (Vortmann)

+ $5\text{H}_2\text{O}$ (Lenz, A 40 99) Formula according to Jochum is—

$5\text{Cu}_2\text{S}_2\text{O}_3, 4\text{Na}_2\text{S}_2\text{O}_3 + 8\text{H}_2\text{O}$ Insol in H_2O or alcohol Sol in HCl + Aq without evolution of SO_2 , also in dil H_2SO_4 or HNO_3 + Aq Sol in NH_4OH + Aq (Jochum)

+ $6\text{H}_2\text{O}$ As above (Jochum)

$\text{Cu}_2\text{S}_2\text{O}_3, \text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}$ Insol in H_2O , sol in $\text{Na}_2\text{S}_2\text{O}_3$ + Aq (Russell, Ch Ztg 9 233)

+ $2\text{H}_2\text{O}$ Insol in H_2O and alcohol

Decomp by dil acids (Rosenheim and Steinhauser, Z anorg 1900, 25 84)

+ $2\frac{1}{2}\text{H}_2\text{O}$ Sol in H_2O Pptd by alcohol

(Bhaduri, Z anorg 1898, 17 1)

+ $3\text{H}_2\text{O}$ Decomp by H_2O (Vortmann, M 1888, 9 168)

$3\text{Cu}_2\text{S}_2\text{O}_3, 2\text{Na}_2\text{S}_2\text{O}_3$ (Gerard, C C 1904, I 253)

+ $5\text{H}_2\text{O}$ Sol in 352 pts H_2O (Russell, Ch Z 1885, 9 223)

100 cc 5% $\text{Na}_2\text{S}_2\text{O}_3$ + Aq dissolve 12 28 g

" " 7 5% " " 17 46 g

" " 10% " " 22 54 g

(Russell, Ch Z 1885, 9 223)

$4\text{Cu}_2\text{S}_2\text{O}_3, 3\text{Na}_2\text{S}_2\text{O}_3 + 6\text{H}_2\text{O}$ Insol in H_2O and alcohol

Decomp by dil acids (Rosenheim and Steinhauser, Z anorg 1900, 25 84)

+ $9\text{H}_2\text{O}$ Sol in H_2O Pptd by alcohol

(Bhaduri, Z anorg 1898, 17 1)

$7\text{Cu}_2\text{S}_2\text{O}_3, 5\text{Na}_2\text{S}_2\text{O}_3 + 16\text{H}_2\text{O}$ Decomp by H_2O and by alcohol (Bhaduri, Z anorg 1898, 17 1)

It is impossible to determine whether any of these compds are complex or double salts As a class they are not easily sol and decomp in solution They may therefore be mixtures whose comp depended upon the temp and conc of the solution in which they were pptd (Rosenheim, Z anorg 1900, 25 81)

Cuprocupric sodium thiosulphate ammonia, $\text{Cu}_2\text{S}_2\text{O}_3, \text{CuS}_2\text{O}_3, 2\text{Na}_2\text{S}_2\text{O}_3, 4\text{NH}_3$

Insol in, but decomp by hot H_2O Sol in $\text{HC}_2\text{H}_3\text{O}_2$ + Aq Sol in NH_4OH + Aq or $\text{Na}_2\text{S}_2\text{O}_3$ + Aq (Schutte, C R 42 1267)

Cuprous sodium thiosulphate cuprous chloride, $\text{Cu}_2\text{S}_2\text{O}_3, 2\text{Na}_2\text{S}_2\text{O}_3, 2\text{CuCl}$

(Rosenheim and Steinhauser, Z anorg 1900, 25 86)

Cupric sodium thiosulphate cupric sulphide, $\text{Cu}_2\text{S}_2\text{O}_3, \text{Na}_2\text{S}_2\text{O}_3, \text{CuS} + 4\text{H}_2\text{O}$

Sl sol in H_2O , easily sol in $\text{Na}_2\text{S}_2\text{O}_3$ + Aq, and NH_4OH + Aq, insol in alcohol (Lenz, A 40 99)

$\text{Cu}_2\text{S}_2\text{O}_3, \text{Na}_2\text{S}_2\text{O}_3, 2\text{CuS}$ Sol in H_2O or dil HCl + Aq (Kessel, B 11 1585)

Cuprous sodium thiosulphate sodium chloride, $3\text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 \cdot 4\text{NaCl} + 8\text{H}_2\text{O}$
Sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Siewert, Zeit ges Naturwiss **26** 486)
Ppt (Bhaduri, Z anorg 1898, **17** 3)

Cupric thiosulphate ammonia, $\text{CuS}_2\text{O}_3 \cdot 4\text{NH}_3$
100 pts H_2O dissolve 21.79 pts at 25° (Pudschies, Dissert)

Cuprocupric thiosulphate ammonium chloride, $\text{Cu}_2\text{O} \cdot \text{CuO} \cdot 3\text{S}_2\text{O}_3 \cdot 2\text{NH}_4\text{Cl}$
Sol in $\text{HNO}_3 + \text{Aq}$ with separation of S (v Hauer, W A B **13** 447)

Glucinum thiosulphate, $\text{HS}_2\text{O}_3 \cdot 11\text{H}_2\text{O}$
(Faktor, C C **1901**, II 878)

Gold (aurous) hydrogen thiosulphate, $\text{Au}_2\text{S}_2\text{O}_3 \cdot 3\text{H}_2\text{S}_2\text{O}_3$
Known only in solution (Fordos and Gélis, A ch (3) **13** 394)

Gold (aurous) sodium thiosulphate, $\text{Au}_2\text{S}_2\text{O}_3 \cdot 3\text{Na}_2\text{S}_2\text{O}_3 + 4\text{H}_2\text{O}$
Sol in H_2O , solution decomp on heating Insol in absolute, sl sol in dil alcohol (Fordos and Gélis)
 $\text{Au}_2\text{S}_2\text{O}_3 \cdot 6\text{Na}_2\text{S}_2\text{O}_3 + 10\text{H}_2\text{O}$ Very sol in H_2O but decomp by boiling (Jochum, C

sulphate, $\text{FeS}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

Very sol in H_2O or alcohol (Pogg **63** 241)

Iron (ferrous) sodium thiosulphate, $\text{FeS}_2\text{O}_3 \cdot 3\text{Na}_2\text{S}_2\text{O}_3 + 8\text{H}_2\text{O}$
Very sol in H_2O , and easily decomp (Vortmann and Padberg, B **22** 2641)

Lead thiosulphate, PbS_2O_3

Sl sol in 3266 pts H_2O Sol in alkali thiosulphates + Aq (Rammelsberg, Pogg **56** 308)

Lead lithium thiosulphate, $\text{PbS}_2\text{O}_3 \cdot \text{Li}_2\text{S}_2\text{O}_3$
Very hygroscopic
Decomp by H_2O with separation of PbS (J Meyer, B 1907, **40** 1355)

Lead potassium thiosulphate, $\text{PbS}_2\text{O}_3 \cdot 3\text{K}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$
Sol in H_2O with partial separation of PbS_2O_3 Sol in $\text{K}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Rammelsberg, Pogg **56** 310)

Lead rubidium thiosulphate, $2\text{Rb}_2\text{S}_2\text{O}_3 \cdot \text{PbS}_2\text{O}_3 + 2\text{H}_2\text{O}$
Difficultly sol in cold H_2O
Decomp by H_2O (J Meyer, B 1907, **40** 1358)

Lead sodium thiosulphate, $\text{PbS}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3$
Sl sol in H_2O Very easily sol in $\text{Na}_2\text{C}_2\text{H}_3\text{O}_2$ and $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Lenz, A **40** 98)
Insol in alcohol
 $2\text{PbS}_2\text{O}_3 \cdot 5\text{Na}_2\text{S}_2\text{O}_3 + 60\text{H}_2\text{O}$ Easily decomp (Jochum, C C **1885** 642)
 $\text{PbS}_2\text{O}_3 \cdot 3\text{Na}_2\text{S}_2\text{O}_3 + 12\text{H}_2\text{O}$ Decomp in boiling aqueous solution (Vortmann and Padberg, B **22** 2637)

Lead strontium thiosulphate

Sol in H_2O Precipitated as a syrup by alcohol (Rammelsberg)

Lithium thiosulphate, $\text{Li}_2\text{S}_2\text{O}_3 + 3\text{H}_2\text{O}$

Very deliquescent, and sol in H_2O and absolute alcohol (Fock and Kluss, B **22** 3099)

Lithium silver thiosulphate, $\text{Li}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}$

Hygroscopic
Decomp by boiling H_2O and by acids (Meyer and Eggeling, B 1907, **40** 1355)

Magnesium thiosulphate, $\text{MgS}_2\text{O}_3 + 6\text{H}_2\text{O}$

Very easily sol in H_2O Precipitated from conc solution by alcohol (Rammelsberg, Pogg **56** 303)

Magnesium potassium thiosulphate, $\text{MgK}_2(\text{S}_2\text{O}_3)_2 + 6\text{H}_2\text{O}$

Deliquescent, and sol in H_2O Less sol than $\text{K}_2\text{S}_2\text{O}_3$ (Rammelsberg, Pogg **56** 304)
Not deliquescent (Fock and Kluss, B **23** 539)

Magnesium rubidium thiosulphate, $\text{MgS}_2\text{O}_3 \cdot \text{Rb}_2\text{S}_2\text{O}_3 + 6\text{H}_2\text{O}$

Easily sol in H_2O (Meyer B 1907, **40** 1358)

Manganous thiosulphate, MnS_2O_3

Sol in H_2O , from which it is pptd by alcohol (Rammelsberg, Pogg **56** 305)
 $+ 5\text{H}_2\text{O}$ Decomp very easily (Vortmann and Padberg, B **322** 2641)

Manganous sodium thiosulphate, $\text{MnS}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 + 16\text{H}_2\text{O}$

Sol in H_2O Insol or but sl sol in alcohol (Jochum, C C **1885** 642)

Mercuric potassium thiosulphate, $3\text{HgS}_2\text{O}_3 \cdot 5\text{K}_2\text{S}_2\text{O}_3$

Sol in 10 pts H_2O at 15° , and $\frac{1}{2}$ pt at 100° Aqueous solution decomp on standing or heating

Insol in alcohol (Kirchhoff, Scher J **2** 30)

$\text{HgS}_2\text{O}_3 \cdot 3\text{K}_2\text{S}_2\text{O}_3 + 3\text{H}_2\text{O}$ (Fock and Kluss, B **24** 1353)

$\text{HgS}_2\text{O}_3 \cdot 5\text{K}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}$ (F and K)

Nickel thiosulphate, $\text{NiS}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$

Permanent Sol in H_2O (Rammelsberg, Pogg 56 306)

Nickel sodium thiosulphate, $2\text{NiS}_2\text{O}_3 \cdot 5\text{Na}_2\text{S}_2\text{O}_3 \cdot 25\text{H}_2\text{O}$

Efflorescent Sol in H_2O (Jochum)

Nickel thiosulphate ammonia, $\text{NiS}_2\text{O}_3 \cdot 4\text{NH}_3 \cdot 6\text{H}_2\text{O}$

Decomp on air Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 56 306)

$\text{NiS}_2\text{O}_3 \cdot 5\text{NH}_3 + \text{H}_2\text{O}$ (Ephraim, B 1913, 46 3108)

$\text{NiS}_2\text{O}_3 \cdot 6\text{NH}_3 + 3\text{H}_2\text{O}$ (Vortmann and Padberg, B 22 2641)

Platinous sodium thiosulphate

See Platothiosulphate, sodium

Potassium thiosulphate, $\text{K}_2\text{S}_2\text{O}_3 \cdot 1\frac{1}{2}\text{H}_2\text{O}$, and $2\text{H}_2\text{O}$

Very deliquescent Very sol in H_2O with absorption of heat Solution is stable on the air Insol in alcohol

100 pts H_2O dissolve pts $\text{K}_2\text{S}_2\text{O}_3$ at t°

t°	Pts $\text{K}_2\text{S}_2\text{O}_3$	Solid phase
0	96 1	$\text{K}_2\text{S}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
17	150 5	$3\text{K}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
20	155 4	"
25	165 0	"
30	175 7	"
35	202 4	$3\text{K}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O} + \text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$
40	204 7	$\text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$
45	208 7	"
50	215 2	"
55	227 7	"
60	238 3	"
56 1	234 5	$\text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O} + 3\text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$
65	245 8	$3\text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}$
70	255 2	"
75	268 0	"
78 3	292 0	$3\text{K}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O} + \text{K}_2\text{S}_2\text{O}_3$
80	293 1	$\text{K}_2\text{S}_2\text{O}_3$
85	298 5	"
90	312 0	"

(Inohiko Io, Mem Coll Sc Kyoto, 1911, 3 212)

Sol in dil $\text{HCl} \cdot \text{H}_2\text{O}_2 + \text{Aq}$ without decomp (Mathieu-Plessey, C R 101 59)

Insol in ethyl acetate (Cuvillier, C R 30 821)

Potassium silver thiosulphate, $2\text{K}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3$

Sol in H_2O (Cohen)
 $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3$ Sl sol in H_2O (Herschel)

$3\text{K}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Rather sl sol in H_2O (Rosenheim and Steinhauser, Z anorg 1900, 25 76)

Sl sol in H_2O (Rosenheim)

Potassium silver thiosulphate ammonia, $\text{KAgS}_2\text{O}_3 \cdot 2\text{NH}_3$

Very sl sol in H_2O Easily sol in hot $\text{NH}_4\text{OH} + \text{Aq}$ (Schwicker, B 22 1735)

$5\text{K}_2\text{S}_2\text{O}_3 \cdot 3\text{Ag}_2\text{S}_2\text{O}_3 \cdot \text{NH}_3$ Difficultly sol in H_2O with decomp

Sol in hot $\text{NH}_4\text{OH} + \text{Aq}$ with partial decomp (J Meyer, B 1907, 40 1359)

Potassium sodium thiosulphate

(a) $\text{KNaS}_2\text{O}_3 + 2\text{H}_2\text{O}$ Very sol in H_2O 100 pts H_2O dissolve 213 7 pts salt at 15° (Schwicker, B 22 1733)

(b) $\text{NaKS}_2\text{O}_3 + 2\text{H}_2\text{O}$ 100 pts H_2O dissolve 205 3 pts salt at 15° (Schwicker)

Potassium strontium thiosulphate, $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{SrS}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

Sol in H_2O (Fock and Kluss, B 24 3017)

Potassium zinc thiosulphate, $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{ZnS}_2\text{O}_3 + \text{H}_2\text{O}$

Very sol in H_2O (Rosenheim and Davidsohn, Z anorg 1904, 41 238)

Potassium thiosulphate sodium chloride, $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{NaCl}$

Sol in H_2O (Pape, Pogg 139 238)

Rubidium thiosulphate, $\text{Rb}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$

Very hygroscopic, easily sol in H_2O (J Meyer, B 1907, 40 1356)

Rubidium silver thiosulphate, $2\text{Rb}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$

Ppt Not hygroscopic Difficultly sol in cold H_2O Decomp by warm H_2O (J Meyer)

Rubidium silver thiosulphate ammonia, $\text{Rb}_2\text{S}_2\text{O}_3 \cdot \text{Ag}_2\text{S}_2\text{O}_3 \cdot \text{NH}_3$

Ppt (J Meyer)
 $3\text{Rb}_2\text{S}_2\text{O}_3 \cdot 4\text{Ag}_2\text{S}_2\text{O}_3 \cdot \text{NH}_3$ Ppt Decomp in the air (J Meyer)

Samarium thiosulphate

(Cleve)

Scandium thiosulphate, basic, $\text{Sc}(\text{OH})\text{S}_2\text{O}_3$

Ppt (R J Meyer, Z anorg 1914, 86 282)

Silver thiosulphate, $\text{Ag}_2\text{S}_2\text{O}_3$

Sl sol in H_2O Sol in NH_4OH or alkali thiosulphates + Aq (Herschel, Fdnb Phil J 1 26)

Silver sodium thiosulphate, $\text{Ag}_2\text{S}_2\text{O}_3 \cdot \text{Na}_2\text{S}_2\text{O}_3 + \text{H}_2\text{O}$

Sl sol in H_2O Easily sol in $\text{NH}_4\text{OH} + \text{Aq}$, also in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ to form—
 $\text{Ag}_2\text{S}_2\text{O}_3 \cdot 2\text{Na}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ Easily sol in H_2O or $\text{NH}_4\text{OH} + \text{Aq}$, somewhat sol in al-

cohol, especially if warm or dilute (Lenz, A 40 94)

$\text{Ag}_2\text{S}_2\text{O}_3$, $6\text{Na}_2\text{S}_2\text{O}_3 + 21\text{H}_2\text{O}$ Sol in H_2O (Jochum, C C 1885 642)

Silver sodium thiosulphate acetylde acetylene, $2\text{Na}_2\text{S}_2\text{O}_3$, $7\text{Ag}_2\text{S}_2\text{O}_3$, $18\text{Ag}_2\text{C}_2$, $32\text{C}_2\text{H}_2$

Decomp by H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$
Insol in alkalis (Bhaduri, Z anorg 1913, 79 356)

$7\text{Na}_2\text{S}_2\text{O}_3$, $5\text{Ag}_2\text{S}_2\text{O}_3$, $86\text{Ag}_2\text{C}_2$, $13\text{C}_2\text{H}_2$ (Bhaduri)

Silver sodium thiosulphate ammonia, NaAgS_2O_3 , NH_3

Very unstable (Schwicker, B 22 1736)

Silver strontium thiosulphate, $\text{Ag}_2\text{S}_2\text{O}_3$, SrS_2O_3

Nearly insol in H_2O Very sl sol in $\text{SrS}_2\text{O}_3 + \text{Aq}$, easily sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Herschel)

Sodium thiosulphate, $\text{Na}_2\text{S}_2\text{O}_3$ and +1, 2 and $5\text{H}_2\text{O}$

100 pts H_2O dissolve

At 16° , 65 pts $\text{Na}_2\text{S}_2\text{O}_3$

" 20° , 69 " "

" 25° , 75 " "

" 30° , 80 " "

" " "

" " "

" " "

114 " "

(Mulder)

100 pts H_2O dissolve at 0° , 47.6 pts $\text{Na}_2\text{S}_2\text{O}_3$, at 20° , 69.5 pts, at 40° , 104 pts, at 60° , 192.3 pts (Kremers, Pogg 99 50)

100 pts H_2O dissolve 171 pts cryst (= 108.9 pts anhydrous) salt at 19.5° to form a solution of 1.3875 sp gr (Schiff, A 113 350)

By supersaturation 100 pts H_2O may dissolve 217.4 pts $\text{Na}_2\text{S}_2\text{O}_3$ at 0° (Kremers)

Solubility in H_2O

t°	% $\text{Na}_2\text{S}_2\text{O}_3$	Solid phase
0	34.43	$\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$
10	37.89	"
20	41.17	"
30	45.86	"
40	50.65	"
45	54.49	"
50	62.92	$\text{Na}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$
60	67.39	"
72	70.39	"
80 5	71.33	"
90 5	71.76	"
100	72.68	"

(Taylor, Proc Edinburgh Soc 1898, 22 49)

Solubility of anhydrous $\text{Na}_2\text{S}_2\text{O}_3$ in H_2O at t°

t°	g $\text{Na}_2\text{S}_2\text{O}_3$ per 100 g	
	Solution	H O
40	67.40	206.70
45	67.60	208.60
50	67.76	210.20
55	68.15	214.00
60	68.48	217.30
65	68.80	220.50
70	69.05	223.10
75	69.35	226.30
80	69.80	231.80

(Young and Burke, J Am Chem Soc 1906, 28 327)

The solubility of the hydrates of $\text{Na}_2\text{S}_2\text{O}_3$ are exceedingly complicated. There are five groups of hydrates, (I) primary, (II) secondary, (III) tertiary, (IV) quaternary, and (V), quintary, and transitions occur between members of the same and different groups. $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$ (I) is the commercial thiosulphate. The relations and solubility of the various hydrates is shown in the following table

Solubility of $\text{Na}_2\text{S}_2\text{O}_3$ in H_2O at t°

I Primary hydrates

t°	g $\text{Na}_2\text{S}_2\text{O}_3$ per 100 g		Solid phase
	Solution	H.O	
0	33.40	50.15	$\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$ (I)
5	35.33	54.64	"
10	37.37	59.69	"
15	39.11	64.22	"
20	41.20	70.07	"
25	43.15	75.90	"
30	45.19	82.45	"
35	47.71	91.24	"
40	50.83	105.37	"
45	55.33	123.87	"
48 17			" + Na_2SO_3 , $2\text{H}_2\text{O}$ (I)
0	52.73	111.60	$\text{Na}_2\text{S}_2\text{O}_3 + 2\text{H}_2\text{O}$ (I)
5	53.45	114.90	"
10	53.94	117.10	"
20	55.15	122.68	"
25	56.03	127.43	"
30	57.13	133.27	"
40	59.38	146.20	"
45	60.73	154.70	"
50	62.28	165.11	"
55	63.85	176.60	"
60	65.68	191.30	"
65	68.04	212.90	"
66 5			" + $\text{Na}_2\text{S}_2\text{O}_3$

Solubility of $\text{Na}_2\text{S}_2\text{O}_3$ in H_2O at t° —
Continued

II Secondary hydrates

t°	g $\text{Na}_2\text{S}_2\text{O}_3$ per 100 g		Solid phase
	Solu- tion	H_2O	
0	41 96	72 30	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}(\text{II})$
5	43 56	77 17	"
10	45 25	82 65	"
15	47 27	89 36	"
20	49 38	97 55	"
25	52 15	108 98	"
30	56 57	130 26	"
30 22			" $\text{Na}_2\text{S}_2\text{O}_3 \cdot 4\text{H}_2\text{O}(\text{II})$
33 5	58 59	141 48	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 4\text{H}_2\text{O}(\text{II})$
36 2	60 51	153 23	"
38 6	62 80	168 82	"
40 65			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{II})$

0	60 47	153 00	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{II})$
5	60 74	154 70	"
10	61 04	156 70	"
15	61 57	160 20	"
20	62 11	163 90	"
25	62 73	168 30	"
30	63 56	174 40	"
35	64 32	180 20	"
40	65 22	187 60	"
45	66 02	194 30	"
50	66 82	201 40	"
55	67 90	211 50	"
56 5			" $+\text{Na}_2\text{S}_2\text{O}_3$

III Tertiary hydrates

0	46 14	85 67	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 6\text{H}_2\text{O}$ (III and IV)
5	48 44	93 95	"
10	51 66	106 80	"
13	54 96	122 00	"
14 35			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{4}{3}\text{H}_2\text{O}(\text{IV})$
14 3			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{3}{2}\text{H}_2\text{O}(\text{III})$

0	57 42	134 80	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{3}{2}\text{H}_2\text{O}(\text{III})$
5	57 84	137 20	"
10	58 28	139 70	"
15	58 80	142 70	"
20	59 28	145 60	"
25	60 18	151 10	"
30	60 78	155 00	"
35	61 57	160 20	"
40	62 60	167 40	"
45	63 97	177 50	"
47 5	64 68	183 00	"
48 5			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{III})$

47 5	64 78	183 90	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{III})$
50	65 30	188 20	"
52 5	65 89	193 20	"
55	66 45	198 10	"
60	68 07	213 10	"
61			" $+\text{Na}_2\text{S}_2\text{O}_3$

Solubility of $\text{Na}_2\text{S}_2\text{O}_3$ in H_2O at t° —
Continued

IV Quaternary hydrate

t°	g $\text{Na}_2\text{S}_2\text{O}_3$ per 100 g		Solid phase
	Solu- tion	H_2O	
0	57 63	136 00	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{4}{3}\text{H}_2\text{O}(\text{IV})$
5	58 08	138 60	"
10	58 49	140 90	"
15	59 00	143 90	"
20	59 57	147 30	"
25	50 35	152 30	"
30	61 03	156 60	"
35	61 94	162 80	"
40	62 95	169 90	"
45	64 22	179 50	"
50	65 45	189 50	"
55	67 07	203 70	"
58			" $+\text{Na}_2\text{S}_2\text{O}_3$

V Quaternary hydrates

0	57 63	136 00	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 2\text{H}_2\text{O}(\text{V})$
5	58 23	139 40	"
10	59 05	144 20	"
15	60 02	150 10	"
20	61 02	156 50	"
25	62 30	165 30	"
30	63 56	174 40	"
35	65 27	188 00	"
27 5			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{V})$
30	63 34	172 80	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \text{H}_2\text{O}(\text{V})$
35	64 07	178 40	"
40	64 75	183 70	"
45	65 58	190 50	"
50	66 58	199 20	"
55	67 59	208 50	"
43			" $+\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{1}{2}\text{H}_2\text{O}(\text{V})$

25	64 21	179 40	$\text{Na}_2\text{S}_2\text{O}_3 \cdot \frac{1}{2}\text{H}_2\text{O}(\text{V})$
35	64 60	182 50	"
40	64 99	185 60	"
45	65 61	190 82	"
50	66 02	194 30	"
55	66 57	199 10	"
60	67 40	206 70	"
65	68 24	214 90	"
70	69 06		"
70			" $\text{Na}_2\text{S}_2\text{O}_3$

(Young and Burke, J Am Chem Soc 1906, 28 321)

Heat is absorbed by dissolving in H_2O
110 pts $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O} + 100$ pts H_2O
lower temp from 10.7° to 8° (Rudorff, B 2 68)
 $+\frac{1}{2}\text{H}_2\text{O}$ (Young and Burke, J Am Chem Soc 1906, 28 321)
 $+\text{H}_2\text{O}$
 $+\frac{4}{3}\text{H}_2\text{O}$ (Young and Burke)
 $+\frac{3}{2}\text{H}_2\text{O}$ (Young and Burke)

Thorium hydroxide, $\text{Th}(\text{OH})_4$

Insol in H_2O
Sol in acids, except oxalic, molybdic, and hydrofluoric acids

Insol in alkali hydroxides, but easily sol in alkali carbonates + Aq. More sol in $\text{NH}_4\text{OH} + (\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ than in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ alone (Berzelius). Not pptd in presence of tartaric and citric acids (Chydenius, Pogg **119** 43).

$4\text{ThO}_2 \cdot \text{H}_2\text{O}$ Insol in water and acids at boiling temp

Thorium hydroxybromide, $\text{Th}(\text{OH})_2\text{Br}_2 + 11\text{H}_2\text{O}$

Sol in alcohol (Rosenheim, B 1900, **33** 979)

Thorium hydroxychloride, $(\text{OH})\text{ThCl}_3 + 11\text{H}_2\text{O}$

Sol in alcohol (Rosenheim, B 1900, **33** 978)

$\text{Th}(\text{OH})_2\text{Cl}_2 + 5\text{H}_2\text{O}$ Slowly takes up H_2O from the air

Sol in H_2O without decomp

Sol in alcohol. Pptd from solution in alcohol by ether (Rosenheim, Z anorg 1903, **35** 425)

$+8\text{H}_2\text{O}$ Hydrosopic, sol in alcohol (Rosenheim, B 1900, **33** 978)

Thorium hydroxyiodide, $\text{Th}(\text{OH})\text{I}_3 + 10\text{H}_2\text{O}$

Evolves iodine in the light (Rosenheim, Z anorg 1903, **35** 430)

Thorium iodide

Sol in H_2O

Thorium nitride, Th_3N_4

Decomp by H_2O (Matignon, C R 1901, **132** 37)

Thorium oxide, ThO_2

When ignited is insol in HCl , and $\text{HNO}_3 + \text{Aq}$. Sol in H_2SO_4 by heating to boiling and subsequent addition of H_2O . Insol in alkali hydrates or carbonates + Aq

Thorium metoxide, $\text{Th}_3\text{O}_5 + \text{H}_2\text{O}$

Sl sol in HCl (Locke, Z anorg 1894, **7** 348)

$+2\text{H}_2\text{O}$ Loses 1 H_2O at 100° . Sol in H_2O , insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Locke)

Metathorium oxide

Sol in H_2O after having been treated with conc HNO_3 or $\text{HCl} + \text{Aq}$, even if previously ignited

$\text{ThO}_2, x\text{Th}(\text{OH})_4$. Compare Th_3O_5 (Locke) (Stevens, Z anorg 1901, **27** 42)

Thorium peroxide, Th_2O_7

Precipitate (Cleve, C R **100** 605)

Thorium oxychloride

Decomp by H_2O into ThCl_4 and ThO_2 . ThOCl_2 Sol in H_2O

Insol in abs alcohol (Matignon, A ch 1907, (8) **10** 133)

$+3\text{H}_2\text{O}$
 $+5\text{H}_2\text{O}$ (Matignon, A ch 1907, (8) **10** 135)

Metathorium oxychloride, $\text{ThO}_2, x\text{ThCl}_4$

Hydrosopic, sol in H_2O , insol in abs alcohol (Stevens, Z anorg 1901, **27** 47)

Thorium oxyfluoride, ThOF_2

Insol in H_2O

Sol in H_2SO_4 with decomp (Chauvenet, C R 1908, **146** 974)

Thorium oxysulphide, $\text{ThS}_2, 2\text{ThO}_2$

(Chydenius)

Thorium phosphide

Insol in H_2O (Berzelius)

Thorium silicide, ThSi_2

Sol in aq min acids, insol in aq alkalis. Decomp by fusion with NaOH or KOH (Honigschmid, C R 1906, **142** 158)

Thorium sulphide, ThS_2

Insol in warm H_2SO_4 . Very slightly attacked by HNO_3 or $\text{HCl} + \text{Aq}$. Sol in hot aqua regia (Berzelius)

Thoromolybdic acid**Ammonium thoromolybdate,**

$(\text{NH}_4)_8\text{Th}(\text{Mo}_2\text{O}_7)_6 + 8\text{H}_2\text{O}$

Insol in H_2O , sol in dil acids (Barbieri, C A **1913** 3724)

$(\text{NH}_4)_8\text{H}_2\text{Th}(\text{Mo}_2\text{O}_7)_6 + 11\text{H}_2\text{O}$ Insol in H_2O , sol in dil acids (Barbieri)

Silver thoromolybdate, $\text{Ag}_8\text{Th}(\text{Mo}_2\text{O}_7)_6$

Insol in H_2O , sl sol in $\text{HNO}_3 + \text{Aq}$, but nearly insol in presence of AgNO_3 (Barbieri)

Sodium thoromolybdate, $\text{Na}_8\text{Th}(\text{Mo}_2\text{O}_7)_6 + 15\text{H}_2\text{O}$

Insol in H_2O , sol in dil acids (Barbieri)

$\text{Na}_8\text{H}_2\text{Th}(\text{Mo}_2\text{O}_7)_6 + 17\text{H}_2\text{O}$ Insol in H_2O , sol in dil acids (Barbieri)

Thulium, Tm**Thulium chloride, $\text{Tm}_2\text{Cl}_6 + 14\text{H}_2\text{O}$**

Very sol in H_2O and in alcohol (James, J Am Chem Soc 1911, **33** 1342)

Thulium hydroxide

Easily sol in dil acids (James, J Am Chem Soc 1911, **33** 1342)

Thulium oxide, Tm_2O_3

Slowly sol in hot conc acids (James, Am Chem Soc 1911, **33** 1342)

Tin, Sn

Insol in H_2O Tin is not attacked by distilled H_2O when air is passed through it for a week

Slowly sol in dil cold $HCl + Aq$, but rapidly sol if hot and conc Slowly sol in not dil $H_2SO_4 + Aq$, but decomp by hot conc H_2SO_4

Readily sol in cold aqua regia Attacked violently by conc $HNO_3 + Aq$ with pptn of SnO_2 Completely sol in dil cold $HNO_3 + Aq$ (1 pt HNO_3 , 1 pt H_2O) at 22° (Hay, J N **22** 298) Not attacked by pure conc $HNO_3 + Aq$ of 1.512–1.419 sp gr, but violently attacked by less conc acid Also attacked by most conc acid if it contains NO_2 (Millon, A ch (3) **6** 95)

If Sn is placed in dil $HNO_3 + Aq$ of 1.15 sp gr it is sl dissolved, but soon pptd again as SnO_2 If a small amt of NH_4Cl is added, the Sn remains permanently in solution, $HCl + Aq$ has a similar action (Ordway, Am J Sci (2) **23** 220) Easily sol in the cold in mixture of 1 vol H_2SO_4 , 2 vols HNO_3 , and 3 vols H_2O (Basset, C N **53** 172)

$HNO_3 + Aq$ containing less than 12% HNO_3 attacks Sn and forms a stannous salt, which decomposes, giving a turbid solution $HNO_3 + Aq$ (12–45% HNO_3) completely dissolves Sn, but solution becomes turbid on standing $HNO_3 + Aq$ containing more than 45% HNO_3 does not dissolve Sn, but forms a white substance, which is sol in H_2O if over 70% acid is used, this solution soon becomes turbid (Montemartini, Gazz ch it **22** 381)

Sn dissolves in $HNO_3 + Aq$ at low temps $0-21^\circ$ When very dil $HNO_3 + Aq$ (14% HNO_3) is used, the amount of stannous salt formed decreases only slightly with increase of temp while with 30–40% acid it falls to zero at 21° (Walker, J Soc Chem Ind **1893** 845)

In presence of Fe, Cr or Al, $HNO_3 + Aq$ acts on Sn to form soluble products, from which conc HNO_3 pptts all Sn as meta-stannic acid (van Leent, C C **1899** I 101)

Much more sol in acids when small quantities of metallic salts have been added This is most noticeable when $PtCl_4$ or tartar emetic is added to $HCl + Aq$ $HCl + Aq$ with tartar emetic exerts 11 times, and with $PtCl_4$ 13 times the action exhibited by pure acid (Millon, C R **21** 47)

Sol in 2N $HClO_4 + Aq$ (Hendrixson, J Am Chem Soc 1904, **26** 755)

Pyrosulphuric acid dissolves Sn on warming (Divers, Chem Soc 1885, **47** 639)

Hot telluric acid attacks Sn (Hutchins, J Am Chem Soc 1905, **27** 1183)

Sn is attacked by 17% $HN_3 + Aq$ (Cur-tius and Rissom, J pr 1898, (2) **58** 299)

Sol in a solution of Na in liquid NH_3

(Kraus, J Am Chem Soc 1907, **29** 1562)
Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 830)

Sol in boiling alum + Aq (1 pt alum to 4 pts H_2O)

Sol in $KHSO_3$, NH_4Cl (1 4), and $K_2C_4H_4O_6 + Aq$ Sl sol in $KC_2H_3O_2 + Aq$, but not attacked by $MgSO_4$, K_2SO_4 , KNO_3 , or $Na_2SO_4 + Aq$ (Cludius, J pr **9** 161)

Sol in alkalis + Aq

Attacked easily by conc $NaCl$, KCl , or $NH_4NO_3 + Aq$, not attacked by $NH_4Cl + Aq$ (Hallock, Am Ch J **6** 52)

Sol in $Fe(NO_3)_3 + Aq$ in presence of $HNO_3 + Aq$ in proportion of 1 atom Sn to 1 atom Fe (Lopez and Storch, W A B **98**, **2b** 268)

Solubility in dil saline solutions

100 ccm H_2O containing 0.5 g $NaCl$ or KCl dissolve 6 mg Sn from 11.8 sq cm in one week when air without CO_2 is passed through the solution, but none at all when the air contains CO_2

100 ccm H_2O containing 1 g NH_4Cl dissolve 5 mg Sn under above conditions without CO_2 , and none with CO_2

With 1 g $MgCl_2$, 1 mg Sn was dissolved without CO_2 , and none with CO_2

With 1 g K_2SO_4 , 2 mg Sn were dissolved without CO_2 , and none with CO_2

With 1 g KNO_3 , 3 mg Sn were dissolved without CO_2 , and 1 mg with CO_2

With 1 g Na_2CO_3 , 7 mg Sn were dissolved without CO_2

With 1 g $NaOH$, 220 mg Sn were dissolved without CO_2

$CaO_2H_2 + Aq$ did not dissolve (Wagner, Dingl **221** 260)

Not attacked by sugar + Aq (Klein, C R **102** 1170)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0134 g Sn in 6 days (Gates, J phys Chem 1911, **15** 143)

Tin antimonide, $SnSb$

(Stead, J Soc Chem Ind 1897, **16** 205)

Tin arsenide, Sn_3As_2

(Stead, J Soc Chem Ind 1897, **16** 206)

Tin (stannous) bromide, $SnBr_2$

Sol in H_2O

Sol in pyridine (Naumann, B 1904, **37** 4609)

Mol weight determined in pyridine and ethyl sulphide (Werner, Z anorg 1897, **15** 23)

Tin (stannic) bromide, basic, $SrBr_2OH + 3H_2O$

Sol in H_2O Decomp in aq solution when warmed

Sol in ether, methyl alcohol ethyl alcohol, acetone, acetic acid and esters of organic acids Nearly insol in benzene, ligroin and $CHCl_3$ (Pfeiffer, Z anorg 1914, **87** 242)

Tin (stannic) bromide, SnBr_4

Deliquescent Sol in H_2O without evolution of heat (Balard)

Decomp by H_2O much more quickly than SnCl_4 (Lorenz, Z anorg 1895, 9 378)

Easily sol in AsBr_3 (Walden, Z anorg 1902, 29 374), PCl_3 , PBr_3 and S_2Cl_2 (Walden, Z anorg 1900, 25 217)

Sol in acetone (Naumann, B 1904, 37 4328)

+ $4\text{H}_2\text{O}$ (Preis and Raymann, C C 1882 773)

Stannic hydrogen bromide, $\text{SnBr}_4 \cdot 2\text{HBr}$

See Bromostannic acid.

Stannic bromide with MBr

See Bromostannate, M

Tin (stannic) bromochloride, SnClBr_3

Fumes in moist air, decomp by H_2O (Besson, C R 1897, 124 685)

SnCl_2Br_2 Fumes in moist air Decomp by H_2O (Besson)

SnCl_3Br Fumes in moist air Decomp by H_2O (Besson)

Iodide, $\text{SnBr} \cdot \text{I}_2$

Decomp in aq solution

(Lenormand, C C 1899, II 521, 1899, 10 114)

(stannous) chloride, SnCl_2 , and $+2\text{H}_2\text{O}$

Not deliquescent 100 pts H_2O dissolve 83.9 pts SnCl_2 at 0° (Engel, A ch (6) 17 347) 100 pts H_2O dissolve 269.8 pts SnCl_2 at 15° , and sat solution has sp gr 1.827 (Michel and Krafft, A ch (3) 41 478) Sol in a certain amount of H_2O without decomp, but more H_2O causes pptn of SnO , SnCl_2

$\text{SnCl}_2 + \text{Aq}$ absorbs O from air

Melts in crystal H_2O at 46° (Ordway)

Sat solution boils at 121.7°

Sp gr of $\text{SnCl}_2 + \text{Aq}$ at 15° containing

5 10 15 20 % $\text{SnCl}_2 + 2\text{H}_2\text{O}$,
1 0331 1 0684 1 1050 1 1442

25 30 35 40 % $\text{SnCl}_2 + 2\text{H}_2\text{O}$,
1 1855 1 2300 1 2779 1 3298

45 50 55 60 % $\text{SnCl}_2 + 2\text{H}_2\text{O}$,
1 3850 1 4451 1 5106 1 5823

65 70 75 % $\text{SnCl}_2 + 2\text{H}_2\text{O}$
1 6598 1 7452 1 8399

(Gerlach, Dingl 186 131)

Solubility of SnCl_2 in $\text{HCl} + \text{Aq}$ $\frac{\text{SnCl}_2}{2} =$

$\frac{1}{2}$ molecules SnCl_2 in milligrammes in 10 ccm solution, HCl = molecules HCl in milligrammes in ditto, H_2O = amt H_2O present in grammes

$\frac{\text{SnCl}_2}{2}$	HCl	Sum of equiv	Sp gr of solution	H_2O
74	0	74	1.532	8.33
66.7	6.6	73.3	1.489	8.35
63.75	13.54	77.29	1.472	8.198
68.4	24.8	93.2	1.524	7.869
81.2	34.9	116.1	1.625	7.305
94.2	40.0	134.2	1.724	6.880
117.6	44	161.6	1.883	6.108
147.6	49.4	197.0	2.114	5.387
156.4	66	222.4	2.190	4.715
157	78	235	2.199	4.309

(Engel, A ch (6) 17 347)

Solubility is thus diminished by $\text{HCl} + \text{Aq}$ while there are less than 8-10 mols HCl for 1 mol SnCl_2 . When that limit is passed the solubility rapidly increases (Engel)

Sol in very dil HCl or tartaric acid + Aq
Sol in $\text{KOH} + \text{Aq}$ Sol in conc $\text{SnOCl}_2 + \text{Aq}$ (Gerlach) Sol in $\text{NH}_4\text{Cl} + \text{Aq}$

Anhydrous SnCl_2 is partially sol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Sol in absolute alcohol Insol in oil of turpentine

11.41 pts SnCl_2 are sol in 100 pts ether at 0°

11.38 pts SnCl_2 are sol in 100 pts ether at 16°

11.38 pts SnCl_2 are sol in 100 pts ether at 35.5° (Laszczyński, B 1894, 27 2286)

Anhydrous SnCl_2 is sol in ether (de Jong, Z anal 1902, 41 596)

1 g anhydrous SnCl_2 is sol in 1.8 g acetone at 18° Sp gr of sat solution $18^\circ/4^\circ = 1.6$ (Naumann, B 1904, 37 4336)

Sol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Anhydrous SnCl_2 is sol in methyl acetate to the extent of 15.7% (Schroder and Steiner, J pr 1909, (2) 79 63)

31.20 pts $\text{SnCl}_2 + 2\text{H}_2\text{O}$ are sol in 100 pts ethyl acetate at -2°

35.53 pts $\text{SnCl}_2 + 2\text{H}_2\text{O}$ are sol in 100 pts ethyl acetate at $+22^\circ$

73.44 pts $\text{SnCl}_2 + 2\text{H}_2\text{O}$ are sol in 100 pts ethyl acetate at 82° (Laszczyński, B 1894, 27 2286)

1 pt anhydrous SnCl_2 is sol in 22.40 pts ethyl acetate at 18° $D_{18^\circ/4^\circ} = 0.9215$ (Naumann, B 1910, 43 319)

Insol in ethyl amine (Shinn, J phys Ch 1907 11 538), pyridine (Naumann, B 1904, 37 4609), benzonitrile (Naumann, B 1914, 47 1369)

Insol in CS_2 (Arctowski, Z anorg 1894, 6 257)
 Sol in urethane (Castoro, Z anorg 1899, 20 61)
 Mol weight determined in pyridine and ethyl sulphide (Werner, Z anorg 1897, 15 22)

Tin (stannic) chloride, basic, $\text{SnCl}_3\text{OH} + 3\text{H}_2\text{O}$

Hydroscopic
 Sol in H_2O
 Sol in ether, alcohol, acetone, acetic acid
 Nearly insol in ligroin and benzene (Pfeiffer Z anorg, 1914, 87 241)

Tin (stannic) chloride, SnCl_4

(a) *Ordinary modification*—Deliquescent. Sol in H_2O . On diluting $\text{SnCl}_4 + \text{Aq}$ and boiling, SnO_2 separates out. $\text{SnCl}_4 + \text{Aq}$ is not pptd by HNO_3 , HCl , or $\text{H}_2\text{SO}_4 + \text{Aq}$, $\text{H}_3\text{PO}_4 + \text{Aq}$ ppts in a few days, and $\text{H}_3\text{AsO}_4 + \text{Aq}$ in a short time. No ppt is formed by K_2SO_4 , Na_2SO_4 , KCl , NaCl , NH_4Cl , KNO_3 , etc + Aq

Sp gr of $\text{SnCl}_4 + \text{Aq}$ at 15°

% SnCl_4 + $5\text{H}_2\text{O}$	Sp gr	% SnCl_4 + $5\text{H}_2\text{O}$	Sp gr	% SnCl_4 + $5\text{H}_2\text{O}$	Sp gr
2	1.012	34	1.226	66	1.538
4	1.024	36	1.242	68	1.563
6	1.036	38	1.259	70	1.587
8	1.048	40	1.276	72	1.614
10	1.059	42	1.293	74	1.641
12	1.072	44	1.310	76	1.669
14	1.084	46	1.329	78	1.698
16	1.097	48	1.347	80	1.727
18	1.110	50	1.366	82	1.759
20	1.124	52	1.386	84	1.791
22	1.137	54	1.406	86	1.824
24	1.151	56	1.426	88	1.859
26	1.165	58	1.447	90	1.894
28	1.180	60	1.468	92	1.932
30	1.195	62	1.491	94	1.969
32	1.210	64	1.514	96	1.988

(Gerlach Dingl 178 49)

Sp gr of $\text{SnCl}_4 + \text{Aq}$

Deg Baumé	% Sn	Deg Baumé	% Sn	Deg Baumé	% Sn
65.7	29.45	55	24.47	34	14.90
65	29.12	54	24.02	33	14.45
64	28.64	53	23.56	32	14.00
63	28.17	52	23.11	31	13.56
62	27.70	51	22.65	30	13.11
61	27.24	50	22.20	29	12.67
60	26.77	49	21.74	28	12.23
59	26.30	48	21.29	27	11.79
58	25.84	47	20.83	26	11.35
57	25.38	46	20.38	25	10.91
56	24.93				

(Heermann, Ch Z 1907, 31 680)

Sol in S_2Cl_2 (Walden, Z anorg 1900, 25 217)

Easily sol in PCl_3 and PBr_3 (Walden, Z anorg 1900, 25 211)

Very sol in liquid NH_3 (Gore, Am Ch J 1899, 20 830)

Very sol in absolute alcohol, from which it is pptd by H_2O . Easily sol in ether, decomp by oil of turpentine. Miscible with CS_2 and Br_2

Sol in acetone (Naumann, B 1904, 37 4328)

Sol in acetone and in methylal (Eidmann, C C 1899, II 1014)

Sol in ethyl acetone (Naumann, B 1904, 37 3601)

Distribution of SnCl_4 between H_2O and xylene

n = pts by wt of Cl in 100 pts of H_2O layer

m = pts by wt of Cl in 100 pts of xylene layer

k = partition coefficient

50 cc xylene + 60 g $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$

t°	n	m	k
66°	40.35	0.08	504.4
80°	39.95	0.175	228.5
97.5°	40.24	0.33	122.1
111°	40.27	0.68	59.3

(Smirnov, Z phys Ch 1907, 58 377)

50 cc xylene + 60 g $\text{SnCl}_4 \cdot 4\text{H}_2\text{O}$

t°	n	m	k
66°	41.905	0.925	45.3
80°	41.915	1.555	27.0
100°	41.845	2.515	16.7
111°	41.68	3.235	12.9

(Smirnov)

50 cc xylene + 60 g $\text{SnCl}_4 \cdot 3\text{H}_2\text{O}$

t	n	m	k
80°	43.205	9.95	4.4
94°	42.545	9.325	4.6
100°	42.645	10.56	5.1
111°	42.31	10.03	4.2

(Smirnov)

+ $2\text{H}_2\text{O}$ Sol in H_2O

+ $3\text{H}_2\text{O}$ Tr pt 83° (Meyerhoffer, Bull Soc 1891 (3) 6, 85)

+ $4\text{H}_2\text{O}$ Tr pt 63° (Meyerhoffer)

+ $5\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O . Decomp by alcohol. Sol in $\text{HCl} + \text{Aq}$

Tr pt 56° (Meyerhoffer)

+ $8\text{H}_2\text{O}$ More deliquescent than the $5\text{H}_2\text{O}$ salt. Tr pt 19° (Meyerhoffer)

+ $9\text{H}_2\text{O}$ (Nollner, Z Ch 1865 45)

(b) *Metastannic chloride*—Sol in cold H_2O , solution coagulates on boiling. Conc HCl + Aq ppts from $SnCl_4$ + Aq. When solution does not contain HCl , the addition of HCl + Aq causes a ppt, which dissolves in H_2O , HNO_3 , and H_2SO_4 + Aq also ppt K_2SO_4 , Na_2SO_4 , and $NaCl$ + Aq produce ppts insol in H_2O , but sol in HCl + Aq. NH_4Cl or KCl + Aq do not ppt KNO_3 + Aq ppts slowly (Rose)

Tin (stannous) hydrogen chloride, $SnCl_2$, HCl + $3H_2O$
Decomp by H_2O
Melts at -25° (Engel, C R 106 1398)

Tin (stannic) hydrogen chloride
See Chlorostannic acid

Tin (stannous) hydrazine chloride, $SnCl_2$, $2N_2H_4$, HCl
Very hygroscopic
Sol in H_2O and abs alcohol (Curtius J pr 1894, (2) 50 341)

Tin (stannic) chloride with MCl
See Chlorostannate, M

Tin (stannous) chloride ammonia, $SnCl_2$, NH_3
(Berzelius)
 $SnCl_2$, $4NH_3$ Ppt (Naumann B 1904, 37 433b)

Tin (stannic) chloride ammonia, $SnCl_4$, $2NH_3$
Sol in cold H_2O without decomp, but decomposes by heating

Tin (stannous) chloride arsenate
See Arsenate chloride, stannous

Tin (stannic) chloride cyanhydric acid, $SnCl_4$, $2HCN$
Decomp on moist air or with H_2O (Klein, A 74 85)

Tin (stannous) chloride hydrazine, $SnCl_2$, $2N_2H_4$
Decomp by H_2O
Insol in NH_4OH + Aq (Franzen, Z anorg 1908, 60 286)

Tin (stannic) chloride nitrogen sulphide, $SnCl_4$, $2N_4S_4$
Insol in most solvents
Decomp by warm NH_4OH + Aq
Decomposes in the air (Wolbling, Z anorg 1908, 57 284)
Decomp by H_2O (Davis, Chem Soc, 1906, 89 1576)

Tin (stannic) chloride phosphine, $3SnCl_4$, $2PH_3$

Decomp by H_2O (Rose, Pogg 24 159)

Tin (stannous) chloride potassium stannous sulphate

See Sulphate, potassium stannous stannous chloride

Tin (stannic) chloride sulphur tetrachloride, $SnCl_4$, $2SCl_4$

Very hygroscopic
Sol in $CHCl_3$, ligroin, petroleum ether, CS_2 , $POCl_3$, very sol in completely dry absolute ether, in benzene, acetic ester and in SCl_2 (Ruff, B 1904, 37 4517)

Tin (stannic) chloride sulphide, $2SnCl_4$, SnS_2
See Stannic sulphochloride

Tin (stannic) chlorobromide, $SnClBr_3$
Decomp by H_2O (Ladenburg, A suppl 8 60)
 $SnCl_2Br_2$ Decomp by H_2O (Ladenburg)

Tin (stannous) chloriodide, $SnClI$
Decomp immediately by H_2O (Henry, Phil Trans 1845 363)

Tin (stannic) chloriodide, $SrCl_2I_2$
Fumes in the air
Decomp by H_2O (Lenormand, J Pharm 1898 8)
 $SnClI_3$ (Lenormand, J Pharm 1899, 10 114)

Tin (stannous) fluoride, SnF_2
Easily sol in H_2O (Berzelius, Pogg 1 34)

Tin (stannic) fluoride, SnF_4
Very hygroscopic
Sol in H_2O Slowly decomp in aq solution with separation of SnO_2 (Ruff, B 1904, 37 681)

Tin (stannic) fluoride with MF
See Fluostannate, M

Tin (stannous) hydroxide, $2SnO$, H_2O
Decomp to SnO when boiled with H_2O
More easily sol in acids than Sn or SnO
Sol in $NaOH$, and KOH + Aq, even when dil. Insol or very sl sol in NH_4OH , $(NH_4)_2CO_3$, and K_2CO_3 + Aq, sol in cold CaO_2H_2 , and BaO_2H_2 with decomposition on boiling (Fremy, A ch (3) 12 460) Only sl sol in NH_4Cl + Aq hot or cold (Brett) Sl sol in $NaC_2H_3O_2$ + Aq (Mercer)

Solubility in NaOH+Aq

G Na in 20 ccm	G Sn in 20 ccm
0 2480	0 1904
0 3680	0 2614
0 6394	0 4304
0 8326	0 5560
0 9661	0 7849
2 1234	1 8934

(Rubenbauer, Z anorg 1902, 30 335)

Not pptd in presence of Na citrate (Spiller)

Sol in water-glass +Aq (Ordway)

$\text{SnO}_2 \cdot \text{H}_2\text{O}$ Solubility in 1 l H_2O = 0.000135 g mol at 25° (Goldschmidt, Z phys Ch 1906, 56 389)

in hydroxide, SnO , $6\text{SnO}_2 + 5\text{H}_2\text{O}$

+ $9\text{H}_2\text{O}$ (Schiff, A 120 153)

in sesquihydroxide, $\text{Sn}_2\text{O}_3 \cdot x\text{H}_2\text{O}$

Insol in H_2O Sol in NH_4OH +Aq (Fuchs, J pr 5 318)

in (stannic) hydroxide**" α " modification**

Obtained by pptn by alkali in stannic chloride solution

Freshly pptd substance when air dried contains 73.5% H_2O , when dried over H_2SO_4 r in a vacuum for 1 month 12.6% H_2O . Heated to glowing loses all H_2O and passes into the anhydride. The " α " form is capable of existing in all degrees of hydration (Lorenz, Z anorg 1895, 9 372-375)

" α " stannic hydrate is a white amorphous substance which is very sol in HNO_3 , when moist, sol in H_2SO_4 even dil, sol in HCl and not pptd by an excess. Very sol in NaOH +Aq and is not pptd by an excess.

A solution of α stannic acid in HCl is identical with a solution of freshly prepared aqueous stannic chloride and gives no ppt with dil HCl , H_2SO_4 , HNO_3 or arsenic acid even on long standing.

" β " modification

Obtained by oxidizing and dissolving Sn in HNO_3 , and from solution of sodium stannate by pptn. Freshly pptd from HNO_3 when air dried contains 21.3% H_2O , and when dried over H_2SO_4 or in a vacuum 11.3%,—corresponding to $\text{Sn}(\text{OH})_4$ and $\text{SnO}(\text{OH})_2$ respectively.

Freshly pptd from sodium stannate solution and air dried contains 22.5% H_2O and when dried over H_2SO_4 or in a vacuum contains 12.1%,—corresponding to $\text{Sn}(\text{OH})_4$ and $\text{SnO}(\text{OH})_2$. Passes into the anhydride when heated to glowing.

The " β " form is capable of existing in all degrees of hydration. It is a white amorphous substance which is insol in HNO_3 , in-

sol in H_2SO_4 even when conc, insol in HCl but changed by contact with the acid in that when the acid has been removed the ppt is readily sol in H_2O , though pptd again from solution by addition of HCl . When freshly prepared the " β " form is sol in NaOH +Aq but is pptd by an excess of NaOH .

A solution of " β " stannic acid in HCl behaves quite differently from an aq solution of stannic chloride in that it ppts metastannic sulphate when treated with H_2SO_4 .

This ppt dissolves when heated with dilute HNO_3 or HCl , but the solution on standing spontaneously forms another ppt. A solution of " β " stannic acid in HCl gives a ppt when treated with arsenic acid (Lorenz, Z anorg 1895, 9 372)

See also Stannic acid

Tin hydroxyl chloride, $\text{SnO}(\text{OH})\text{Cl}$

See Chlorostannic acid

Tin (stannous) iodide, SnI_2 , and + $2\text{H}_2\text{O}$

Sl sol in cold, more abundantly in hot H_2O , without decomp

Solubility in H_2O

t°	Pts SnI_2 in 100 pts solution	t°	Pts SnI_2 in 100 pts solution
98.5	3.43	97.3	3.70
84.9	3.05	87.4	3.24
73.9	2.56	77.6	2.75
60.1	2.09	67.5	2.34
51.5	1.79	59.7	2.03
41.0	1.50	49.5	1.72
30.5	1.21	39.4	1.38
20.8	1.03	29.6	1.11
		19.8	0.96

(Young, J Am Chem Soc 1897, 19 846)

Solubility of SnI_2 in HI +Aq at t°

Pts SnI_2 per 100 pts solvent

t°	5.83% HI	9.60% HI	15.20% HI	20.44% HI	24.80% HI	30.40% HI	36.82% HI
20	0.98	0.20	0.60	1.81	4.20	10.86	25.31
30	1.16	0.23	0.64	1.81	4.06	10.28	23.46
40	1.40	0.33	0.71	1.90	4.12	10.06	23.15
50	1.69	0.46	0.82	1.24	3.34	10.35	23.76
60	2.07	0.66	1.12	5.14	7.78	11.03	24.64
70	2.48	0.91	1.37	2.92	5.43	11.97	25.72
80	2.95	1.23	1.83	7.06	3.38	13.30	27.23
90	3.46	1.65	2.40	5.87	7.82	15.52	29.84
100	4.03	2.23	3.63	5.82	9.60		34.05

(Young, J Am Chem Soc 1897, 19 851)

(b) *Metastannic chloride*—Sol in cold H_2O , solution coagulates on boiling. Conc $\text{HCl} + \text{Aq}$ ppts from $\text{SnCl}_4 + \text{Aq}$. When solution does not contain HCl , the addition of $\text{HCl} + \text{Aq}$ causes a ppt, which dissolves in H_2O , HNO_3 , and $\text{H}_2\text{SO}_4 + \text{Aq}$ also ppt K_2SO_4 , Na_2SO_4 , and $\text{NaCl} + \text{Aq}$ produce ppts, insol in H_2O , but sol in $\text{HCl} + \text{Aq}$. NH_4Cl or $\text{KCl} + \text{Aq}$ do not ppt. $\text{KNO}_3 + \text{Aq}$ ppts slowly (Rose)

Tin (stannous) hydrogen chloride, SnCl_2 , $\text{HCl} + 3\text{H}_2\text{O}$

Decomp by H_2O

Melts at -25° (Engel, C R 106 1398)

Tin (stannic) hydrogen chloride

See Chlorostannic acid

Tin (stannous) hydrazine chloride, SnCl_2 , $2\text{N}_2\text{H}_4$, HCl

Very hygroscopic

Sol in H_2O and abs alcohol (Curtius J pr 1894, (2) 60 341)

Tin (stannic) chloride with MCl

See Chlorostannate, M

Tin (stannous) chloride ammonia, SnCl_2 , NH_3

(Berzelius)

SnCl_2 , 4NH_3 Ppt (Naumann B 1904, 37 4336)

Tin (stannic) chloride ammonia, SnCl_4 , 2NH_3

Sol in cold H_2O without decomp, but decomposes by heating

Tin (stannous) chloride arsenate

See Arsenate chloride, stannous

Tin (stannic) chloride cyanhydric acid, SnCl_4 , 2HCN

Decomp on moist air or with H_2O (Klein, A 74 85)

Tin (stannous) chloride hydrazine, SnCl_2 , $2\text{N}_2\text{H}_4$

Decomp by H_2O

Insol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 286)

Tin (stannic) chloride nitrogen sulphide, SnCl_4 , $2\text{N}_2\text{S}_4$

Insol in most solvents

Decomp by warm $\text{NH}_4\text{OH} + \text{Aq}$

Decomposes in the air (Wolbling, Z anorg 1908, 57 284)

Decomp by H_2O (Davis, Chem Soc, 1906, 89 1576)

Tin (stannic) chloride phosphure, 3SnCl_4 , 2PH_3

Decomp by H_2O (Rose, Pogg 24 159)

Tin (stannous) chloride potassium stannous sulphate

See Sulphate, potassium stannous stannous chloride

Tin (stannic) chloride sulphur tetrachloride, SnCl_4 , 2SCl_4

Very hygroscopic

Sol in CHCl_3 , ligroin, petroleum ether, CS_2 , POCl_3 , very sol in completely dry absolute ether, in benzene, acetic ester and in SCl_2 (Ruff, B 1904, 37 4517)

Tin (stannic) chloride sulphide, 2SnCl_4 , SnS_2

See Stannic sulphochloride

Tin (stannic) chlorobromide, SnClBr_2

Decomp by H_2O (Ladenburg, A suppl 8 60)

SnCl_2Br_2 Decomp by H_2O (Ladenburg)

Tin (stannous) chloriodide, SnClI

Decomp immediately by H_2O (Henry, Phil Trans 1845 363)

Tin (stannic) chloriodide, SrCl_2I_2

Fumes in the air

Decomp by H_2O (Lenormand, J Pharm 1898 8)

SnClI_2 (Lenormand, J Pharm 1899, 10 114)

Tin (stannous) fluoride, SnF_2

Easily sol in H_2O (Berzelius, Pogg 1 34)

Tin (stannic) fluoride, SnF_4

Very hygroscopic

Sol in H_2O . Slowly decomp in aq solution with separation of SnO_2 (Ruff, B 1904, 37 681)

Tin (stannic) fluoride with MF

See Fluostannate, M

Tin (stannous) hydroxide, 2SnO , H_2O

Decomp to SnO when boiled with H_2O . More easily sol in acids than Sn or SnO . Sol in NaOH , and $\text{KOH} + \text{Aq}$, even when dil. Insol or very sl sol in NH_4OH , $(\text{NH}_4)_2\text{CO}_3$, and $\text{K}_2\text{CO}_3 + \text{Aq}$, sol in cold CaO_2H_2 , and BaO_2H_2 with decomposition on boiling (Fremy, A ch (3) 12 460). Only sl sol in $\text{NH}_4\text{Cl} + \text{Aq}$ hot or cold (Brett). Sl sol in $\text{NaC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Mercer)

Solubility in NaOH+Aq

G Na in 20 ccm	G Sn in 20 ccm.
0 2480	0 1904
0 3680	0 2614
0 6394	0 4304
0 8326	0 5560
0 9661	0 7849
2 1234	1 8934

(Rubenbauer, Z anorg 1902, 30 335)

Not pptd in presence of Na citrate (puller)

Sol in water-glass +Aq (Ordway)

SnO_2H_2 Solubility in 1 l H_2O = 3000135 g mol at 25° (Goldschmidt, Z lys Ch 1906, 56 389)

n hydroxide, SnO , $6\text{SnO}_2 + 5\text{H}_2\text{O}$

+ $9\text{H}_2\text{O}$ (Schiff, A 120 153)

n sesquihydroxide, Sn_2O_3 , $x\text{H}_2\text{O}$

Insol in H_2O Sol in NH_4OH +Aq (uchs, J pr 5 318)

n (stannic) hydroxide

" α " modification

Obtained by pptn by alkali in stannic loricide solution

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Obtained by oxidizing and dissolving Sn in NO_3 , and from solution of sodium stannate by pptn. Freshly pptd from HNO_3 when air dried contains 21.3% H_2O , and when dried over H_2SO_4 or in a vacuum 11.3%,—corresponding to $\text{Sn}(\text{OH})_4$ and $\text{SnO}(\text{OH})_2$ respectively

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See also Stannic acid

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Sl sol in cold, more abundantly in hot H_2O , without decomp

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(Young, J Am Chem Soc 1897, 19 846)

Solubility of SnI_2 in HI +Aq at t°

Pts SnI_2 per 100 pts solvent

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70	2.48	0.91	1.37	2.92	5.43	11.97	25.72
80	2.95	1.23	1.83	3.70	6.38	13.30	27.23
90	3.46	1.65	2.40	4.87	7.82	15.52	29.84
100	4.03	2.23	3.63	5.82	9.60		34.05

(Young, J Am Chem Soc 1897, 19 851)

Solubility of SnI_2 at low temp in 29 95%
 $\text{HI} + \text{Aq}$

Temp	Pts in 100 pts solution	Pts in 100 pts solvent
1 5	12 96	14 89
1 5	13 15	15 14
6 0	12 35	14 09
10 5	11 01	12 36
15 2	10 48	11 70
24 8	9 36	10 33
30 7	8 78	9 62
34 8	8 70	9 50
40 3	9 51	10 50

(Young, J Am Chem Soc 1897, **19** 854)Solubility of SnI_2 at low temp in 39 6%
 $\text{HI} + \text{Aq}$

Temp	Pts in 100 pts of solution		Pts in 100 pts of solvent
	I	II	
0°	13 52	13 56	15 66
5 7°	16 44	16 37	19 71
10 5°	19 47	19 60	24 27
15 7°	23 56	23 68	30 92
20 3°	25 50	25 60	34 30

(Young, J Am Chem Soc 1897, **19** 852-853)

Sol in $\text{SnCl}_2 + \text{Aq}$ Sol in warm alkali chlorides or iodides + Aq, also in dil $\text{HCl} + \text{Aq}$ Very sl sol in CHCl_3 , CS_2 , or C_6H_6 (Personne, C R **54** 216)

Sol in $\text{KOH} + \text{Aq}$ (Rose)Sol in acetone (Naumann, B 1904, **37** 4328)**Tin (stannic) iodide, SnI_4** Decomp by H_2O into SnO_2 and HI
Very sol in PCl_3 (Beckmann, Z anorg 1906, **51** 110)Sol in POCl_3 (Walden, Z anorg 1900, **25** 212)Easily sol in PCl_5 and PBr_3 (Walden, Z anorg 1900, **25** 211)Sol in liquid AsBr_3 forming a solution with sp gr = 3.731 at 15° (Retgers, Z phys Ch 1893, **11** 342)Sol in SOCl_2 , S_2Cl_2 and SO_2Cl_2 (Walden, Z anorg 1900, **25** 215)Sol in SnCl_4 (Walden)Sol in anhydrous alcohol, ether, and benzene 1 pt CS_2 dissolves 1.45 pts SnI_4 at ordinary temp (Schneider, Pogg **127** 624)100 pts methylene iodide, CH_2I_2 , dissolve 22.9 pts SnI_4 at 10° Sp gr of solution = 3.481 (Retgers, Z anorg **3** 343)

Solubility in organic solvents at t°

Solvent	t°	G SnI_4 in 100 g of the sat solution	Sp gr of the sat solution
CCl_4	22 4	5 25	1 59
CCl_4	50 0	12 50	1 63
CHCl_3	28 0	8 21	1 50
C_6H_6	20 2	12 65	0 95

(McDermott, J Am Chem Soc 1911, **33** 1964)Sol in methyl acetate (Naumann, B 1909, **42** 3790)Sol in acetone (Eidman, C C **1899**, **II** 1014)

Solubility in CS_2
100 g of the sat solution contain at
-58° -84° -89° -94° -114 5°
16 27 10 22 9 68 10 65 9 41 g SnI_4
(Arcetowski, Z anorg 1896, **11** 274)

Sol in allyl mustard oil (Mathews, J phys Ch 1905, **9** 647)**Tin (stannous) hydrogen iodide, SnI_2 , HI** Not obtained in pure state (Young, J Am Chem Soc 1897, **19** 856)

Tin (stannous) iodide ammonia, SnI_2 , 2NH_3
(Ephraim and Schmidt, B 1909, **42** 3857)
 SnI_4 , 8NH_3 (Ephraim and Schmidt)

Tin (stannic) iodide ammonia, SnI_4 , 3NH_3 (Personne, C R **54** 218) SnI_4 , 4NH_3 (Personne) SnI_4 , 8NH_3 (Rammelsberg, Pogg **48** 169)**Tin iodosulphide,**

See Tin sulphuride

Tin monoxide (Stannous oxide), SnO Insol in H_2O Sol in acids Very sl sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose) Insol in NaOH or $\text{KOH} + \text{Aq}$ Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 830)Insol in acetone (Naumann, B 1904, **37** 4329)**Tin dioxide (Stannic oxide), SnO_2** Insol in H_2O or conc acids except conc H_2SO_4 Insol in conc alkalis or $\text{NH}_4\text{OH} + \text{Aq}$ Not absolutely insol in dil $\text{HNO}_3 + \text{Aq}$ (Mulder)Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 830)Min *Cassiterite* (Tin stone) Not attacked by acids

Tin sesquioxide, Sn_2O_3

While moist, easily sol in $\text{NH}_4\text{OH} + \text{Aq}$
sl sol in dil, more easily in conc $\text{HCl} + \text{Aq}$
(Berzelius)

Tin (stannic) oxybromide, $\text{Sn}_2\text{Br}_2\text{O} + 12\text{H}_2\text{O}$

Decomp by H_2O into SnBr_2 and H_2SnO_3
 $\text{Sn}_2\text{Br}_2\text{O}_3$ As above (Preis and Rav-
nann, C C 1882 773)

Tin (stannic) oxybromide nitrogen pentoxide, $\text{SnO}_2, 3\text{Br}_2, \text{N}_2\text{O}_5$

Decomp by H_2O (Thomas, C R 1896,
22 33)

Tin (stannous) oxychloride, $\text{SnO}, \text{SnCl}_2 + 3\text{H}_2\text{O}$

Insol in H_2O Sol in $\text{HCl}, \text{HC}_2\text{H}_3\text{O}_2$, and
hl HNO_3 , or $\text{H}_2\text{SO}_4 + \text{Aq}$ (J Davy, Schw
10 325)

$\text{Sn}_2\text{Cl}_4\text{O}_8 + 10\text{H}_2\text{O}$ Easily sol in H_2O or
alcohol

Can be recrystallized from alcohol but
not from H_2O (Tschermak, W A B 44
736)

$3\text{SnO}_2, 2\text{SnCl}_2 + 6\text{H}_2\text{O}$ Very sl sol in
 H_2O Sol in dil acids (Ditte, A ch 1882,
5) 27 146)

$4\text{SnO}, \text{SnCl}_2 + 6\text{H}_2\text{O}$ (Ditte)

Tin (stannic) oxychloride, $\text{SnO}_2, \text{SnCl}_4$

Sol in H_2O (Scheurer-Kestner, A ch
3) 47 6)

Tin (metastannic) oxychloride, $3\text{SnO}_2, \text{SnCl}_4 + 3\text{H}_2\text{O}$

Sol in little, decomp by much H_2O
Weber, Pogg 122 368)

$4\text{SnO}, \text{SnCl}_4 + 7\text{H}_2\text{O}$ (Weber)

"Metastannyl chloride β ," $\text{Sn}_2\text{O}_3\text{Cl}_2$ De-
iquescent Sol without decomp in a small
amount of H_2O or in a large amount of H_2O
containing a few drops HCl

Sol in abs alcohol (Engel, C R 1897,
24 767)

$+4\text{H}_2\text{O}$ and $+9\text{H}_2\text{O}$ Sol in H_2O acidified
with one drop of HCl Pptd by excess HCl
Engel, C R 1897, 124 768)

"Parastannyl chloride," $\text{Sn}_2\text{O}_3\text{Cl}_2 + 2\text{H}_2\text{O}$
Decomp by excess H_2O

Sol in H_2O , pptd by HCl (Engel, C R
1897, 125 465)

Tin (stannic) oxychloride nitrogen pentoxide, $\text{SnOCl}_2, 3\text{SnCl}_4, \text{N}_2\text{O}_5$

Hydroscopic, sol in H_2O

Decomp by heat (Thomas, C R 1896,
122 32)

Tin (stannous) oxyiodide, $\text{SnO}, 3\text{SnI}_2, 2\text{SnO}, 3\text{SnI}_2, \text{SnO}, \text{SnI}_2$, and $2\text{SnO}, \text{SnI}_2$

Decomp by much H_2O (Personne, C R
4 216)

Tin oxysulphide, $\text{Sn}_2\text{S}_3\text{O} + 11\text{H}_2\text{O}$

Very sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, slowly sol
in H_2O (Schmidt, B 1894, 27 2739)

Tin phosphide, Sn_3P

(Ragg, C C 1898, II 170)

SnP Sol in $\text{HCl} + \text{Aq}$ Insol in HNO_3
 $+ \text{Aq}$

SnP_2 Not attacked by HCl Easily at-
tacked by aqua regia (Emmerling, B 1879,
12 155)

SnP_3 Insol in HCl Slowly attacked by
dil HNO_3 at 50° Oxidized by fuming HNO_3
with ignition (Jolibois, C R 1909, 148
638)

Sn_3P_2 Insol in mercury
Decomp by HCl (Stead, J Soc Chem
Ind 1897, 16 206)

Sn_4P_3 Attacked by HCl, HNO_3 and al-
kalies (Jolibois, C R 1909, 148 637)

The only true compounds are Sn_4P_3 and
 SnP_3 (Jolibois, C R 1909, 148 637)

Tin phosphochloride, $\text{Sn}_2\text{P}_2\text{Cl}_4$

(Mahn, Jena Zeit 5 1660)

Tin (stannous) selenide, SnSe

Decomp by boiling $\text{HCl} + \text{Aq}$ Slowly
oxidised by boiling $\text{HNO}_3 + \text{Aq}$, and easily
dissolved in aqua regia (Schneider, Pogg
127 624) Easily sol in alkalies $+ \text{Aq}$
(Uelsmann, A 116 122), or scarcely even on
boiling (Schneider), according to method
of preparation Sol in alkali sulphides or
selenides $+ \text{Aq}$

Tin (stannic) selenide, SnSe_2

Not attacked by H_2O or dil acids, scarcely
attacked by boiling conc $\text{HCl} + \text{Aq}$, gradu-
ally decomp by hot $\text{HNO}_3 + \text{Aq}$, easily dis-
solved by warm aqua regia, and hot conc
 H_2SO_4

Sol in cold, more easily in warm KOH ,
 NaOH , or $\text{NH}_4\text{OH} + \text{Aq}$ (Uelsmann, A
116 122)

Tin (stannous) sulphide, SnS

1 l H_2O dissolves 0.14×10^{-6} mols SnS
at 18° (Weigel, Z phys Ch 1907, 58 294)

Insol in dil, sol in conc $\text{HCl} + \text{Aq}$ Sl
sol in hot conc $\text{HNO}_3 + \text{Aq}$ Insol in KOH
 $+ \text{Aq}$

$+ \text{H}_2\text{O}$ Insol in $\text{H}_2\text{O}, \text{H}_2\text{S} + \text{Aq}$, or dil
acids, sol with decomp in conc acids,
easily sol in hot conc $\text{HCl} + \text{Aq}$ Insol
in $\text{H}_2\text{SO}_3 + \text{Aq}$ Insol in $\text{NH}_4\text{OH} + \text{Aq}$
Insol in NH_4Cl , or $\text{NH}_4\text{NO}_3 + \text{Aq}$ Scarcely
sol in $(\text{NH}_4)_2\text{S} + \text{Aq}$, but easily sol in the
same on addition of S (Rose)

10% $\text{NaOH} + \text{Aq}$ dissolves SnS by violent
boiling

Insol in cold, sl sol in hot $\text{Na}_2\text{SO}_3 + \text{Aq}$
(Materne, C C 1906, II 557)

Sol in alkali polysulphides $+ \text{Aq}$

Insol in acetone (Eidmann, C C 1899,

II 1014), (Naumann, B 1904, **37** 4329), ethyl acetate (Naumann, B 1910, **43** 314)

Tin (stannic) sulphide, SnS_2

Anhydrous (Moscow gold) Insol in HCl or $\text{HNO}_3 + \text{Aq}$, but decomp by aqua regia. Sol in hot $\text{KOH} + \text{Aq}$ or $\text{K}_2\text{CO}_3 + \text{Aq}$, also in hot K_2S , $\text{Na}_2\text{S} + \text{Aq}$, and $(\text{NH}_4)_2\text{S} + \text{Aq}$. 1 l H_2O dissolves 1.13×10^{-6} mols SnS_2 at 18° (Weigel, Z phys Ch 1907, **58** 294) $+ x\text{H}_2\text{O}$ Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$, but readily in KOH , K_2S , or $\text{Na}_2\text{S} + \text{Aq}$, also in hot conc $\text{HCl} + \text{Aq}$. Decomp by hot $\text{HNO}_3 + \text{Aq}$ Insol in $\text{KHSO}_3 + \text{Aq}$ Sol in $\text{K}_2\text{CO}_3 + \text{Aq}$ Insol in NH_4Cl , and $\text{NH}_4\text{NO}_3 + \text{Aq}$ (Brett)

Pptd SnS_2 is insol in cold, sol in hot $\text{Na}_2\text{B}_4\text{O}_7 + \text{Aq}$ Sol in $\text{Na}_2\text{CO}_3 + \text{Aq}$ Very sol in $\text{NaOH} + \text{Aq}$ (Materne, C C 1906, II 557)

Sol in boiling conc $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ (Clarke, C N **21** 124)

Insol in methyl acetate (Naumann, B 1909, **42** 3790), ethyl acetate (Naumann, B 1910, **43** 314), acetone (Naumann, B 1904, **37** 4329, Eidmann, C C 1899, II 1014)

Tin sesquisulphide, Sn_2S_3

Sol in moderately conc HCl (Antony and Niccoli, Gazz ch it 1892, **22** (2) 408)

Iphochloride, $\text{SnS}_2 \cdot 2\text{SnCl}_4$

J dissolves out SnCl_4 (Dumas, Schw **409**)

$\text{Sn}_2\text{S}_3 \cdot 12\text{SnCl}_4 = \text{SnCl}_4 \cdot 2\text{SnCl}_4$ Sol in H_2O with separation of S

Gradually sol in dil $\text{HNO}_3 + \text{Aq}$

Sol in POCl_3 (Casselmann, A **83** 267)

Tin sulphoiodide, SnS_2I_4

Decomp by H_2O into SnO_2 , S, and HI, by cold conc $\text{HCl} + \text{Aq}$ with separation of S, also by aqua regia, and $\text{HNO}_3 + \text{Aq}$

Cold $\text{KOH} + \text{Aq}$ separates S and SnO_2

Completely sol in hot $\text{KOH} + \text{Aq}$

Sol in cold, more easily in hot CS_2 or CHCl_3

Decomp by alcohol (Schneider, Pogg **111** 249)

Tin sulphophosphide, $\text{Sn}_3\text{P}_2\text{S}_3$

Insol in HCl , HNO_3 and aqua regia

Sol in aq alkali hydroxides, containing Cl_2 or Br_2 in solution (Granger, C R 1896, **122** 322)

Tin (stannous) telluride, SnTe

Not attacked by conc $\text{HCl} + \text{Aq}$ (Ditte, C R **97** 42)

Titanic acid, $\text{TiO}_2 \cdot x\text{H}_2\text{O}$

α -Titanic acid—Insol in H_2O or alcohol. When dried in the cold, is completely sol in

acids, especially HCl , or dil $\text{H}_2\text{SO}_4 + \text{Aq}$, but when the solution in acids is boiled, it is converted into β -titanic acid. Very sl sol even when moist in $\text{H}_2\text{SO}_3 + \text{Aq}$ (Berthier) Sl sol in alkali carbonates $+ \text{Aq}$. A complete solution in an alkali carbonate $+ \text{Aq}$ can only be obtained by adding a Ti salt drop by drop to the alkaline solution, and allowing the ppt to dissolve entirely before adding more Ti salt. On boiling the solution in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (or in K_2CO_3 or $\text{Na}_2\text{CO}_3 + \text{Aq}$ with NH_4Cl) the titanic acid is pptd

Relatively easily sol in mineral acids, decreasing in the following order HCl , HNO_3 , H_2SO_4 . Insol in perchloric acid (Landecker, Z anorg 1909, **64** 67)

Sol in dil H_2SO_4 40 g $\text{H}_2\text{O} + 70$ g H_2SO_4 (sp gr 1.145) dissolves 0.33 g TiO_2 in 15 min (Hall and Smith, Proc Atm Phil Soc 1905, **44** 193)

Insol in liquid NH_3 (Gore, Am Ch J 1898, **20** 830)

β -Titanic acid, Metatitanic acid—Insol in H_2O , acids except HF, or alkali hydrates or carbonates $+ \text{Aq}$. When digested with conc H_2SO_4 until acid is evaporated, the residue is sol in H_2O (Berzelius)

γ -Titanic acid—Sol in pure H_2O , but β -acid is pptd by boiling (Knop, A **123** 351)

Colloidal $\text{TiO}_2 \cdot x\text{H}_2\text{O} + \text{Aq}$ has been prepared by Graham (Chem Soc **17** 325)

Barium titanate, $2\text{BaO} \cdot 3\text{TiO}_2$

(Bourgeois, C R **103** 141)

Barium pertitanate peroxide

See Pertitanate, barium peroxide

Calcium titanate, CaTiO_3

(Ebelmen, C R **32** 711)

Min *Perofskite* Scarcely attacked by $\text{HCl} + \text{Aq}$ or other acids, except hot H_2SO_4 , which decomposes it

$\text{CaO} \cdot 2\text{TiO}_2$ Min *Titanomorphite* Partially decomp by $\text{HCl} + \text{Aq}$, completely by H_2SO_4

Cobaltous titanate, CoTiO_3

(Bourgeois, C C **1893**, I 226)

Ferrous orthotitanate, Fe_2TiO_4

(Hautefeuille, C R **59** 733)

Ferroferric titanate, $\text{FeTiO}_3 \cdot x\text{Fe}_2\text{O}_3$

Min *Menaccanite* Very sl sol in HCl or aqua regia with separation of TiO_2

Ferric titanate

Not attacked by boiling H_2SO_4 , or conc $\text{HCl} + \text{Aq}$ (Wohler and Liebig, Pogg **21** 578)

Magnesium titanate, $MgTiO_3$

Insol in H_2O and acids (Hautefeuille, A h (4) 4 169)

Min *Gekröhle*

When finely powdered, is easily sol in hot HCl , or in cold HF in a few hours (Dick, Miner, Mag 1894, 10 146)

Mg_2TiO_4 . Slowly decomp by boiling with $HNO_3 + Aq$ (Hautefeuille, A ch (4) 1 169)

Potassium titanate, K_2TiO_3

Anhydrous Decomp with H_2O
 $+4H_2O$ Deliquescent Very sol in H_2O
 Precipitated from aqueous solution by alcohol
 Demolv, Compt chm 1849 325)

Potassium titanate, acid, $K_2O, 3TiO_2 + 2H_2O$

Insol in H_2O (Demolv)
 $K_2O, 6TiO_2 + 2H_2O$ (Demolv)
 $K_2O, 3TiO_2 + 3H_2O$ Insol in H_2O Completely sol in $HCl + Aq$ if only cold H_2O is used for washing When heated to 100° , no longer completely sol in $HCl + Aq$ (Rose, Pogg 74 563)
 $K_2O, 12TiO_2$ (Rose, Gilb Ann 73 78)

Sodium titanate, Na_2TiO_3

Anhydrous Decomp by H_2O into $NaOH$, and an acid titanate, insol in H_2O
 $+4H_2O$ Deliquescent Very sol in H_2O
 Precipitated from aqueous solution by alcohol (Demolv)

Sodium titanate, acid, $2Na_2O, 9TiO_2 + 5H_2O$

If not heated to 100° , is sol in cold $HCl + Aq$ (Rose, Gilb Ann 73 78)
 $2Na_2O, 3TiO_2$ Insol in H_2O , slowly sol in cold, easily in hot $HCl + Aq$ (Cormmucœuf, C R 115 823)
 $Na_2O, 2TiO_2$ As above (C)
 $Na_2O, 3TiO_2$ Insol in H_2O , and nearly so in boiling $HCl + Aq$ (C)

Strontium titanate, $2SrO, 3TiO_2$

(Bourgeois, C R 103 141)

Zinc titanate, $ZnO, TiO_2(?)$

(Lévy, A ch (6) 24 456)
 $2ZnO, 1TiO_2(?)$ (Lévy)
 $3ZnO, 2TiO_2$ Slowly attacked by warm H_2SO_4 or $HNO_3 + Aq$, and by $H_2SO_4 + HF$ Wholly sol in cold $HCl + Aq$ (Lévy)
 $4ZnO, 5TiO_2$ Not attacked by cold cone acids, but sol by boiling except in $HCl + Aq$ (Lévy)

$ZnO, 3TiO_2$ Insol in H_2O , alcohol, or ether Dil HNO_3, H_2SO_4 , or $HCl + Aq$ do not attack even on boiling, boiling H_2SO_4 dissolves with difficulty, not attacked by conc boiling alkalis $+ Aq$ (Lévy A ch (6) 25 471)

Perititanic acid

See Perititanic acid

Titanium, Ti

Decomp H_2O even under 100° (Wöhler), not attacked by H_2O under 500° (Kern, C N 33 57)

Does not decomp H_2O at 100° (Schneider, Z anorg 1894, 8 85)

Sol in $HCl + Aq$ if warmed Rapidly sol in $HF + Aq$ Sol in cold dil $H_2SO_4 + Aq$, $HNO_3 + Aq$, or $HC_2H_3O_2 + Aq$ Dissolves almost instantaneously in $HF + Aq$ (Merz)

Sol in molten lead and iron, sol in HCl , HNO_3 , and aqua regia (Moissan, C R 1895, 120 293)

Amorphous Loses its spontaneous inflammability when left for a time in contact with H_2O (Schneider, Z anorg 1895, 8 85)

Titanium amide, $Ti(NH_2)_4$

Violently attacked by H_2O (Stähler, B 1905, 38 2629)

Titanium tribromide, $TiBr_3 + 6H_2O$

Very hygroscopic (Stähler, B 1904, 37 4409)

Titanium tetrabromide, $TiBr_4$

Deliquescent Decomp by H_2O (Duppa, C R 42 352)

Sol in absolute alcohol and in dry ether (Rosenheim and Schutte, Z anorg 1900, 24 238)

Titanium bromonitride, $TiNBr$

Decomp by a small amount of H_2O On addition of more H_2O , a part dissolves forming a solution which decomp on warming with separation of titanic acid It behaves similarly toward dil HNO_3 , dil HCl and dil H_2SO_4 Completely sol in warm dil H_2SO_4 (Ruff, B 1908, 41 2262)

Titanium carbide, TiC

Sol in $HNO_3 + Aq$ (Shimer, C N 55 71)
 Insol in HCl Slowly sol in aqua regia (Moissan, C R 1895, 120 295)

Titanium carbide nitride, $Ti_{10}C_2N_2 = Ti(CN)_2, 3Ti_2N_2$

Insol in, and not attacked by boiling HNO_3 or H_2SO_4 (Wollaston), but sol in $HNO_3 + HF$ (Berzelius)

Titanium dichloride, $TiCl_2$

Very deliquescent Decomposes H_2O with violence Insol in ether, CS_2 , or $CHCl_3$ Decomp by 99.5% alcohol

Titanium trichloride, $TiCl_3$

Deliquescent Sol in H_2O with evolution of heat

$+4H_2O$ (Glatzel, B 9 1829)

$+6H_2O$ Very sol in H_2O (Polidori, Z anorg 1898, 19 307)

Titanium tetrachloride, TiCl_4

Anhydrous Sol in H_2O with evolution of much heat
 $+5\text{H}_2\text{O}$ Deliquescent

Titanium sulphuryl chloride, $\text{TiCl}_4\text{SO}_3 = \text{TiCl}_3\text{OSO}_2\text{Cl}$

Deliquesces gradually in moist air (Clausnitzer, B 11 2011)

Titanium chloride ammonia, $\text{TiCl}_4, 4\text{NH}_3$

Deliquescent Solution in H_2O is not quite clear (Rose)

According to Persoz (A ch 46 315), is $\text{TiCl}_4, 6\text{NH}_3$

$\text{TiCl}_4, 6\text{NH}_3$ and $\text{TiCl}_4, 4\text{NH}_3$
 Both compds are unstable in moist air, insol in ether (Rosenheim, Z anorg 1901, 26 245)

$\text{TiCl}_4, 8\text{NH}_3$ Violently decomp by H_2O (Stahler, B 1905, 38 2627)

Titanium tetrachloride cyanobromide, $\text{TiCl}_3, \text{NCClBr}$

(Schneider, Z anorg 1894, 8 92)

Titanium chloride cyanhydric acid, $\text{TiCl}_4, 2\text{HCN}$

Deliquescent Sol in H_2O with evolution of heat (Wohler, A 73 226)

Titanium trichloride nitrogen sulphide, $2\text{TiCl}_3, \text{N}_4\text{S}_4$

Decomp rapidly in air (Davis, Chem Soc 1906, 89 (2) 1576)

Titanium tetrachloride nitrogen sulphide, $\text{TiCl}_4, \text{N}_4\text{S}_4$

Hydroscopic

Decomp by H_2O , HNO_3 , HCl , KOH and alcohol (Wolbling, Z anorg 1908, 57 282)

Titanium chloride phosphine

Decomp by H_2O , $\text{HCl} + \text{Aq}$, $\text{KOH} + \text{Aq}$, $\text{K}_2\text{CO}_3 + \text{Aq}$, or $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Rose)

Titanium tetrachloride phosphoryl chloride, $\text{TiCl}_4, 2\text{POCl}_3$

(Ruff, B 1903, 36 1783)

Titanium chloronitride, TiNCl

Decomp by small amount cold H_2O On the addition of more H_2O it is only partially decomp For complete solution, the addition of dil HCl or a mixture of warm dil H_2SO_4 and HF is necessary Easily sol in conc HNO_3 and in conc H_2SO_4 (Ruff, B 1908, 41 2259)

Titanium difluoride

(Hautefeuille, C R 57 151)

Probably sesquifluoride

Titanium sesquifluoride, Ti_2F_3

Appears to be two modifications, one sol in H_2O , and the other insol in H_2O (Hautefeuille, C R 59 189)

Insol in H_2O (Weber, Pogg 120 292)

Titanium tetrafluoride, TiF_4

Decomp by H_2O (Unverdorben)

Sol in H_2O , but solution decomp upon evaporation (Marignac, Ann Min (5) 15 258)

Sol in H_2O (Emich, M 1904, 25 910)

Very hydroscopic

Sol in H_2O Sl sol in conc $\text{HF} + \text{Aq}$

Sol in cold POCl_3 without decomp Decomp in warm POCl_3

Sol in alcohol and dry pyridine

Insol in ether, CS_2 , CCl_4 , SiCl_4 , SiBr_4 , SO_2Cl_2 , SOCl_2 , SCl_2 , AsCl_3 , SO_3 , CrO_3 , PCl_5 (Ruff, B 1903, 36 1780)

$+2\text{H}_2\text{O}$ Sol in H_2O (Ruff, B 1903, 36 1780)

Titanium hydrogen fluoride, $2\text{HF}, \text{TiF}_4 = \text{H}_2\text{TiF}_6$

Sol in H_2O with decomposition and separation of a basic salt Corresponds to fluosilicic acid, and may be considered as fluotitanic acid H_2TiF_6

Titanium fluoride with MF
*See Fluotitanate, M***Titanium tetrafluoride ammonia, $\text{TiF}_4, 2\text{NH}_3$**

Sol in H_2O , decomp in aq solution on boiling (Ruff, B 1903, 36 1781)

Titanium monohydroxide, TiO_2H_2

Ppt (Wohler, A 73 49)

$\text{Ti}_2\text{O}_3\text{H}$ Not attacked by cold conc acids, sl attacked on warming Insol in cold or hot $\text{KOH} + \text{Aq}$ (Winkler, B 1890, 23 2659)

Titanium sequihydroxide, $\text{Ti}_2\text{O}_3, x\text{H}_2\text{O}$

Decomposes very quickly with H_2O , forming titanium dihydroxide

TiO_2H_2 (Polidori, Z anorg 1899, 19 306)

Titanium dihydroxide

See Titanic acid

Titanium hydroxychloride, $\text{TiCl}_3(\text{OH})$

Deliquescent Easily sol in H_2O and alcohol Sol in ether

$\text{TiCl}_2(\text{OH})_2 + 1\frac{1}{2}\text{H}_2\text{O}$ Deliquescent Sol in H_2O , alcohol, and ether Aqueous solution decomp by boiling

$\text{TiCl}(\text{OH})_3 + \text{H}_2\text{O}$ Nearly insol in H_2O Insol in alcohol and ether (König and v der Pfordten, B 21 1708)

See also Titanium oxychloride

Titanium diiodide, TiI_2

Very hydroscopic, insol in organic solvents, sol in conc HF and boiling HCl , decomp by

H_2O , alkalis, H_2SO_4 and HNO_3 (Defacqz, C R 1908, 147 66)

Titanium triiodide, $\text{TiI}_3+6\text{H}_2\text{O}$

Very hygroscopic (Stahler, B 1904, 37 4410)

Titanium tetraiodide, TiI_4

Fumes on air, and dissolves rapidly in H_2O with evolution of heat. Solution decomposes on standing (Weber)

Titanium nitride, Ti_3N_4

Difficultly sol in warm HNO_3+Aq . More easily sol in aqua regia (Rose)

Insol in dil acids. Decomp by hot conc H_2SO_4 and by conc HNO_3 , especially when HF is added, and by boiling $\text{KOH}+\text{Aq}$ (Ruff and Eisner, B 1906, 41 2252)

Decomp by H_2O and dil acids

Insol in all ordinary indifferent organic solvents (Ruff, B 1912, 45 1369)

TiN_2 Insol in H_2O (Wohler)

Is TiN , according to Guerin (C R 82 972)

Titanium monoxide, TiO

(Moissan, C R 1895, 120 290)

Titanium sesquioxide, Ti_2O_3

Insol in HCl or HNO_3+Aq . Difficultly sol in H_2SO_4 (Ebelen, A ch (3) 20 392)

When moist, insol in H_2O or $\text{NH}_4\text{OH}+\text{Aq}$, but quickly decomp to TiO_2 . Sol in oxygen acids, but quickly decomp (Berzelius)

Titanium dioxide, TiO_2

Amorphous Insol in H_2O , HCl , or dil $\text{H}_2\text{SO}_4+\text{Aq}$, even when heated for a long time

Sol in conc H_2SO_4 by long digestion

TiO_2 , strongly ignited at 1000° , is practically insol in conc H_2SO_4 and HF

When less strongly ignited (by heating ortho or metatitanic acid to 700°) it is easily sol therein (Bornmann and Schirrmeyer, C C 1910, II 1870)

Ignited TiO_2 is very difficultly sol in HCl (Pennington, J Am Chem Soc 1896, 18 56)

The solubility of ignited TiO_2 in H_2SO_4 is helped by H_2O_2 (Weiss and Landecker, Z anorg 1909, 64 71)

The solubility in H_2SO_4 is increased by addition of H_2O_2 . H_2O_2 brings TiO_2 quickly and completely into solution in the presence of NH_4OH , NH_4Cl , NaOH , Na_2CO_3 and Na_2HPO_4 (Weiss and Landecker, Z anorg 1909, 64 71)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Crystalline Min Rutile, Brookite, and Anatase. Solubility as above
See also Titanic acid

Titanium oxide, Ti_2O_3

(Deville, C R 53 163)

True formula is Ti_2O_{12} (v der Pfordten, A 237 201)

Titanium peroxide, TiO_2

Sol in acids. Solution in H_2SO_4 is very stable, but the HCl solution decomposes very easily (Weber, B 15 2599, Piccini, B 15 2221, Classen, B 21 370)

Titanium oxychloride, $\text{TiO}_2, \text{TiOCl}_2+8\text{H}_2\text{O}$

Sol in much H_2O (Merz, Bull Soc 1867 401)

$\text{Ti}_2\text{O}_3\text{Cl}_2$ Insol in H_2O . Sol in $\text{NH}_4\text{OH}+\text{Aq}$ with separation of TiO_2

See also Titanium hydroxychloride

Titanium oxyfluoride

Insol in H_2O (Berzelius)

Titanium oxyfluoride with MF

See Fluoxypertitanate, M

Titanium phosphide, TiP

Sl sol in boiling aqua regia

Insol in dil or conc acids and alkalis

Sl attacked by fuming HNO_3 in sealed tube at $250^\circ\text{--}300^\circ$ (Gewecke, A 1908, 361 84)

Titanium phosphochloride

See Phosphorus titanium chloride

Titanium silicide, TiSi_2

Sol in HF , insol in other min acids

Slowly sol in 10% $\text{KOH}+\text{Aq}$ (Hönigschmid, C R 1906, 143 226)

Titanium monosulphide, TiS

Insol in alkalis. Difficultly sol in nitric acid and aqua regia

Insol in HF (v der Pfordten, A 234 257)

Titanium disulphide, TiS_2

Decomp slowly on moist air. Insol in HCl or dil $\text{H}_2\text{SO}_4+\text{Aq}$ (Ebelen)

Sol in aqua regia or HNO_3+Aq . Decomp by $\text{KOH}+\text{Aq}$ or $\text{NaOH}+\text{Aq}$. Insol in $\text{KSH}+\text{Aq}$ (Rose)

Sol in HF at 100° (v der Pfordten, A 234 257)

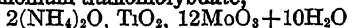
Titanium sesquisulphide, Ti_2S_3

Insol in caustic alkalis + Aq . Sol in HF at a high temp. Insol in aqua regia (v der Pfordten, A 234 257)

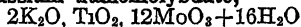
Titanomolybdic acid, $\text{TiO}_2, 12\text{MoO}_3+22\text{H}_2\text{O}$

Very sol in H_2O

Sol in ether (Pèchard, C R 1893, 117 790)

Ammonium titanomolybdate,

Sol in H_2O and acids, completely insol in solutions of ammonium salts (Pécharé)

Potassium titanomolybdate,

Efflorescent

Sol in H_2O (Pécharé)

Titanodec tungstic acid, $\text{H}_5\text{TiW}_{10}\text{O}_{36} + x\text{H}_2\text{O}$

(Lecarme, Bull Soc (2) 36 17)

Titanotungstic acid or Titanododec tungstic acid, $\text{H}_5\text{TiW}_{12}\text{O}_{42} + x\text{H}_2\text{O}$

(Lecarme, Bull Soc (2) 36 17)

Titanous acid**Sodium titanate, $\text{Na}_2\text{TiO}_3 = 3\text{Na}_2\text{O}, \text{Ti}_2\text{O}_3$**

Sol in dil acids (Koenig and v der Pfordten, B 22 2075)

Titanyl compounds

See Titanium oxy-compounds

Triamine cobaltic compounds

See Dichrocoaltic compounds

Trithionic acid, $\text{H}_2\text{S}_3\text{O}_6$

Known only in aqueous solution

Solution in H_2O gradually decomposes in the cold, rapidly at 80° . Not decomp if very dilute or in presence of acids, except HNO_3 , HClO_3 , and HIO_3 (Fordos and Gélis, A ch (3) 28 451)

Trithionates

The trithionates are all sol in H_2O , and very easily decomposed

Ammonium trithionate, $(\text{NH}_4)_2\text{S}_3\text{O}_6$

Very deliquescent and unstable

Very sol in H_2O

Insol in abs alcohol (Divers and Ogawa, Chem Soc 1900, 77 337)

Barium trithionate, $\text{BaS}_3\text{O}_6 + 2\text{H}_2\text{O}$

Very sol in H_2O . Precipitated from aqueous solution by large excess of alcohol. Aqueous solution is very unstable (Kessler, Pogg 74 250)

Lead trithionate, PbS_3O_6

Very sl sol in H_2O . Sol in $\text{Na}_2\text{S}_2\text{O}_3 + \text{Aq}$ (Fogh, C R 110 524)

Potassium trithionate, $\text{K}_2\text{S}_3\text{O}_6$

Sol in H_2O . Insol in alcohol (Kessler, Pogg 74 270)

Sol in H_2O with decomp

Insol in alcohol (Langlois, A 1841, 40 102)

Sodium trithionate, $\text{Na}_2\text{S}_3\text{O}_6$

Very sol in H_2O

+ $3\text{H}_2\text{O}$ (Villiers, C R 106 1356)

Thalious trithionate, $\text{Ti}_2\text{S}_3\text{O}_6$

Sol in H_2O (Bevan, C N 38 294)

Zinc trithionate

Sol in H_2O , but decomposes upon warming the solution (Fordos and Gélis, C R 16 1070)

Tungsten, W

Metallic Not attacked by heating with fuming HNO_3 , aqua regia, or other acids, or by boiling $\text{KOH} + \text{Aq}$. Sol in $\text{KOH} + \text{Aq}$ and $\text{NaClO} + \text{Aq}$ (v Uslar, A 94 255)

Not easily acted upon by moist air, if no CO_2 present. Sol in a mixture of HF and HNO_3 . Very slowly sol in H_2SO_4 , HCl and HF (Moissan, C R 1896, 123 15)

Very slowly attacked by HNO_3 , H_2SO_4 , HCl and even CrO_3 . A mixture of CrO_3 and H_2SO_4 dissolved 1.67 g in 16 hrs from a fine wire and 1.36 g in 14 hours (Fink, Met Chem Eng 1910, 8 341)

Compact tungsten is not attacked by dil, and only sl dissolved by conc H_2SO_4 . Not attacked by dil or conc HCl , HNO_3 and $\text{HNO}_3 + \text{HCl}$ attack slowly by long heating, forming thin layer of WO_3 . Slowly sol in $\text{HNO}_3 + \text{HF}$ (Weiss Z anorg 1910, 65 339)

Aluminothermic tungsten is insol in acids and in aqua regia. Sol in fused KOH (Stavenhagen, B 1899, 32 1515)

Insol in HCl of any concentration at room temp and only very sl sol at 110° . After being in contact with hot conc HCl (sp gr 1.15) for 175 hrs the metal lost 0.5% of its weight. Sl sol in dil HCl at 110°

Insol in conc H_2SO_4 at room temp and in dil H_2SO_4 at 110° . Somewhat sol in conc H_2SO_4 at high temp

Insol in conc HNO_3 , and hot or cold HF . Sl sol in aqua regia

Very sol in $\text{HF} + \text{HNO}_3$ (Ruder, J Am Chem Soc 1912, 34 387)

Insol in aqua regia and acids sol in fused KOH (Stavenhagen, B 1899, 32 1514)

Insol in $\text{KOH} + \text{Aq}$

Sol in fused KOH

Slowly sol in fused Na_2CO_3 , K_2CO_3 or mixture of the two

Somewhat sol in $\text{NaOCl} + \text{Aq}$ (Ruder, J Am Chem Soc 1912, 34 388)

Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Crystalline Insol in H_2O , HCl , or H_2SO_4 . Oxidised by HNO_3 or aqua regia (D'Elhujar)

Sol in boiling $\text{KOH} + \text{Aq}$ (Ruche, A ch (3) 50 5)

Amorphous Easily oxidised by $\text{HNO}_3 + \text{Aq}$ (Zettnow)

Tungsten amide

See Tungsten nitride

Tungsten arsenide, WAs_2

Insol in H_2O and other solvents Not attacked by boiling HF or HNO_3 Sol in old $HF + HNO_3$ and in hot aqua regia Not attacked by hot $KOH + Aq$ or $NaOH + Aq$ Decomp by fused KOH or $NaOH$ (Defacqz, C R 1901, 132 139)

Tungsten boride, WB_2

Slowly attacked by conc acids, vigorously attacked by aqua regia (Tucker and Moody, Chem Soc 1902, 81 16)

Tungsten dibromide, WBr_2

Partly sol in H_2O , the rest decomposing to WO_2 and HBr

Tungsten pentabromide, WBr_5

Decomp by moist air or H_2O Sol in austic alkalis + Aq

Very hygroscopic Fumes in the air

Decomp by H_2O

Sol in HF , or conc HCl Sl sol in fuming HBr Decomp by dil HCl , conc HNO_3 or dil H_2SO_4 Readily attacked by fused alkalis or alkalis + Aq Sol in CCl_4 , $CHCl_3$, $CHBr_3$, abs alcohol, ether, essence of tereenthine and benzene (Defacqz, C R 899, 128 1232)

Tungsten hexabromide, WBr_6

Decomp by H_2O and in the air

Sol in $NH_4OH + Aq$ (Smith, J Am Chem Soc 1897, 18 1100)

Tungsten bromochloride, WCl_5, WBr_5

Decomp by H_2O Sol in HF Decomp by HNO_3 or H_2SO_4 Violently attacked by used alkali or alkali + Aq Sol in most organic solvents

$WCl_5, 3WBr_5$ Properties like those of WCl_6, WBr_6 (Defacqz, C R 1899, 129 516)

Decomp by H_2O Sol in 40% $HF + Aq$ 2° B $HCl + Aq$ gives a sl ppt of WO_3 Decomp by HNO_3 and by H_2SO_4 Sol in abs alcohol, ether, CS_2 , C_6H_6 and glycerine Sol in CCl_4 only on warming Nearly insol in oil of turpentine (Defacqz)

Tungsten bronze

See—

Tungstate tungsten oxide, barium

Tungstate tungsten oxide, barium potassium

Tungstate tungsten oxide, barium sodium

Tungstate tungsten oxide, calcium potassium

Tungstate tungsten oxide, calcium sodium

Tungstate tungsten oxide, lithium

Tungstate tungsten oxide, lithium potassium

Tungstate tungsten oxide, potassium

Tungstate tungsten oxide, potassium sodium

Tungstate tungsten oxide, potassium strontium

Tungstate tungsten oxide, sodium

Tungstate tungsten oxide, sodium strontium

Tungsten carbide, W_2C

Sol in boiling HNO_3 , very slowly acted upon by other acids (Moissan, C R 1896, 123 16)

WC Insol in dil acids, only sl sol in H_2SO_4 and conc HNO_3 , sol in fused $KClO_3$ and KNO_3 (Williams, C R 198, 126 1724)

Tungsten dichloride, WCl_2

Decomp on the air or with H_2O (Roscoe)

Tungsten tetrachloride, WCl_4

Deliquescent Partly sol in H_2O , with subsequent decomposition (Roscoe)

Tungsten pentachloride, WCl_5

Very deliquescent Decomp with H_2O with hissing and evolution of heat and separation of W_2O_5

Very sl sol in CS_2 (Roscoe)

Tungsten hexachloride, WCl_6

Not decomp by moist air or H_2O Decomp by alcohol Very sol in CS_2 (Roscoe)

Easily sol in PCl_3 (Teclu, A 187 255)

Tungsten chloride nitrogen sulphide, WCl_4, N_4S_4

(Davis, Chem Soc 1906, 89 (2) 1575)

Tungsten chloroarsenide, W_2AsCl_5

Hygroscopic, decomp by H_2O and acids, sol in aq solution of alkalis, insol in anhydrous organic solvents (Defacqz, C R 1901, 132 139)

Tungsten chlorosulphide, $W_2S_7Cl_8$

Decomp by H_2O

Sol in S_2Cl_2 (Smith and Oberholtzer, Z anorg 1894 5 68)

$WCl_5, 3WS_2$ Decomp by H_2O Insol in CS_2 alcohol and C_6H_6 (Defacqz, A ch 1901, (7) 22 266)

Tungsten hexafluoride, WF_6

Fumes in the air

Decomp by H_2O Easily sol in aq alkalis (Ruff, B 1905, 38 747)

Tungsten duodide, WI_2

Not decomp by H_2O (Roscoe, A 162 366)

Insol in H_2O , CS_2 and alcohol Decomp by boiling H_2O , HNO_3 , H_2SO_4 and aqua regia, sol in fused KOH , and alkali carbonates (Defacqz, C R 1898, 126 936)

Tungsten tetraiodide, WI_4

Insol in H_2O , ether, chloroform and turpentine, sol in abs alcohol, decomp when boiled with H_2O , sol with decomp in dil HCl and H_2SO_4 , in HNO_3 and aqua regia, and in alkali hydroxides and carbonates fused or in aq solution (Defacqz, C R 1898, **127 511**)

Tritungsten nitride, W_3N_2

(Uhrlaub)

W_2N_3 Insol in HNO_3 , dil H_2SO_4 and $NaOH + Aq$ (Rideal, Chem Soc 1889, **55 44**)

Tungsten nitride amide, $W_3N_6H_4 = 2WN_2, W(NH_2)_2$

Not attacked by acids or caustic alkalis + Aq (Wohler, A **73 191**)

Tungsten nitride amide oxide, $W_7N_3H_4O_4 = 3WN_2, W_2(NH_2)_2, 2WO_3$

Not attacked by acids or alkalis (Wohler)

Tungsten monoxide, WO

Insol in H_2O . Not attacked by HCl, HF, H_2SO_4 , or $KOH + Aq$. $HNO_3 + Aq$ or aqua regia convert it into WO_3 (Headden, Sil Am J **145 280**)

in the dry way, is at a regia, which oxidises to

when moist, is sol in HCl or $H_2SO_4 + O$ in $KOH + Aq$. Insol in $NH_4OH + Riche$, A ch (3) **50 5**)

Insol in HCl, H_2SO_4 and conc aq, sol in HNO_3 (Hallepeau, C R **27 135**)

Tungsten oxide, blue

W_2O_5 (Riche, A ch (3) **50 33**), W_3O_8 (v Uslar), W_4O_{11} (Gmeln)

All are probably the same substance. Not attacked by boiling HNO_3 or aqua regia. Slowly sol in boiling $KOH + Aq$

Tungsten trioxide, WO_3

Insol in H_2O or acids. Sl sol in dil $KOH + Aq$, $NaOH + Aq$, $Na_2CO_3 + Aq$, or $H_2CO_3 + Aq$, but easily sol in conc boiling solutions of same. $NH_4OH + Aq$ when boiling has a solvent action

Insol in conc and dil H_2SO_4 (Desi, J Am Chem Soc 1897, **19 214**)

Min Tungstate Insol in acids. Sol in $NH_4OH + Aq$

Tungsten oxide, W_2O_5

Sol in alkalis (Desi, J Am Chem Soc 1897, **19 214**)

W_3O_8 . Insol in acids and alkalis (Desi, J Am Chem Soc 1897, **19 228**)

+ H_2O Like $W_5O_{14} + H_2O$ (Allen and Gottschalk, Am Ch J 1902, **27 336**)

W_4O_3 (Desi, J Am Chem Soc 1897, **19 219**)

W_5O_9 (Desi)

$W_5O_{14} + H_2O$ Insol in H_2O containing a little HCl

Slowly attacked by cold, conc $MOH + Aq$ (Allen and Gottschalk, Am Ch J 1902, **27 333**)

Tungsten trioxide ammonia, $WO_3, 3NH_3$

(Rosenheim and Jacobsohn, Z anorg 1906, **50 306**)

Tungsten oxybromide, etc

See Tungstyl bromide, etc

Tungsten monophosphide, WP

Not attacked by HF or HCl

Sol in warm $HNO_3 + HF$. Slowly attacked by hot HNO_3

Not attacked by $KOH + Aq$ or $NaOH + Aq$ (Defacqz, C R 1901, **132 34**)

Tungsten diphosphide, WP_2

Insol in H_2O and in most organic solvents, insol in HCl and HF, sol in a mixture of HF and HNO_3 in the cold, and in aqua regia on warming (Defacqz, C R 1900, **130 916**)

Tungsten phosphide, W_4P_2

Not attacked by any acid, not even by aqua regia (Wohler and Wright, A **79 244**)

W_3P_4 (Wohler and Wright)

Tungsten diselenide, WSe_2

(Uelsmann)

Tungsten triselenide, WSe_3

Easily sol in alkali sulphides or selenides + Aq (Uelsmann, Jahrb f Ch **1860 92**)

Tungsten silicide

Sol in HF

Only very sl sol in other acids (Warren, C N 1898, **78 319**)

WSi_2 . Not attacked by ordinary acids and scarcely by warm aqua regia, but violently attacked by $HNO_3 + HF$. Sl attacked by 10% alkalis + Aq (Honigschmid, M 1907, **28 1017**)

Not attacked by dil or conc HCl, HF, HNO_3 or H_2SO_4 , nor by hot aqua regia

Attacked by $HNO_3 + HF$ or by fused alkalis (Defacqz, C R 1907, **144 850**)

WSi_3 . Violently attacked by $HNO_3 + HF$. Not attacked by HNO_3 , H_2SO_4 , HCl or HF (Frliley, Rev Mét 1911, **8 509**)

W_2Si_3 . Insol in acids including HF, sol in a mixture of HF and HNO_3 , sol in fused alkali hydroxides and carbonates (Vigouroux, C R 1898, **127 394**)

Tungsten disulphide, WS₂

Oxidised by HNO₃+Aq (Berzelius)
 Insol in min acids
 Sol in a mixture of HF and HNO₃ and in
 used alkalis and alkali carbonates (De-
 acqz, C R 1899, 128 611)

Tungsten trisulphide, WS₃

Somewhat sol in cold, abundantly in hot
 H₂O, but separated out by the addition of
 salts, especially NH₄Cl, or acids Sol in
 alkali sulphides, and hydrosulphides+Aq
 Sol in caustic alkalis, and alkali carbonates
 +Aq Slowly sol in NH₄OH+Aq in the
 cold

Tungstic acid, H₂WO₄

Insol in H₂O Sol in HF Insol in tung-
 states+Aq

44 7% H₂WO₄ is sol in 50% HF+Aq at
 25°

55 3% H₂WO₄ is sol in 50% HF +Aq at
 50°

100 g sat H₂WO₄+HCl+Aq contain
 68 g H₂WO₄ at 80°

9 8 % H₂WO₄ is sol in sat alcoholic HCl
 at 75°

Insol in alcoholic solutions of HBr and HI
 Rosenheim, Chem Soc 1911 100 (2) 402)

Freshly pptd tungstic acid dissolves in
 H₂O₂ (Kellner, Dissert 1909)

Insol in liquid NH₃ (Gore, Am Ch J
 1898, 20 830)

H₂WO₅ Precipitate Sl sol in H₂O and
 aqueous solutions of the tungstates Sol in
 50-300 pts H₂O When frshly pptd, sol
 in alkali hydrides or carbonates+Aq (An-
 hon, J pr 9 6)

Metatungstic acid, H₂W₂O₁₁+9H₂O

Sol in H₂O Solution may be boiled and
 vaporated to a syrupy consistency, when it
 suddenly gelatinises and ordinary tungstic
 acid is precipitated

Sol in H₂O When heated to 50°, it be-
 comes insol in H₂O (Soboleff, Z anorg
 896, 12 28)

Solubility in H₂O at t°

t°	100 ccm H ₂ O dis- solve g. of the cryst acid	Sp gr of the solution
0	41 46	1 6025
22	88 57	2 5239
43 5	111 87	3 6503

(Soboleff)

Sp gr of solution of metatungstic acid at
 7 5° containing

2 79 12 68 27 61 43 75% WO₃

1 0257 1 1278 1 3274 1 6343

(Scheibler, J pr 83 273)

Sp gr of aqueous solution calculated by
 M=Mendeleeff, and G=(Gerlach (Z anal
 27 300), containing

	5	10	15	20	25% WO ₃
M	1 047	1 098	1 153	1 214	1 285
G	1 0469	1 0980	1 1544	1 2172	1 2873

	30	35	40	45	50% WO ₃
M	1 366	1 458	1 555	1 581 (?)	
G	1 3660	1 4540	1 5527	1 6630	1 7860

Solubility in ether at t°

t°	100 ccm ether dissolve g of the cryst acid
0	83 456
7 8	88 389
18 2	99 66
24 3	110 76

(Soboleff, Z anorg 1896, 12 32)

Colloidal Sol in H₂O Not precipitated
 by acids or alcohol Can be evaporated to
 dryness and heated to 200°, and still remains
 sol in H₂O Sol in $\frac{1}{4}$ pt of H₂O

Sp gr of aqueous solution containing

5	20	50	66 5	79 8% WO ₃
1 0475	1 2168	1 8001	2 596	3 243

(Graham, Chem Soc 17 318)

Perhaps *paratungstic acid*, H₁₀W₁₂O₄₁
 (Klein, Bull Soc (2) 36 547)

Tungstates

Few normal tungstates are sol in H₂O,
 even some of the K and NH₄ salts are very
 sl sol Most of the metatungstates however,
 are easily sol in H₂O

Tungstates insol in H₂O are usually insol
 in dil acids

Aluminum tungstate, Al₂(WO₄)₃+8H₂O

Precipitate Insol in H₂O and Na₂WO₄+
 Aq Sol in (NH₄)₂Al₂(SO₄)₄+Aq, NaOH+Aq,
 NH₄OH+Aq

Easily sol in H₃PO₄, H₂C₂O₄, and
 H₂C₄H₄O₆+Aq (Lotz, A 83 65)

Sol in 1500 pts H₂O at 15° (Lefort, C R
 87 748)

Al₂O₃, 4WO₃+9H₂O Sol in 400 pts H₂O
 at 15° (Lefort, C R 87 748)

Al₂O₃, 5WO₃+6H₂O Sol in H₂O, from
 which it is pptd by alcohol (Lefort)

Formula according to Lefort is Al₂O₃, 3WO₃
 +3H₂O, 2WO₃

See also *Aluminoctungstic acid*

Aluminum paratungstate, 5Al₂O₃, 36WO₃+
 46H₂O=Al₂O₃, 7WO₃+9H₂O (?)

Easily sol in an alum solution (Lotz, A
 83 65)

Aluminum ammonium tungstate, 3(NH₄)₂O,
 Al₂O₃, 9WO₃+4H₂O

Sol in conc HNO₃ and in conc HCl
 (Balke and Smith, J Am Chem Soc 1903,
 25 1230)

Aluminum ammonium antimony tungstate

See *Aluminicoantimoniotungstate, ammonium*

Aluminum antimony tungstate

See *Aluminicoantimoniotungstic acid*

Aluminum zinc tungstate, Al_2O_3 , ZnO , $9WO_3$, $+20H_2O$

Very sol in H_2O (Daniels, J Am Chem Soc 1908, **30** 1850)

$2Al_2O_3$, $3ZnO$, $18WO_3$, $+16H_2O$ Sol in much H_2O

Sol in very dil mineral acids or in acetic acid (Daniels)

Ammonium tungstate, $(NH_4)_2WO_4$

Known only in solution

$(NH_4)_4W_3O_{11}+3H_2O=2(NH_4)_2O$, $3WO_3$, $+3H_2O$ Sol in H_2O with decomp. Decomp on air with evolution of NH_3 , and formation of *paratungstate* Sol in NH_4OH + Aq (Marignac, A ch (3) **69** 23)

$(NH_4)_4W_3O_{17}+5H_2O=2(NH_4)_2O$, $5WO_3$, $+5H_2O$ Sol at ordinary temp in 26-29 pts H_2O with partial decomposition (Marignac) $+2\frac{1}{2}H_2O$, $+3H_2O$, $+4H_2O$, $+4\frac{1}{2}H_2O$, and $+5H_2O$ (Pinagel, Dissert, 1904)

$(NH_4)_6W_3O_{27}+8H_2O=3(NH_4)_2O$, $8WO_3$, $+8H_2O$ Sol in H_2O (Marignac)

Colloidal $(NH_4)_2O$, $6WO_3$, $+4$ or $6H_2O$ Miscible with water in nearly all proportions (Taylor, J Am Chem Soc 1902, **24** 632)

Ammonium metatungstate, $(NH_4)_2W_4O_{13}$

$+6H_2O$ (Marignac, A ch (4) **3** 74)
 $+8H_2O$ Efflorescent Very sol in H_2O
1 pt dissolves at 15° in 0.84 pt H_2O (Lotz)
1 pt dissolves at ordinary temp in 0.35 pt H_2O (Riche)

Solubility increases rapidly with the temperature

Saturated solution at 40° is solid on cooling. Sl sol in ordinary, insol in absolute alcohol (Lotz) Insol in ether (Riche)

$[(NH_4)_2W_3O_{10}+5H_2O \text{ of } \text{Marignac}]$
 $(NH_4)_6W_3O_{27}+17H_2O=3(NH_4)_2O$, $16WO_3$, $+17H_2O$ Very efflorescent. Decomp by dissolving in pure H_2O (Marignac, A ch (4) **3** 75)

Ammonium paratungstate, $(NH_4)_{10}W_{12}O_{41}=5(NH_4)_2O$, $12WO_3$

(Marignac, A ch (3) **69** 25)
According to Lotz (A **91** 49) and Scheibler (J pr **80** 208), formula is $(NH_4)_6W_7O_{24}=3(NH_4)_2O$, $7WO_3$

$+5H_2O$ (Scheibler J pr **48** 232)
 $+11H_2O$ Sol in 25-28 pts cold H_2O (Anthon)

Sol in 26.1 pts H_2O at 107° , and 5.8 pts at 100° (Lotz)

Sol in 33.3 pts cold H_2O , and 9.6 pts at 100° (Riche)

Sol in 22-38 pts H_2O at $15-18^\circ$ The solution gradually decomposes, with the formation of a more soluble salt (Marignac)

Not much more sol in NH_4OH + Aq than in H_2O Insol in alcohol (Anthon)

Sol in H_2O_2 (Kellner Dissert, 1909)

Ammonium bismuth tungstate

See *Bismuthicotungstate, ammonium*

Ammonium cadmium paratungstate,

$3(NH_4)_2O$, $12CdO$, $35WO_3$, $+35H_2O$

Ppt Sol in H_2O acidulated with HNO_3 (Lotz, A **91** 49)

Ammonium cerium tungstate

See *Cericotungstate, ammonium*

Ammonium cobaltous tungstate, $8(NH_4)_2O$,

$2CoO$, $15WO_3$, $+3H_2O$

(Carnot, C R **109** 147)

Ammonium hydroxylamine tungstate,

$NH_4OWO_4NH_4$

Sol in H_2O (Hofmann, Z anorg 1898, **16** 465)

Ammonium iron (ferric) tungstate, $5(NH_4)_2O$,

Fe_2O_3 , $5WO_3$, $+5H_2O$

Sol in H_2O (Borck)

Ammonium lanthanum tungstate

See *Lanthanicotungstate, ammonium*

Ammonium magnesium paratungstate,

$2(NH_4)_2O$, $3MgO$, $12WO_3$, $+24H_2O$

Very slightly sol in H_2O (Marignac, A ch (3) **69** 58)

$(NH_4)_2O$, $2MgO$, $7WO_3$, $+10H_2O$ Very sl sol in H_2O , sol in H_2O acidulated with HNO_3 (Lotz)

Ammonium mercuric tungstate, $(NH_4)_2WO_4$,

$HgWO_4$, $+H_2O$

Insol in H_2O Decomp by acids or alkalis (Anthon)

Ammonium neodymium tungstate

See *Neodymicotungstate, ammonium*

Ammonium nickel tungstate

See *Nickelicotungstate, ammonium*

Ammonium potassium paratungstate,

$5K(NH_4)O$, $12WO_3$, $+11H_2O$

Sol in boiling H_2O , sl sol in cold H_2O (Hallopeau, C R 1896, **123** 180)

Ammonium potassium sodium paratungstate,

$5(K, Na, NH_4)_2O$, $12WO_3$, $+13H_2O$, where $K, Na, NH_4=3, 3, 4$

$10(K, Na, NH_4)_2O$, $24WO_3$, $+26H_2O$, where $K, Na, NH_4=3, 3, 14$ (Laurent)

Ammonium sodium paratungstate, $4(\text{NH}_4)_2\text{O}$, Na_2O , $12\text{WO}_3+5\text{H}_2\text{O}$

Can be crystallised from H_2O without decomp (Lotz, A 91 57)

+ $14\text{H}_2\text{O}$ Sol in warm H_2O (Hallopeau, C R 1896, 123 181)

$(\text{NH}_4)_2\text{O}$, $4\text{Na}_2\text{O}$, $12\text{WO}_3+25\text{H}_2\text{O}$ Sl sol in H_2O (Hallopeau, C R 1895, 120 1344)

$5\text{Na}_2\text{O}$, $15(\text{NH}_4)_2\text{O}$, $48\text{WO}_3+48\text{H}_2\text{O}$ (Marignac, A ch (3) 69 53)

$2\text{Na}_2\text{O}$, $3(\text{NH}_4)_2\text{O}$, $12\text{WO}_3+15\text{H}_2\text{O}$ (Marignac)

$3(\text{NH}_4)_2\text{O}$, $2\text{Na}_2\text{O}$, $12\text{WO}_3+15\text{H}_2\text{O}$
 $3(\text{NH}_4)_2\text{O}$, $3\text{Na}_2\text{O}$, $16\text{WO}_3+22\text{H}_2\text{O}$ Sol

in H_2O without decomp (Hallopeau, C R 1896, 123 181)

$3\text{Na}_2\text{O}$, $4(\text{NH}_4)_2\text{O}$, $16\text{WO}_3+18\text{H}_2\text{O}$ (Gibbs, Am Ch J 7 236)

Is $2\text{Na}_2\text{O}$, $3(\text{NH}_4)_2\text{O}$, $12\text{WO}_3+13\text{H}_2\text{O}$, according to Knorre (B 19 823)

Very sol in hot H_2O (Knorre, B 1886, 19 823)

$(\text{NH}_4)_2\text{O}$, $3\text{Na}_2\text{O}$, $16\text{WO}_3+38\text{H}_2\text{O}$ (Wyrouboff, Bull Soc Min 1892, 15 85)

$6(\text{NH}_4)_2\text{O}$, $2\text{Na}_2\text{O}$, $20\text{WO}_3+24\text{H}_2\text{O}$ Can be cryst from boiling H_2O (Baragiola, Dissert, 1902)

$4\text{Na}_2\text{O}$, $16(\text{NH}_4)_2\text{O}$, $50\text{WO}_3+50\text{H}_2\text{O}$ Sl scl in cold H_2O (Gibbs, Proc Am Acad 15 12)

Ammonium zinc paratungstate, $(\text{NH}_4)_2\text{O}$, 2ZnO , $7\text{WO}_3+13\text{H}_2\text{O}$

Sl sol in boiling H_2O , but more easily on addition of oxalic tartaric, phosphoric, or dil nitric acids, or of ammonium tungstate (Lotz, A 91 49)

Ammonium zirconium tungstate

See Zirconotungstate, ammonium

Ammonium metatungstate nitrate

See Nitrate metatungstate, ammonium

Ammonium tungstate vanadate

See Vanadotungstate, ammonium

Antimony tungstate, Sb_2O_3 , $5\text{WO}_3+4\text{H}_2\text{O}$

Sol in H_2O without decomp (Lefort)

Sb_2O_3 , $6\text{WO}_3+8\text{H}_2\text{O}$ Ppt

See also Antimoniotungstic acid

Barium tungstate, BaWO_4

Anhydrous Insol in H_2O Decomp by boiling HNO_3+Aq (Geuther and Forsberg, A 120 270)

+ $\frac{1}{2}\text{H}_2\text{O}$ Insol in H_2O or boiling $\text{H}_3\text{PO}_4+\text{Aq}$ Sol in boiling, less sol in cold $\text{H}_2\text{C}_2\text{O}_4+\text{Aq}$ (Anthon)

+ $2\frac{1}{2}\text{H}_2\text{O}$ Insol precipitate (Scheibler)

Pptd BaWO_4 is attacked by dil acids More sol in $\text{NH}_4\text{NO}_3+\text{Aq}$ than in H_2O (Smith and Bradbury, B 24 2930)

Barium ditungstate, $\text{BaW}_2\text{O}_7+\text{H}_2\text{O}$ (?)

Nearly insol in H_2O 100 ccm H_2O dissolve about 0.05 g at 15° (Lefort, A ch (5) 15 325)

Barium tritungstate, $\text{BaW}_3\text{O}_{10}+4\text{H}_2\text{O}$ (?)

Sol in about 300 pts H_2O at 15° Decomp by boiling H_2O into an insol salt (Lefort, C R 88 798)

+ $6\text{H}_2\text{O}$ (Scheibler)

Barium metatungstate, $\text{BaW}_4\text{O}_{13}+9\text{H}_2\text{O}$

Efflorescent Quite sol in hot H_2O Partly decomp by cold H_2O into $\text{BaW}_3\text{O}_{10}$ and WO_3 , which recombine on heating (Scheibler, J pr 80 204)

Barium tungstate, $\text{BaW}_5\text{O}_{18}+8\text{H}_2\text{O}$

Insol in H_2O or $\text{HCl}+\text{Aq}$ (Zettnow)
 $\text{BaW}_5\text{O}_{18}$ Barium bronze (Hallopeau, A ch 1900, (7) 19 121)

Barium paratungstate, $\text{Ba}_5\text{W}_{12}\text{O}_{41}+14\text{H}_2\text{O}$, or $\text{Ba}_3\text{W}_7\text{O}_{24}+8\text{H}_2\text{O}$

Insol in cold H_2O , when freshly pptd is sl sol in HNO_3+Aq (Lotz, A 91 60)
Sol in $\text{NH}_4\text{Cl}+\text{Aq}$ (Wackenroder)
+ $27\text{H}_2\text{O}=\text{Ba}_3\text{W}_7\text{O}_{24}+16\text{H}_2\text{O}$ Insol in cold, sl sol in hot H_2O (Knorre, B 18 327)

Barium potassium tungstate tungsten oxide,

$\text{BaW}_4\text{O}_{12}$, $5\text{K}_2\text{W}_4\text{O}_{12}$

(Engels, Z anorg 1903, 37 136)

Barium silver metatungstate

(Scheibler)

Barium sodium paratungstate, 2BaO , $3\text{Na}_2\text{O}$,

$12\text{WO}_3+24\text{H}_2\text{O}$ (Marignac), or BaO , $2\text{Na}_2\text{O}$, $7\text{WO}_3+14\text{H}_2\text{O}$ (Scheibler)

Insol in H_2O

Barium sodium tungstate tungsten oxide,

$2\text{BaW}_4\text{O}_{12}$, $3\text{Na}_2\text{W}_5\text{O}_{15}$

$\text{BaW}_4\text{O}_{12}$, $5\text{Na}_2\text{W}_5\text{O}_{15}$ (Engels, Z anorg 1903 37 131)

Bismuth tungstate, Bi_2O_3 , $6\text{WO}_3+8\text{H}_2\text{O}$

Very sol in H_2O with decomp Pptd by alcohol from aqueous solution (Lefort, C R 87 748)

Cadmium tungstate, CdWO_4

Anhydrous

+ H_2O Sol in about 2000 pts H_2O (Lefort)

+ $2\text{H}_2\text{O}$ Insol in H_2O Sol in hot phosphoric or oxalic acids, or in $\text{NH}_4\text{OH}+\text{Aq}$ (Anthon, J pr 9 341)

Sol in $\text{KCN}+\text{Aq}$ (Smith and Bradbury, B 24 2390)

Lead tungstate, PbWO₄

Insol in H₂O or cold HNO₃+Aq Sol in KOH+Aq Decomp by hot HNO₃+Aq (Anthon, J pr 9 342)

Sol in about 4000 pts H₂O (Lefort)
Min *Scheelenate, Stolzite* Sol in KOH+Aq, decomp by HNO₃

Absolutely insol in NH₄NO₃+Aq (Smith and Bradbury, B 24 2930)

Lead ditungstate, PbW₂O₇+2H₂O (?)

Sol in about 80 pts H₂O at 15° (Lefort)

Lead tritungstate, PbW₃O₁₀+2H₂O (?)

Ppt (Lefort)

Lead metatungstate, PbW₄O₁₃+5H₂O

Sl sol in cold, more in hot H₂O Sol in hot HNO₃+Aq (Scheibler, J pr 83 318)

Lead paratungstate, Pb₃W₇O₂₄

Insol in H₂O, dil HNO₃+Aq, (NH₄)₂WO₄+Aq, or Pb(NO₃)₂+Aq Sol in NaOH+Aq or boiling H₃PO₄+Aq (Lotz, A 91 49)

Lead sodium paratungstate, PbO, 4Na₂O, 12WO₃+28H₂O

(Gonzalez)

Lithium tungstate, Li₂WO₄

Rather easily sol in H₂O (Gmelin)

Lithium metatungstate, Li₂W₄O₁₃

Insol in H₂O (Knorre, J pr (2) 27 94)
+xH₂O Syrup (Scheibler)

Lithium paratungstate, Li₁₀W₁₂O₄₁+33H₂O (or Li₆W₇O₂₄+19H₂O)

According to Scheibler, more sol than the paratungstates of the other alkali metals

Lithium tungstate tungsten oxide, Li₂W₅O₁₅

Lithium bronze Insol in H₂O

Lithium potassium tungstate tungsten oxide, Li₂W₈O₁₅, 3K₂W₄O₁₂

Lithium potassium bronze Insol in H₂O (Feit, B 21 135)

Lithium sodium tungstate, Li₂WO₄+3H₂O, 3(Na₂WO₄+3H₂O)

(Traube, N Jahrb Miner, 1894, I 190)

Magnesium tungstate, MgWO₄

Anhydrous Insol in H₂O Gradually decomp by boiling conc HNO₃+Aq (Geuther and Forsberg, A 120 272)

+3H₂O Very sol in H₂O, nearly insol in alcohol (Lefort, A ch (5) 15 329)

+7H₂O Slowly sol in cold, very easily in hot H₂O (Ullik, W A B 56 2 152)

Magnesium ditungstate, MgW₂O₇+8H₂O (?)

Sol in about 100 pts H₂O (Lefort)

Magnesium tritungstate, MgW₃O₁₀+4H₂O(?)

Easily sol in H₂O with gradual decomp (Lefort)

Magnesium metatungstate, MgW₄O₁₃+8H₂O

Sol in H₂O (Scheibler)

Magnesium paratungstate, Mg₃W₇O₂₄+24H₂O

Very difficultly sol in cold, somewhat sol in hot H₂O (Knorre, B 19 825)

Magnesium potassium tungstate, MgWO₄, K₂WO₄

+2H₂O Very sl sol in H₂O (Ullik)
+6H₂O Precipitate

Magnesium potassium paratungstate, 5(2/3K₂O, 1/3MgO), 12WO₃+24H₂O

Insol in cold, sol in hot H₂O (Hallepeau, C R 1898, 127 621)

Magnesium sodium paratungstate, 3MgO, 3Na₂O, 14WO₃+33H₂O

Nearly insol in H₂O (Knorre, B 19 825)

Manganous tungstate, MnWO₄

Min *Hubnerite* Partially sol in HCl+Aq

+2H₂O Insol in H₂O, sol in warm H₃PO₄ and H₂C₂O₄+Aq, sl sol in HC₂H₃O₂+Aq Insol in cold HCl+Aq (Anthon)

+H₂O Sol in about 2500 pts H₂O at 15° (Lefort)

Manganous ditungstate, MnW₂O₇+3H₂O (?)

Sol in about 450 pts H₂O at 15° (Lefort, A ch (5) 15 333)

Manganous tritungstate, MnW₃O₁₀+5H₂O(?)

Decomp by H₂O into MnW₂O₇ and MnW₄O₁₃ (Lefort, A ch (5) 17 480)

Manganous metatungstate, MnW₄O₁₃+10H₂O

Very sol in H₂O (Wyruboff, Bull Soc Min 1892, 15 82)

Manganous paratungstate, 5MnO, 12WO₃+34H₂O

(Gonzalez, J pr (2) 36 44)

Mn₃W₇O₂₄+11H₂O When recently pptd, sol in a small amt of H₂O acidulated with HNO₃ (Lotz)

Manganous potassium tungstate, 2MnO, 3K₂O, 12WO₃+16H₂O

Completely insol in H₂O (Hallepeau Bull Soc 1898, (3) 19 955)

Manganous sodium paratungstate, $3\text{Na}_2\text{O}$, 3MnO , $14\text{WO}_3 + 36\text{H}_2\text{O}$ Sol in H_2O (Knorre, B 19 826)**Manganic sodium tungstate**

See Permanganotungstate, sodium

Mercurous tungstate, Hg_2WO_4 Insol in H_2O (Anthon)

Impossible to obtain pure, as it is decomp into—

 $2\text{Hg}_2\text{O}$, $3\text{WO}_3 + 8\text{H}_2\text{O}$ Sol in 100 pts H_2O at 15° (Lefort)**Mercurous metatungstate**, $\text{Hg}_2\text{W}_4\text{O}_{18} + 25\text{H}_2\text{O}$

Ppt (Scheibler, J pr 83 319)

Mercuric tungstate, HgWO_4 Sl sol in H_2O and very unstable (Lefort, A ch (5) 15 356) 3HgO , 2WO_3 Insol in H_2O (Anthon) 2HgO , 3WO_3 Insol in H_2O (Anthon) 3HgO , $5\text{WO}_3 + 5\text{H}_2\text{O}$ Sol in about 250 pts H_2O at 15° (Lefort) 2HgO , $5\text{WO}_3 + 7\text{H}_2\text{O}$ Decomp by hot or cold H_2O (Lefort, C R 88 798)**Mercuric tritungstate**, $\text{HgW}_3\text{O}_{10} + 7\text{H}_2\text{O}$ (?)Sol in about 120 pts H_2O at 15° (Lefort, A ch (5) 15 360)**Molybdenum tungstate**Easily sol in H_2O Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ or in alcohol of 0.87 sp gr (Berzelius)**Neodymium tungstate**, $\text{Nd}_2(\text{WO}_4)_3$ Very sl sol in H_2O 1 pt is sol in 52630 pts H_2O at 22° , 59580 pts at 65° , 66040 pts at 98° (Hitchcock, J Am Chem Soc 1895, 17 532)**Nickel tungstate**, NiWO_4 $+3\text{H}_2\text{O}$ Sol in about 1000 pts H_2O at 15° (Lefort) $+6\text{H}_2\text{O}$ Insol in H_2O or $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ Sol in boiling $\text{H}_3\text{PO}_4 + \text{Aq}$, $\text{HCl}_2\text{H}_3\text{O}_2 + \text{Aq}$, or in warm $\text{Ni}_4\text{OH} + \text{Aq}$ (Anthon)**Nickel ditungstate**, $\text{NiW}_2\text{O}_7 + 5\text{H}_2\text{O}$ (?)Sol in about 200 pts H_2O (Lefort)**Nickel tritungstate**, $\text{NiW}_3\text{O}_{10} + 4\text{H}_2\text{O}$ (?)Sol in H_2O Pptd by alcohol Decomp by cold or warm H_2O after above pptn (Lefort)**Nickel metatungstate**, $\text{NiW}_4\text{O}_{18} + 8\text{H}_2\text{O}$ Sol in H_2O (Scheibler, J pr 83 273)**Nickel paratungstate**, $\text{Ni}_3\text{W}_7\text{O}_{24} + 14\text{H}_2\text{O}$ Insol in H_2O Sl sol in $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ Completely sol in warm H_3PO_4 or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Anthon)**Potassium tungstate**, K_2WO_4 *Anhydrous* Rather deliquescent Easily sol in H_2O $+ \text{H}_2\text{O}$ Easily sol in H_2O Insol in alcohol $+ 2\text{H}_2\text{O}$ Very sol in H_2O with absorption of heat1 pt dissolves in 194 pts cold, and 0.66 pt boiling H_2O Alcohol does not mix with conc aq solution, but slowly separates out the salt from it Acids, even H_2SO_3 , $\text{HC}_2\text{H}_3\text{O}_2$ or $\text{H}_2\text{C}_2\text{O}_4$, separate out WO_3 from solution (Riche, A ch (3) 50 45)**Potassium ditungstate**, $\text{K}_2\text{W}_2\text{O}_7 + 2\text{H}_2\text{O}$ Sol in about 8 pts H_2O at 15° , but on heating is converted into— $+ 3\text{H}_2\text{O}$ 100 pts H_2O dissolve only 2-3 pts at 15° (Lefort, A ch (5) 9 102)**Potassium tritungstate**, $\text{K}_2\text{W}_3\text{O}_{10} + 2\text{H}_2\text{O}$ Sol in 5-6 pts H_2O at 15° Can be recryst from hot H_2O (Lefort, A ch (5) 9 105)**Potassium metatungstate**, $\text{K}_2\text{W}_4\text{O}_{18} + 5\text{H}_2\text{O}$ Not efflorescent Easily sol in H_2O (Marignac) $(\text{K}_4\text{W}_5\text{O}_{17} + 8\text{H}_2\text{O})$ of Margueritte) $+ 8\text{H}_2\text{O}$ Extremely efflorescent (Scheibler)**Potassium octotungstate**, $\text{K}_3\text{W}_8\text{O}_{28}$ Insol in H_2O (Knorre, J pr (2) 27 49)**Potassium tungstate**, $\text{K}_2\text{W}_{10}\text{O}_{34} + 9\text{H}_2\text{O} = 4\text{K}_2\text{O}$, $10\text{WO}_3 + 9\text{H}_2\text{O}$

Properties resemble the paratungstate (Gibbs, Proc Am Acad 15 11)

 $+ 8\text{H}_2\text{O} = \text{K}_4\text{W}_8\text{O}_{17} + 4\text{H}_2\text{O}$ Sol in 15 pts H_2O at 15° , but decomposed by heating into $\text{K}_2\text{W}_2\text{O}_7$ and $\text{K}_2\text{W}_3\text{O}_{10}$ (Lefort, A ch (5) 9 104) $\text{K}_{10}\text{W}_{14}\text{O}_{47}$ Very difficulty sol in cold, appreciably sol in hot H_2O , probably with decomposition (Knorre)**Potassium paratungstate**, $\text{K}_{10}\text{W}_{12}\text{O}_{41} + 11\text{H}_2\text{O}$ (or $\text{K}_4\text{W}_7\text{O}_{24} + 6\text{H}_2\text{O}$, according to Lotz and Scheibler)Much more sol in hot than cold H_2O (Anthon) Sol in 100 pts H_2O at 16° in 8.5 pts at 100° (Anthon)Sol in 46.5 pts cold and 15.15 pts boiling H_2O (Riche)By shaking the crystals several days at 20° , 1 pt dissolves in 71 pts H_2O If the salt is treated with boiling water, more goes into solution the longer it is boiled, until after several days' boiling 1 pt of the salt dissolved in 552 pts H_2O at 18° Kept in a closed flask, this solution contained after 26 days 1 pt of salt to 11.9 pts H_2O , after 153 days, 1 pt of salt to 15.6 pts H_2O , after 334 days, 1 pt of salt to 15.6 pts H_2O Insol in alcohol (Marignac) $+ 8\text{H}_2\text{O}$

Potassium sodium tungstate, K_2WO_4 , $2Na_2WO_4 + 14H_2O$

Easily sol in hot and cold H_2O (Ullik, W A B 56 2 150)
Deliquescent Sol in 1 pt cold, and $\frac{1}{2}$ pt hot H_2O (Anthon)

Potassium sodium paratungstate, Na_2O , $4K_2O$, $12WO_3 + 15H_2O$

Sol in H_2O (Marignac)
 $\frac{8}{11}Na_2O$, $\frac{3}{11}K_2O$, $12WO_3 + 25H_2O$ Sol in H_2O (Marignac)

Potassium strontium tungstate tungsten oxide, $5K_2W_4O_{12}$, SrW_4O_{12}

(Engels, Z anorg 1903, 37 143)

Potassium uranous tungstate

See Uranosotungstate, potassium

Potassium zirconium tungstate

See Zirconotungstate, potassium

Potassium tungstate tungsten oxide, K_2WO_4 , W_2O_5

Potassium tungsten bronze (Scheibler, J nr 83 321)

$_{12}$ Not attacked by
1 by alkalies (Knorre,

$\frac{4}{3}WO_3$ Not attacked by acids,
or by alkalies + Aq Insol in
(Zettnow, Pogg, 130 262)
a not exist (Knorre)

Potassium sodium tungstate tungsten oxide, $5K_2W_4O_{12} + 2Na_4W_3O_{15}$

Potassium sodium tungsten bronze Properties as potassium bronze

$3K_2W_4O_{12}$, $2Na_4W_3O_{15}$ As above (Knorre, J pr (2) 27 49)

Praseodymium tungstate, $Pr_2(WO_4)_3$

Very sl sol in H_2O

Insol in H_2O at 20° , at 75° , 1 pt is sol in 23,300 pts H_2O (Hitchcock, J Am Chem Soc 1895, 17 529)

Rubidium metatungstate, Rb_2O , $4WO_3 + 8H_2O$

Sol in about 10 pts cold H_2O

Moderately sol in warm H_2O (Wyruboff, Bull Soc Min 1892, 15 69)

Rubidium pentatungstate, $Rb_2W_5O_{18}$

Almost insol in hot H_2O When finely powdered, it is sol in alkali carbonates + Aq (Schaeffer, Z anorg 1904, 38 163)

Rubidium octotungstate, $Rb_2W_8O_{25}$

Insol in H_2O , acids, and alkalies (Schaeffer, Z anorg 1904, 38 103)

Rubidium paratungstate, $5Rb_2O$, $12WO_3 + 18H_2O$

Verv sl sol in H_2O (Schaeffer, Z anorg 1904, 38 173)

Samarium metatungstate, Sm_2O_3 , $12WO_3 + 35H_2O$

Easily sol in H_2O (Cleve)

Samarium sodium tungstate, $Na_3Sm_4(WO_4)_9$

Insol in H_2O Slowly sol in dil acids, easily in conc HCl + Aq (Hogbom, Bull Soc (2) 42 2)

Silver (argentous) tungstate, Ag_2O , $2WO_3$

HNO_3 + Aq separates WO_3 KOH + Aq dissolves out WO_3 and separates Ag_2O (Wohler and Rautenberg, A 114 120)

Does not exist (Muthmann, B 20 983)

Silver tungstate, Ag_2WO_4

Sol in about 2000 pts H_2O at 15° Easily decomp by $NaCl$ + Aq or HNO_3 + Aq (Lefort)

$Ag_2W_2O_7$ Insol in H_2O Nearly insol in $HC_2H_3O_2$ or H_3PO_4 + Aq More sol in KOH , NH_4OH + Aq, or $H_2C_2O_4$ + Aq (Anthon, J pr 9 347)

+ H_2O Sol in about 5000 pts H_2O at 15° (Lefort)

Silver metatungstate, $Ag_2W_4O_{13} + 3H_2O$

Sl sol in H_2O (Scheibler, J pr 83 318)

Nearly insol in H_2O (Rosenheim, Z anorg 1911, 69 250)

Silver paratungstate, $Ag_{10}W_{12}O_{41} + 8H_2O$

(Gonzalez, J pr (2) 36 44)

Silver tungstate ammonia, Ag_3WO_4 , $4NH_3$

Sol in H_2O with rapid decomp (Widmann, Bull Soc (2) 20 64)

Sodium tungstate, $Na_2WO_4 + 2H_2O$

Sol in 4 pts cold, and 2 pts boiling H_2O (Vauquelin and Hecht)

Sol in 1 l pts cold, and 0.5 pt boiling H_2O (Anthon)

Sol in 244 pts H_2O at 0° , 1.81 pts at 15° , 0.81 pt at 100° (Riche)

Solubility in H_2O at t°

t°	% Na_2WO_4	Mols H_2O to 1 mol Na_2WO_4	Mols of anhydrous salt to 100 mols H_2O
-3 5	41 67	22 87	4 37
+0 5	41 73	22 80	4 39
21 0	42 27	22 30	4 48
43 5	43 98	20 80	4 81
80 5	47 65	17 95	5 57
100 0	49 31	16 79	5 95

(Funk, B 1900, 33 3701)

See also +10 H_2O

TUNGSTATE, SODIUM

Sp gr of $\text{Na}_2\text{WO}_4 + \text{Aq}$ at 24.5° containing

5	10	15 % $\text{Na}_2\text{WO}_4 + 2\text{H}_2\text{O}$,
036	1 075	1 119
20	25	30 % $\text{Na}_2\text{WO}_4 + 2\text{H}_2\text{O}$,
166	1 215	1 274
35	40	44 % $\text{Na}_2\text{WO}_4 + 2\text{H}_2\text{O}$
349	1 430	1 492

(Franz, J pr (2) 4. 238)

Sp gr of $\text{Na}_2\text{WO}_4 + \text{Aq}$ at 25°

Sp gr at 20°	Per cent Na_2WO_4	Per cent $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$
1 02016	2 21	2 48
1 03945	4 26	4 78
1 04292	4 59	5 15
1 05831	6 25	7 01
1 07449	7 83	8 79
1 08209	8 61	9 66
1 09687	10 08	11 31
1 12114	12 30	13 81
1 13036	13 16	14 77
1 14392	14 44	16 21
1 16896	16 56	18 62
1 19154	18 52	20 79
1 19938	19 10	21 44
1 20787	19 74	22 16
1 21720	20 59	23 11
1 25041	23 16	25 99
1 25083	23 30	26 15
1 26234	24 05	27 00
1 28143	25 46	28 58
1 33993	29 50	33 11
1 38826	32 68	36 68
1 41072	33 91	38 06
1 47193	37 30	41 87
1 48481	38 20	42 87
1 48595	38 43	43 14

(Pawlewski, B 1900, 33 1224)

$\text{Na}_2\text{WO}_4 + \text{Aq}$ is pptd by HCl , HNO_3 or $\text{H}_2\text{SO}_4 + \text{Aq}$, but not by H_2SO_3 , HI , HCN , oxalic, or tartaric acids + Aq but pptn by the former acids is not prevented by presence of the latter, but when heated with $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, or in presence of $\text{H}_3\text{PO}_4 + \text{Aq}$, mineral acids cause no ppt (Zettnow, Pogg, 130 16)

Much more sol in H_2O_2 than in H_2O (Kellner, Dissert, 1909)

Sl sol in liquid NH_3 (Franklin, Am Ch J 1898, 20 829)

Insol in alcohol (Riche, A ch (3) 50 52)

Insol in methyl acetate (Naumann, B 1909, 42 3790)

+ $10\text{H}_2\text{O}$

Solubility in H_2O at t°

t°	Na_2WO_4	Mols H_2O to 1 mol Na_2WO_4	Mols from 100 m
-5	30 60	37 04	2
-4 0	31 87	34 92	2
-3 5	32 98	33 19	3
-2 0	34 52	30 90	3
0 0	36 54	28 37	3
+3 0	39 20	25 33	3
+5 0	41 02	23 48	4

(Funk, B 1900, 33 3701)

Sodium ditungstate, $\text{Na}_2\text{W}_2\text{O}_7$

Sol in H_2O by heating several h $130-150^\circ$ (Knorre, J pr (2) 27 80)
+ $6\text{H}_2\text{O}$ Sol in 13 pts H_2O at 15 fort, C R 88 798)

Sodium tritungstate, $\text{Na}_2\text{W}_3\text{O}_{11} + 4\text{H}_2\text{O}$

Sol in 1 pt H_2O Decomp on s into sol tetraungstate and insol state (Lefort, C R 88 798)

Neither this nor the other tritungstates Lefort exist, according to Knorre (J 27 49)

Sodium neotungstate, $\text{Na}_2\text{W}_4\text{O}_{13}$

Anhydrous Insol in H_2O
+ $10\text{H}_2\text{O}$ Sol at 13° in 0.935 pt form a solution of 3.02 sp gr (Scheer)
Sol at 19° in 0.195 pt H_2O Precipitated by alcohol

Sodium pentatungstate, $\text{Na}_2\text{W}_5\text{O}_{17}$

Sl sol in H_2O by heating 3 hours (Knorre J pr 2 27 49)

Sodium octatungstate, $\text{Na}_2\text{W}_8\text{O}_{25}$

Insol in H_2O Very difficult by acids and alkalis (Knorre)
+ $12\text{H}_2\text{O}$ Easily sol in cold H_2O be recryst without decomp (J 56, 2 157)

$3\text{Na}_2\text{O}, 8\text{WO}_3 + 17\text{H}_2\text{O}$ Very eff
Very sol in hot H_2O (We Chem Soc 1907 29 112)

Sodium tungstate, Na_2WO_4

+ $10\text{H}_2\text{O}$ (Magnac A ch (3) 50 52)

+ $21\text{H}_2\text{O}$ (Magnac) Much more sol more rapidly than the pentatungstate (Magnac)

$\text{Na}_4\text{W}_3\text{O}_{11} + 7\text{H}_2\text{O}$ Mixture of Na_2WO_4 (Knorre, J pr 2 27 80)

$\text{Na}_4\text{W}_3\text{O}_{11} + 11\text{H}_2\text{O}$ Efforesces in H_2O (Magnac)

100 pts H_2O dissolve 10 pts (Magnac) fort, A ch (3) 9 97

Formula is $4\text{Na}_2\text{O} \cdot 10\text{WO}_3 + 2\text{H}_2\text{O}$ according to Gibbs (Proc Am Acad Sci 1907 13 101)

Sodium paratungstate, $\text{Na}_{10}\text{W}_{12}\text{O}_{41} + 21\text{H}_2\text{O}$
 $+ 25\text{H}_2\text{O}$
 $+ 28\text{H}_2\text{O} = 3\text{Na}_6\text{W}_7\text{O}_{24} + 16\text{H}_2\text{O}$, according
 to Lotz and Scheibler

Sol in 8 pts cold H_2O (Anthon) in 12 6 pts at 22°
 (Forcher)

Sol in about 12 pts H_2O (Marignac)
 The aqueous solution saturated at 35–40°
 contained to 1 pt of the salt, after

1	12	77	227	410 days,
at 18°	18°	18°	16°	20°
9 25	11 26	10 92	11 90	11 74 pts H_2O

The solution saturated by very long boiling,
 after a part of the salt had crystallised out,
 contained, after

1	2	12 days,
0 68	0 91	2 59 pts H_2O to 1 pt salt,
72	222	405 days,
6 88	9 75	8 80 pts H_2O to 1 pt salt

(Marignac)

Decomp by boiling with H_2O (Knorre,
 B 18 2362)

Sodium strontium paratungstate, Na_2O ,
 4SrO , $12\text{WO}_3 + 29\text{H}_2\text{O}$
 (Gonzalez, J pr (2) 36 44)

Sodium strontium tungstate tungsten oxide,
 $5\text{NaW}_5\text{O}_{15}$, $\text{SrW}_4\text{O}_{12}$
 $12\text{Na}_2\text{W}_5\text{O}_{15}$, $\text{SrW}_4\text{O}_{12}$ (Engels, Z anorg
 1903, 37 138)

Sodium thorium tungstate, $\text{Na}_4\text{Th}(\text{WO}_4)_4$
 Insol in H_2O Slowly sol in dil acids,
 easily in conc $\text{HCl} + \text{Aq}$ (Hogbom, Bull
 Soc (2) 42 2)

Sodium ytterbium tungstate, Yb_2O_3 , $9\text{Na}_2\text{O}$,
 12WO_3
 Insol in H_2O (Cleve, Z anorg 1902, 32
 154)

$2\text{Yb}_2\text{O}_3$, $4\text{Na}_2\text{O}$, 7WO_3 Ppt (Cleve)

Sodium yttrium tungstate, $\text{Na}_8\text{Y}_2(\text{WO}_4)_7$
 Insol in H_2O , and very slowly attacked by
 dil acids (Hogbom, Bull Soc (2) 42 2)

Sodium zinc paratungstate, Na_2O , 2ZnO ,
 $7\text{WO}_3 + 15\text{H}_2\text{O}$
 Difficultly sol in cold, more sol in hot H_2O
 (Knorre, B 19 823)
 $+ 21\text{H}_2\text{O}$ (Knorre)

Sodium tungstate tungsten oxide, Na_2WO_4
 W_2O_5

Yellow tungsten bronze Gradually de-
 huesces on air Not decomp by any acid,
 even aqua regia, except Hf , or by alkalis
 (Wohler, Pogg 2 350)
 Correct formula is $\text{Na}_5\text{W}_5\text{O}_{15}$, according
 to Phillip (B 15 499)

Sol in ammoniacal silver solution with
 separation of Ag Easily sol in boiling
 alkaline potassium ferricyanide + Aq
 (Phillip, B 12 2234)

Na_2WO_4 , $2\text{W}_2\text{O}_5$ *Blue tungsten bronze*
 Not attacked by acids or alkalis (Scheibler)
 Correct formula is $\text{Na}_2\text{W}_5\text{O}_{15}$, according
 to Phillip (B 15 506)

Sol in ammoniacal silver solution with
 separation of Ag

$\text{Na}_4\text{W}_5\text{O}_{15}$ Properties as above (Phillip,
 B 15 499)

$\text{Na}_2\text{W}_3\text{O}_9$ Properties as above (Phillip)

Strontium tungstate, SrWO_4

Precipitate (Schultze)

Sol in about 700 pts H_2O (Lefort)

Strontium ditungstate, $\text{SrW}_2\text{O}_7 + 3\text{H}_2\text{O}$ (?)

100 ccm H_2O dissolve 0 35 g at 15° (Le-
 fort, A ch (5) 15 326)

Strontium tritungstate, $\text{SrW}_3\text{O}_{10} + 5\text{H}_2\text{O}$ (?)

Sol in H_2O with decomp into SrW_2O_7 and
 $\text{SrW}_4\text{O}_{13}$ (Lefort, A ch (5) 17 477)

Strontium metatungstate, $\text{SrW}_4\text{O}_{13} + 8\text{H}_2\text{O}$

Solubility as calcium metatungstate
 (Scheibler)

Extraordinarily sol in H_2O (Wyruboff,
 Bull Soc Min 1892, 15 63)

Strontium paratungstate, $\text{Sr}_3\text{W}_7\text{O}_{24} + 16\text{H}_2\text{O}$,
 or $\text{Sr}_3\text{W}_{12}\text{O}_{41} + 27\text{H}_2\text{O}$

Insol in cold, sl sol in hot H_2O (Knorre,
 B 18 327)

Thallous tungstate, TL_2WO_4

Very sl sol in H_2O Sol in hot $\text{Na}_2\text{CO}_3 +$
 Aq (Flemming, J B 1868 250)

Thallous metatungstate, $\text{TL}_2\text{W}_4\text{O}_{13} + 3\text{H}_2\text{O}$

Nearly insol in H_2O (Rosenheim, Z
 anorg 1911, 69 251)

Thallous paratungstate, $5\text{TL}_2\text{O}$, 12WO_3

Insol in H_2O

Sol in $\text{Na}_2\text{CO}_3 + \text{Aq}$ and $\text{KOH} + \text{Aq}$
 decomposed by mineral acids (Schaeffer, Z
 anorg 1904, 38 171)

Thallous hydrogen tungstate, TLHWO_4

Insol in H_2O Difficultly sol in $\text{NH}_4\text{OH} +$
 Aq Easily sol in boiling alkali carbonates
 or hydrates + Aq (Oettinger, J B 1864
 254)

Thorium tungstate

Precipitate (Berzelius)

Insol in H_2O

Tin (stannous) tungstate, $\text{SnWO}_4 + 6\text{H}_2\text{O}$

Insol in H_2O Sol in oxalic acid and in
 $\text{KOH} + \text{Aq}$ Slowly sol in hot $\text{H}_3\text{PO}_4 + \text{Aq}$
 (Anthon, J pr 9 341)

Tin (stannic) tungstate, $9\text{SnO}_2 \cdot 13\text{WO}_3$

Insol in ammonium tungstate + Aq Sol in tin salts + Aq, also in phosphoric, oxalic, or tartaric acids + Aq (Lotz, A 91 49)

Tungsten tungstate, $\text{WO}_2 \cdot \text{WO}_3 = \text{W}_2\text{O}_5$

See Tungsten oxide, W_2O_5

Uranous tungstate, $\text{UO}_2 \cdot 3\text{WO}_3 + 6\text{H}_2\text{O}$

Decomp by $\text{NaOH} + \text{Aq}$ or $\text{HNO}_3 + \text{Aq}$ Sol in $\text{HCl} + \text{Aq}$, but not in H_2SO_4 (Ram-melsberg)

Uranyl tungstate, $\text{UO}_3 \cdot \text{WO}_3 + 2\text{H}_2\text{O}$

Sol in about 100 pts H_2O (Lefort, C R 87 748)

$\text{UO}_3 \cdot 3\text{WO}_3 + 5\text{H}_2\text{O}$ (?) Sol in about 200 pts H_2O (Lefort)

Vanadium tungstate

Sl sol in H_2O

Ytterbium tungstate basic, $(\text{YbO})_2\text{WO}_4$

Ppt (Cleve, Z anorg 1902, 32 153)

Ytterbium metatungstate, $\text{Yb}_2\text{O}_3 \cdot 12\text{WO}_3 + 35\text{H}_2\text{O}$

Very sol in H_2O (Cleve)

Yttrium tungstate, $\text{Y}_2(\text{WO}_4)_3 + 6\text{H}_2\text{O}$

Very sl sol in H_2O , but more sol in $\text{Na}_2\text{WO}_4 + \text{Aq}$ (Berlin)

Zinc tungstate, ZnWO_4

Insol in H_2O (Geuther and Forsberg, A 120 270)

+ H_2O Sol in 500 pts H_2O

Zinc ditungstate, $\text{ZnW}_2\text{O}_7 + 3\text{H}_2\text{O}$ (?)

Sol in 10 pts H_2O at 15° , but solution soon decomposes (Lefort)

Zinc tritungstate, $\text{ZnW}_3\text{O}_{10} + 5\text{H}_2\text{O}$

Insol in boiling H_2O Sol in $\text{ZnSO}_4 + \text{Aq}$, or $\text{Na}_4\text{W}_6\text{O}_{17} + \text{Aq}$ (Gibbs)

Zinc metatungstate, $\text{ZnW}_4\text{O}_{13} + 10\text{H}_2\text{O}$

Easily sol in H_2O Loses crystal H_2O by ignition, and becomes insol in H_2O (Scheibler, J pr 83 273)

+ $8\text{H}_2\text{O}$ More sol in H_2O than magnesian comp (Wyruboff, Bull Soc Min 1892, 15 72)

Zinc tungstate, $\text{Zn}_4\text{W}_{10}\text{O}_{34} + 18\text{H}_2\text{O} = 4\text{ZnO} \cdot 10\text{WO}_3 + 18\text{H}_2\text{O}$

Insol in H_2O Sol in excess of zinc sulphate or of sodium tungstate + Aq (Gibbs, Proc Am Acad 15 14)

+ $29\text{H}_2\text{O}$ (Gibbs)

Zinc paratungstate, $5\text{ZnO} \cdot 12\text{WO}_3 + 37\text{H}_2\text{O}$

(Gonzalez, J pr (2) 36 44)

Zinc tungstate, $\text{Zn}_3\text{W}_{12}\text{O}_{41} + 66\text{H}_2\text{O} = 9\text{ZnO} \cdot 22\text{WO}_3 + 66\text{H}_2\text{O}$

Insol in H_2O (Gibbs)

Zinc tungstate ammonia, $\text{ZnWO}_4 \cdot 4\text{NH}_3 + 3\text{H}_2\text{O}$

Decomp in the air (Briggs Chem Soc 1904, 85 677)

Pertungstic acid

See Pertungstic acid.

Tungstoarsenic acid

See Arsenotungstic acid.

Tungstoboric acid

See Borotungstic acid.

Tungstocyanhydric acid, $\text{H}_4\text{W}(\text{CN})_8 + 6\text{H}_2\text{O}$

Hydroscopic

Sol in H_2O and abs alcohol Insol in ether, benzene etc (Olsson Z anorg 1914, 88 71)

Ammonium tungstocyanide, $(\text{NH}_4)_4\text{W}(\text{CN})_8$

Easily sol in H_2O Aqueous solution decomp slowly

Insol in organic solvents Olsson, Z anorg 1914, 88 62

Cadmium tungstocyanide, $\text{Cd}_2\text{W}(\text{CN})_8 + 8\text{H}_2\text{O}$

Nearly insol in H_2O Sl sol in dil HCl Sol in conc $\text{NH}_4\text{OH} + \text{Aq}$ Insol in organic solvents (Olsson, Z anorg 1914, 88 68)

Cæsium tungstocyanide, $\text{Cs}_4\text{W}(\text{CN})_8$

Easily sol in H_2O forming stable solutions Insol in alcohol and other organic solvents (Olsson)

Calcium tungstocyanide, $\text{Ca}_4\text{W}(\text{CN})_8 \cdot 4\text{H}_2\text{O}$

Easily sol in H_2O Aqueous solution decomp slowly

Insol in organic solvents (Olsson)

Lead tungstocyanide, $\text{Pb}_4\text{W}(\text{CN})_8 \cdot 4\text{H}_2\text{O}$

Sol in H_2O Solution decomp on heating

Insol in organic solvents (Olsson)

Magnesium tungstocyanide, $\text{Mg}_4\text{W}(\text{CN})_8 \cdot 6\text{H}_2\text{O}$

Easily sol in H_2O Aqueous solution decomp on heating

Insol in organic solvents (Olsson)

Manganous tungstocyanide, $\text{Mn}_4\text{W}(\text{CN})_8 \cdot 8\text{H}_2\text{O}$

Insol in H_2O and in acids

Insol in organic solvents (Olsson)

Potassium tungstocyanide, $K_4W(CN)_8 + 2H_2O$

Easily sol in H_2O from which it can be cryst. 10 ccn H_2O dissolve 13-14 g salt at 18°

Insol in alcohol, ether and other organic solvents (Olsson)

Rubidium tungstocyanide, $Rb_4W(CN)_8 + 3H_2O$

Easily sol in H_2O . Can be cryst from H_2O . Insol in alcohol and other organic solvents (Olsson)

Silver tungstocyanide, $Ag_4W(CN)_8$

Insol in H_2O

Insol in acids. Decomp by dil HCl

Sol in hot conc $NH_4OH + Aq$

Insol in organic solvents (Olsson)

Sodium tungstocyanide, $Na_4W(CN)_8 + 2\frac{1}{2}H_2O$

Hydroscopic

Easily sol in H_2O

Insol in organic solvents (Olsson)

Strontium tungstocyanide, $Sr_2W(CN)_8 + 8H_2O, +9H_2O$

Easily sol in H_2O . Aqueous solution decomp on standing

Insol in organic solvents (Olsson)

Thallium tungstocyanide, $Tl_4W(CN)_8$

Difficultly sol in cold H_2O , more sol in hot H_2O

Insol in organic solvents (Olsson)

Zinc tungstocyanide, $Zn_2W(CN)_8 + 4H_2O$

Insol in H_2O , and acids

Sol in conc $NH_4OH + Aq$ (Olsson)

Metatungstioiodic acid

Ammonium metatungstioiodate, $2(NH_4)_2O, 2I_2O_5, 4WO_3 + 12H_2O$

Very sl sol in H_2O (Chrétien, A ch 1898, (7) 15 431)

Potassium tungstioiodate, $K_2H_3WIO_5$

(Blomstrand, J pr (2) 40 327)

$2H_2O, 2I_2O_5, 4WO_3 + 8H_2O$

5.13 g are sol in 1 l H_2O at 15° , 8.25 g at 100° (Chrétien, A ch 1898, (7) 15 431)

Tungstoperiodic acid

Ammonium sodium tungstoperiodate, $2(NH_4)_2O, Na_2O, I_2O_7, 2WO_3 + 16H_2O$

Ppt (Rosenheim, A 1899, 308 64)

Barium tungstoperiodate, $5BaO, I_2O_7, 12WO_3 + 12H_2O$

Ppt (Rosenheim)

Potassium tungstoperiodate, $5K_2O, I_2O_7, 12WO_3 + 8H_2O$

Sol in H_2O (Rosenheim)

Sodium tungstoperiodate, $3Na_2O, I_2O_7, 2WO_3 + 4H_2O$

Ppt

$5Na_2O, I_2O_7, 12WO_3 + 16H_2O$ Sol in H_2O (Rosenheim)

Strontium tungstoperiodate, $5SrO, I_2O_7, 12WO_3 + 28H_2O$

Sol in H_2O (Rosenheim)

Tungstophosphoric acid,

See Phosphotungstic acid

Tungstosilicic acid,

See Silicotungstic acid

Tungstotungstic acid

Lithium tungstotungstate, $Li_2O, WO_3 + WO_3, 3WO_3$

Insol in boiling H_2O and conc HCl (Hallepeau, C R 1898, 127 514)

Potassium tungstotungstate, $K_2O, WO_3 + WO_3, 3WO_3$

Insol in hot H_2O , and conc HCl (Hallepeau, Bull Soc 1899, (3) 21 267)

Tungstous acid

Sodium tungstate, $Na_2W_2O_5$

See Tungstate tungsten oxide, sodium

Tungstovanadic acid

See Vanadotungstic acid

Tungstyl dibromide, WO_2Br_2

Not decomp by cold H_2O (Roscoe)

Tungstyl tetrabromide, $WOBr_4$

Extremely deliquescent. Decomposes at once in moist air or with H_2O

Tungstyl dichloride, WO_2Cl_2

Not decomp by cold, and but slowly by boiling H_2O . Sol in alkalis and ammoni

Tungstyl tetrachloride, $WOCl_4$

Easily decomp by H_2O or moist air

Very sol in CS_2 and S_2Cl_2 . Sl sol in benzene (Smith, J Am Chem Soc 1899, 21 1008)

Tungstyl tetrafluoride, WOF_4

Sol in H_2O with decomp. Very hydroscopic

Insol in carbon tetrachloride

Sl sol in carbon bisulphide, dry benzene and ether

Easily sol in chloroform and absolute alcohol (Ruff, Z anorg 1907, 52 265)

Tungstyl tetrafluoride ammonia, 2WOF_4 , NH_3

Sol in H_2O with decomp
Insol in liquid NH_3 (Ruff, Z anorg 1907, 52 266)

Ultramarine blue, $2\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$, Na_2S_2 (?)

Not attacked by solutions of alkalis or $\text{NH}_4\text{OH} + \text{Aq}$ Decomp by acids or acid salts $+ \text{Aq}$ Decomp by alum $+ \text{Aq}$

Ultramarine green, $\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$, Na_2S (?)

Decomp by mineral acids Not attacked by alkalis Decomp by alum $+ \text{Aq}$

Ultramarine white, $2\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$, Na_2S (?)

Uranic acid, H_2UO_4

Insol in H_2O Sol in acids Very sol in cold dil $\text{HNO}_3 + \text{Aq}$ Sl sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$ Insol in KOH , NaOH , or $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in $(\text{NH}_4)_2\text{CO}_3$, KHCO_3 , and $\text{NaHCO}_3 + \text{Aq}$, less in $\text{KCO}_3 + \text{Aq}$ (Ebelmen)

Easily sol in malic and tartaric acids to form complex compds (Itzig, B 1901, 34 3822)

H_4UO_6 Insol in H_2O , sol in acids (Ebelmen)

Uranates

Insol in H_2O , sol in acids

Ammonium uranate

Sl sol in pure H_2O , insol in H_2O containing NH_4Cl or NH_4OH

Sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$ (Peligot, A ch (3) 5 11)

$(\text{NH}_4)_2\text{O}$, $4\text{UO}_3 + 7\text{H}_2\text{O}$ (Grubler, Dis sert, 1908)

$(\text{NH}_4)_2\text{O}$, $6\text{UO}_3 + 10\text{H}_2\text{O}$ Insol in cold and hot H_2O and alkalis $+ \text{Aq}$ Verv sol in H_2SO_4 , HCl and acetic acid $+ \text{Aq}$ (Zehenter, M 1900, 21 235)

Barium uranate, BaUO_4

Insol in H_2O Sol in dil acids
 BaU_2O_7 As above (Ditte, C R 95 988)

$\text{BaU}_3\text{O}_{10} + 4\frac{1}{2}\text{H}_2\text{O}$ Nearly insol in H_2O , $\text{KOH} + \text{Aq}$ and alcohol

Easily sol in cold dil HCl or HNO_3 and in hot acetic acid (Zehenter, M 1904, 25 200)

$\text{Ba}_2\text{U}_5\text{O}_{17} + 8\text{H}_2\text{O}$ Nearly insol in hot or cold H_2O , $\text{KOH} + \text{Aq}$ and alcohol

Easily sol in cold dil HCl or HNO_3 and in hot acetic acid (Zehenter)

$\text{Ba}_2\text{U}_7\text{O}_{23} + 11\text{H}_2\text{O}$ Same properties as $\text{BaU}_3\text{O}_{10}$ (Zehenter)

Bismuth uranate, Bi_2O_3 , $\text{UO}_3 + \text{H}_2\text{O}$

Min *Uranosphaerite*

Calcium uranate, CaUO_4

Insol in H_2O , sol in dil acids (Ditte, C R 95 988)

CaU_2O_7 Insol in H_2O , sol in dil acids (Ditte)

Cobalt uranate

Insol in H_2O , sol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (Persoz, J pr 3 216)

Sol in $\text{HNO}_3 + \text{Aq}$, insol in $\text{KNO}_3 + \text{Aq}$ (Ebelmen, A ch (3) 5 222)

Cupric uranate, CuU_2O_7

Insol in H_2O (Debray, A ch (3) 61 451)

Lead uranate, PbUO_4

If ignited, very difficultly sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ (Wertheim, J pr 29 228)

Insol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + \text{Aq}$ (Persoz)

3PbO , 2UO_3 Sol in dil $\text{HNO}_3 + \text{Aq}$

(Ditte, A ch (6) 1 338)

$\text{PbU}_{10}\text{O}_{10}$ Insol in H_2O Sol in HNO_3 , Insol in $\text{KOH} + \text{Aq}$, NH_4OH and cold acetic acid Sol in hot acetic acid (Zehenter, M 1904, 25 210)

$\text{PbU}_2\text{O}_{19} + 4\text{H}_2\text{O}$ Insol in hot or cold H_2O Sol in HNO_3 Insol in $\text{KOH} + \text{Aq}$, NH_4OH , alcohol and ether Sl sol in cold, more easily sol in hot acetic acid (Zehenter)

Lithium uranate, Li_2UO_4

Insol in H_2O , but decomp thereby Sol in dil acids

Magnesium uranate, MgUO_4

Insol in H_2O Nearly insol in cold $\text{HCl} + \text{Aq}$ Slowly sol in $\text{HCl} + \text{Aq}$ on warming and more rapidly by addition of a little $\text{HNO}_3 + \text{Aq}$ (Ditte)

MgUO_4 Ppt Berzelius

Neodymium uranate, Nd_2UO_7 $-1\frac{1}{2}\text{H}_2\text{O}$

Ppt (Orloff Ch Z 1907 31 119)

Potassium uranate, K_2UO_4

Insol in H_2O sol in dil acids as NaUO_4 (Ditte)

$\text{K}_2\text{UO}_4 + 6\text{H}_2\text{O}$ Insol in dil acids even acetic acid (B 14 440)

Insol in $\text{KCO}_3 + \text{Aq}$ alkali hydrogen carbonate $+ \text{Aq}$

$\text{HCl} + \text{Aq}$ (Ebelmen A ch (3) 5 222)

K_2O , $4\text{UO}_3 + 5\text{H}_2\text{O}$ (Zehenter M 1900 21 235)

K_2O , $6\text{UO}_3 + 6\text{H}_2\text{O}$ (Drenckmann Zeit ges Nat 17 115)

$+ 10\text{H}_2\text{O}$ Nearly insol in cold H_2O

H_2O Easily sol in hot acetic acid $+ \text{H}_2\text{SO}_4$

HCl and HNO_3 Insol in $\text{KOH} + \text{Aq}$, alcohol and ether (Zehenter M 1900 21 235)

Potassium uranylamine uranate,

Sl sol in H_2O , insol in alcohol (Hofmann, A 1899, 307 318)

Rubidium uranate, RbUO_4

Insol in H_2O (Ditte, A ch (6) 1 338)

Silver uranate, $\text{Ag}_2\text{U}_2\text{O}_7$

Insol in H_2O Easily sol in acids (Alibegoff, A 233 117)

Sodium uranate, Na_2UO_4 (?)

Insol in H_2O , sol in dil acids Sol in alkali carbonates + Aq (Ditte)

$\text{Na}_2\text{U}_2\text{O}_7+6\text{H}_2\text{O}$ Insol in H_2O Sol in dil acids (Stolba, Z anal 3 74)

Na_2O , 3UO_3 Insol in H_2O Easily sol in very dil acids (Drenckmann)

Na_2O , $5\text{UO}_3+5\text{H}_2\text{O}$ Insol in H_2O , alcohol, NH_4OH $\text{KOH}+\text{Aq}$ Sol in HCl , HNO_3 , H_2SO_4 Sl sol even on boiling in conc acetic acid (Zehenter, M 1900, 21 235)

Sodium hydroxylamine uranate,

Sol in H_2O (Hofmann, A 1899, 307 319)
 $\text{UO}_4(\text{NH}_3\text{ONa})_2+6\text{H}_2\text{O}$ Very sol in H_2O (Hofmann)

Strontium uranate, SrUO_4

Insol in H_2O Sol in dil acids
 SrU_2O_7 As above (Ditte, C R 95 988)

Very sl sol in H_2O Sol in all acids especially oxalic

$+\text{H}_2\text{O}$ Very sl sol in H_2O Sol in all acids especially oxalic (J, C C 1896, II 512)

Thallous uranate

Ppt (Bolton, Am Chemist, 1872, 2 456)

Zinc uranate

Insol in H_2O , sol in $\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2+\text{Aq}$ (Persoz, J pr 3 216) Sol in HNO_3+Aq , insol in KNO_3 , and $\text{NH}_4\text{NO}_3+\text{Aq}$ (Ebelmen A ch (3) 5 221)

Peruranic acid

See Peruranic acid

Uranium, U

Not attacked by H_2O Slowly decomp by cold dil $\text{H}_2\text{SO}_4+\text{Aq}$, rapidly on warming Easily sol in dil or conc $\text{HCl}+\text{Aq}$ Fused U is slightly attacked by conc or fuming HNO_3 , or conc H_2SO_4 Amorphous U, however, is easily attacked thereby Not attacked by acetic acid, KOH , NaOH , or $\text{NH}_4\text{OH}+\text{Aq}$ (Zimmermann, B 15 849)

When finely divided, it is decomp by H_2O slowly at ordinary temps and rapidly at 100° (Moissan, C R 1896, 122 1091)

Uranium antimonide, U_3Sb_2

Violently attacked by conc HNO_3 (Colani, C R 1903, 137 383)

Uranium arsenide, U_3As_2

Violently attacked by conc HNO_3 (Colani, C R 1903 137 383)

Uranium boride, UB_2

Sol in HNO_3 and HF Decomp by fused alkalis (Wedekind, B 1913, 46 1204)

Uranium tribromide, UBr_3

Very hygroscopic Sol in H_2O with hissing (Alibegoff, A 233 117)

Uranium tetrabromide, UBr_4

Anhydrous Very deliquescent Sol in H_2O with hissing (Hermann)

Insol in alcohol (v Unruh, Dissert, 1909)

Sol in acetone (Eidmann, C C 1899, II 1014), methyl acetate (Naumann, B 1909, 42 3790), ethyl acetate (Naumann, B 1904, 37 3601)

$+8\text{H}_2\text{O}$ Very deliquescent, and sol in H_2O (Rammelsberg)

Uranium carbide, UC_2

(Ruff and Heinzelmann, Z anorg 1911, 71 72)

Attacked slowly by H_2O Slowly attacked by cold dil HCl , H_2SO_4 or HNO_3+Aq Conc acids, except HNO_3 , react sl in the cold, violently on heating (Moissan, Bull Soc 1897, (3) 17 12)

Sol in fused KNO_3 and KClO_3 , sol in dil acids in the cold and in conc acids on heating, decomp by H_2O (Moissan, C R 1896, 122 276)

Uranium trichloride, UCl_3

Very sol in H_2O (Peligot)

Very unstable (Zimmermann)

Very hygroscopic Sol in H_2O with decomp Sol in conc HCl and solution is much more stable than aqueous one (Rosenheim and Loebel, Z anorg 1908, 57 234)

Uranium tetrachloride, UCl_4

Anhydrous Extremely deliquescent

Sol in H_2O with evolution of heat Decomp on boiling Sol in $\text{NH}_4\text{Cl}+\text{Aq}$ without decomp

HCl increases its solubility in H_2O (Aloy, Dissert 1901)

Sol in alcohol, acetone, acetic ether, benzoic ether Insol in ether, CHCl_3 and C_6H_6 (Loebel)

Sol in ethyl acetate (Naumann, B 1904, 37 3601)

Uranium pentachloride, UCl_5

Deliquescent Sol in H_2O with evolution of heat and decomposition (Roscoe, B 7 1131)

Sol in acetic acid, acetic ether, benzaldehyde, glycerine, benzyl alcohol (trace), nitrobenzene (trace), xylidine and p-toluidine (on warming)

Insol in aniline, ligroin, pyridine, quinoline, phioethyl ether, thioamyl ether and CS_2 (Pummer, Dissert 1904)

Sol in abs alcohol Insol in ether, C_6H_6 , nitrobenzene, ethylene bromide Sl sol in CCl_4 and CHCl_3 Sol in benzoic ether, acetone and trichloroacetic acid Best solvents are ethyl acetate and benzonitrile Sol in many organic compounds containing oxygen (Loebel, Dissert 1907)

Uranum difluoride, $\text{UF}_2 + 2\text{H}_2\text{O}$

Ppt (Giulitti and Agamennone, C C 1906, I 1130)

Uranum tetrafluoride, UF_4

Insol in H_2O Very sl sol in dil acids Sol in hot conc H_2SO_4 , and slowly in warm conc $\text{HNO}_3 + \text{Aq}$ (Bolton, J B 1866 209)

Uranum hexafluoride, UF_6

Very sol in H_2O (Ditte, A ch (6) 1 339)

Fumes in the air

Very hygroscopic, sol in H_2O (Ruff, B 1909, 42 495)

Very hygroscopic Sol in H_2O Nearly insol in CS_2 Insol in paraffine oil Sol in symmetrical tetrachlorethane (best solvent), CHCl_3 , CCl_4 and nitrobenzene (v Unruh, Dissert 1909)

Decomp by H_2O , alcohol and ether Nearly insol in CS_2

Sol in CHCl_3 , CCl_4 , nitrobenzene and $\text{C}_6\text{H}_5\text{Cl}_4$ (Ruff, Z anorg 1911, 72 81)

Uranum hydrogen fluoride, $\text{UF}_6 \cdot 8\text{HF}$ (?)

Sol in H_2O (Ditte)

Is $\text{UO}_2\text{F}_2 \cdot \text{HF} + \text{H}_2\text{O}$ (Smithells)

Uranous hydroxide, $\text{UO}_2 \cdot x\text{H}_2\text{O}$

Easily sol in dil acids

Insol in alkali hydrates and carbonates + Aq (Berzelius)

Sol in alkali carbonates + Aq (Rammelsberg)

$\text{U}(\text{OH})_4$ Sol in dil acids (Aloy, Bull Soc 1899, (3) 21 613)

Uranouranic hydroxide, $\text{U}_3\text{O}_8 \cdot 6\text{H}_2\text{O}$ (?)

Easily sol in acids

Decomp by $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$, which dissolves out UO_3 (Berzelius)

Uranic hydroxide

See Uranic acid

Uranum tetraiodide, UI_4

Sol in H_2O (Guichard, C R 1907, 145 921)

Uranum iodide

Sol in ethyl acetate (Naumann, B 1904 37 3601)

Uranum nitride, U_2N_4

(Colani, C R 1903 137 383)

Uranum suboxide, UO (?)

(Guyard, Bull Soc (2) 1 89)

Does not exist (Zimmermann, A 213 301)

U_2O_3 (?) Ppt Decomp by H_2O and in the air (Pelgrot)

Uranum dioxide (Uranous oxide), UO_2

Insol in dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$

Sol in conc H_2SO_4 , and easily in $\text{HNO}_3 + \text{Aq}$ (Pelgrot)

Insol in $\text{NH}_4\text{Cl} + \text{Aq}$ (Rose)

Only sl sol in H_2SO_4 , but a considerable amount is converted into the sulphate which is nearly insol in H_2SO_4

Slowly sol in HCl, the amount dissolved in a given time varying widely with the method of preparation of the oxide (Colani, C R 1912, 155 1251)

Sl more sol in HNO_3 than in aqua regia. (Raynaud, Bull Soc 1912, (4) 11 802)

Very sol in conc HNO_3 , less sol in dil HNO_3 1 gram is sol in 3100 grams HCl (1 17) at 17° , 4650 grams HBr (1 52) at 17° , 2200 grams H_2SO_4 (1 79) at 17° , 12,000 grams acetic acid at 19° (Raynaud, C R 1911, 153 1481)

Sl attacked by liquid NH_3 (Gore, Am Ch J 1898, 20 830)

Min Uraninite Easily sol in warm $\text{HNO}_3 + \text{Aq}$ Not attacked by $\text{HCl} + \text{Aq}$

Uranum trioxide (Uranic oxide), UO_3

Sol in $\text{HNO}_3 + \text{Aq}$ (Pelgrot)

Insol in boiling K tartrate - Aq Fah lenberg and Hillver, Am Ch J 1894, 16 102

Sol in oleic acid (Gibbons, Arch Pharm 1883, 221 621)

See Uranic acid

Uranum tetroxide, UO_4

Decomp by $\text{HCl} + \text{Aq}$ (Farley Chem Soc 31 133)

+ $2\text{H}_2\text{O}$ Very hygroscopic (Zimmermann)

+ $3\text{H}_2\text{O}$

Uranum pentoxide, U_2O_5

Sol in acids (Pelgrot)

Mixture of UO_3 and U_2O_5 (Rammelsberg, Pogg 59 5)

Mixture of UO and U_3O_8 (Zimmermann A 232 273)

Uranouranic oxide, U_3O_8

Green uranium oxide Very slowly and slightly sol in dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$, more easily when conc Completely sol in boiling H_2SO_4 Easily sol in $\text{HNO}_3 + \text{Aq}$

Solubility in salts + Aq at t°		
Salt solution	t°	Solubility mol per litre
0 05-N NH ₄ Cl + Aq	18	0 01419
	25	0 02246
	35	0 04445
	45	0 07575
	55	0 09544
0 1-N NH ₄ Cl + Aq	18	0 00356
	25	0 00995
	35	0 02347
	45	0 04507
	55	0 06314
0 05-N NH ₄ NO ₃ + Aq	18	0 01433
	25	0 02364
0 1-N NH ₄ NO ₃ + Aq	18	0 00497
	25	0 01050

(Meyer, Z Elektrochem, 1909, 15 267)

Insol in alcohol (v Hauer)

(b) Sol in cold H₂O, from which it is pptd by alcohol (Berzelius)

Ammonium divanadate, (NH₄)₂V₄O₁₁ + 4H₂O

Sol in H₂O, from which it is precipitated by sat NH₄Cl + Aq or alcohol (v Hauer, W A B 21 337)

Correct formula is (NH₄)₃V₇O₁₀ + 2H₂O, according to Rammelsberg (B A B 1883 3) + 3H₂O Very sol in H₂O (Ditte, C R 102 918)

Ammonium trivanadate, (NH₄)₂V₆O₁₆

Anhydrous Nearly insol in hot or cold H₂O (Norblad, B 8 126)

15 g dissolve in 1 litre of boiling H₂O (Ditte, C R 102 918)

+5H₂O Very sl sol in H₂O (Ditte)
+6H₂O (?) Very sol in H₂O (v Hauer, W A B 39 455)

Could not be obtained (Norblad, also Rammelsberg, B A B 1883 3)

Ammonium vanadate, (NH₄)₃V₇O₁₀ + 2H₂O

Correct formula of v Hauer's divanadate, according to Rammelsberg (B A B 1883 3)
Sl sol in H₂O

Ammonium sesquivanadate, (NH₄)₄V₆O₁₇ + 4 or 6H₂O

Very sol in H₂O (Ditte, C R 102 918)

Ammonium pentavanadate, (NH₄)₄V₁₀O₂₇ + 10H₂O

Sol in H₂O (Rammelsberg, B A B 1883 3)

Ammonium hydroxylamine vanadate, VO₂N₃H₁₀

Rapidly decomp by H₂O (Hofmann and Kohlschütter, Z anorg 1898, 16 472)

HVO₃, 3NH₃O, 2NH₃ = VO₂N₃H₁₆ Raptidly decomp by H₂O (Hofmann and Kohlschütter)

Ammonium potassium vanadate, K₂V₄O₁₁ (NH₄)₄V₆O₁₇ + 9H₂O

Sol in H₂O (Ditte, C R 104 1844)

Ammonium sodium vanadate, Na₂V₄O₁₁ (NH₄)₄V₆O₁₇ + 15H₂O

Sol in H₂O (Ditte, C R 104 1841)

Ammonium uranyl vanadate, (NH₄)₂O, 2UO V₂O₅ + H₂O

Insol in H₂O, NH₄OH + Aq, or dil HC₂H₃O₂ + Aq (Carnot, C R 104 1850)

Barium metavanadate, Ba(VO₃)₂ + H₂O

Somewhat sol in H₂O before ignitio Sol in conc H₂SO₄ (Berzelius)

Barium pyrovanadate, Ba₂V₂O₇

Somewhat sol in H₂O (Roscoe)

Barium vanadate, Ba₂V₆O₁₇ + 14H₂O

(Ditte, C R 104 1705)

Ba₃V₁₀O₂₈ + 19H₂O 1 pt is sol in 521 pts H₂O at 20-25° Much more sol in H₂O but decomp by boiling H₂O (v Hauer, W A B 21 344)

Sol in about 5000 pts H₂O (Manasse, C 1886 773)

Ba₄V₁₀O₂₉ + 2H₂O (Norblad)

Bismuth vanadate, Bi₂(VO₄)₂

Min Pucheran Sol in HCl + Aq with evolution of Cl

Cadmium vanadate, Cd(VO₃)₂

(Ditte, C R 102 918)

CdV₆O₁₆ + 24H₂O Sl sol in H₂O (Ditte, C R 104 1705)

Cadmium potassium vanadate, CdK₂V₆O₁₇ + 9H₂O

(Radau, A 251 148)

Cd₃V₁₀O₂₈, K₃V₁₀O₂₈ + 27H₂O 1000 p H₂O dissolve 54 pts at 18° (Radau)

Cadmium vanadate bromide, 3Cd₂(VO₄) CdBr₂

Very sol in dil acids (de Schulten, B Soc 1900, (3) 23 160)

Cadmium vanadate chloride, 3Cd₂(VO₄) CdCl₂

Very sol in dil acids (de Schulten, B Soc 1900, (3) 23 159)

Cæsium metavanadate, CsVO₃

(Chabrie, A ch 1902, (7) 26 228)

Calcium metavanadate, $\text{Ca}(\text{VO}_3)_2 + 4\text{H}_2\text{O}$

Much more sol than $\text{Sr}(\text{VO}_3)_2$, and solution is not precipitated by alcohol (Berzelius)

+ $3\text{H}_2\text{O}$ Sol in H_2O_2 , insol in alcohol
Scheuer, Z anorg 1898, 16 304)

Calcium pyrovanadate, $\text{Ca}_2\text{V}_2\text{O}_7 + 5\text{H}_2\text{O}$

Precipitate

+ $2\text{H}_2\text{O}$ Very sol in dil acids (Ditte)

C R 104 1705)

+ $2\frac{1}{2}\text{H}_2\text{O}$ (Roscoe)

Calcium divanadate, $\text{Ca}_2\text{V}_4\text{O}_{11} + 9\text{H}_2\text{O}$

Easily sol in H_2O (v Hauer)

When fused is nearly insol in H_2O (v Hauer.)

+ $6\text{H}_2\text{O}$ (Manasse, A 240 23)

Calcium trivanadate, $\text{Ca}_3\text{V}_6\text{O}_{17} + 12\text{H}_2\text{O}$

Very sol in H_2O (Ditte, C R 104 1705)

Calcium vanadate, $\text{Ca}_3\text{V}_3\text{O}_{13} + 15\text{H}_2\text{O}$

Sol in H_2O (Manasse, A 204 23)

$\text{Ca}_3\text{V}_4\text{O}_{14} + 7\text{H}_2\text{O}$ (?) Sol in H_2O

Probably a mixture (Manasse, A 240 23)

$\text{Ca}_3\text{V}_{16}\text{O}_{43} + 26\text{H}_2\text{O}$ Sol in H_2O (Manasse, A 240 23)

Calcium copper vanadate, $(\text{Ca}, \text{Cu})_4\text{V}_2\text{O}_9 + \text{H}_2\text{O}$

Min *Volborthite* Sol in $\text{HNO}_3 + \text{Aq}$

Calcium potassium vanadate, $\text{CaK}_3\text{V}_{20}\text{O}_{55} + 22\text{H}_2\text{O}$

Sol in H_2O (Manasse, A 240 23)

Calcium vanadate chloride, $\text{Ca}_3(\text{VO}_4)_2, \text{CaCl}_2$

(Hautefeuille, C R 77 896)

Chromium vanadate, CrVO_4

Absolutely insol in H_2O containing $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ and $\text{HC}_2\text{H}_3\text{O}_2$ (Carnot, C R 104 1850)

Cobaltous metavanadate, $\text{Co}(\text{VO}_3)_2 + 3\text{H}_2\text{O}$

Easily sol in H_2O (Ditte, C R 104 1705)

Cobaltous potassium vanadate, $\text{CoKV}_3\text{O}_{14} + 8\text{H}_2\text{O}$

1000 pts H_2O dissolve 4 8 pts of this salt (Radau, A 251 140)

$\text{Co}_3\text{K}_2\text{V}_{14}\text{O}_{39} + 21\text{H}_2\text{O}$ (Radau)

Cupric metavanadate

Sol in H_2O (Berzelius)

Cupric pyrovanadate, $\text{Cu}_2\text{V}_2\text{O}_7 + 3\text{H}_2\text{O}$

Sol in hot H_2O (Ditte, C R 104 1705)

Could not be obtained (Radau, A 251 150)

Cupric lead vanadate, $5(\text{Cu}, \text{Pb})\text{O}, \text{V}_2\text{O}_5 + 2\text{H}_2\text{O}$

Min *Mottramite*

$3\text{CuO}, \text{V}_2\text{O}_5, 3(3\text{PbO}, \text{V}_2\text{O}_5), 6\text{CuO}_2\text{H}_2 + 12\text{H}_2\text{O}$ Min *Psittacinrite*

Cupric potassium vanadate, $\text{CuKV}_3\text{O}_{14} + 17\text{H}_2\text{O}$

Moderately sol in warm H_2O 100 pts H_2O dissolve 11 1 pts at 18° (Padau, A 251 151)

Didymium vanadate, $\text{Dy}_2(\text{VO}_4)_2$

Precipitate (Cleve)

$\text{Dy}_2\text{V}_{10}\text{O}_{30} + 28\text{H}_2\text{O}$ Precipitate (Cleve, Bull Soc (2) 43 365)

Glucinum metavanadate (?)

Difficultly sol in H_2O (Berzelius)

Glucinum divanadate (?)

Difficultly sol in H_2O (Berzelius)

Indrium metavanadate, $\text{In}(\text{VO}_3)_2 + 2\text{H}_2\text{O}$

Ppt (Renz, Dissert 1902)

Iron (ferrous) metavanadate

Ppt Sol in $\text{HCl} + \text{Aq}$ (Berzelius)

Iron (ferric) metavanadate

Somewhat sol in H_2O (Berzelius)

Lead metavanadate, $\text{Pb}(\text{VO}_3)_2$

Sol in H_2O Easily sol in warm dil $\text{HNO}_3 + \text{Aq}$ Not completely decomp by H_2SO_4 or by boiling with $\text{K}_2\text{CO}_3 + \text{Aq}$ (Berzelius)

Min *Dechenite* Easily sol in dil $\text{HNO}_3 + \text{Aq}$, and decomp by $\text{HCl} + \text{Aq}$

Lead pyrovanadate, basic, $2\text{Pb}_2\text{V O}_7, \text{PbO}$

Insol in boiling H_2O or $\text{HC}_2\text{H}_3\text{O}_2$ Decomp by $\text{HNO}_3 + \text{Aq}$ with separation of V O_5 , which dissolves on warming (Roscoe)

Lead pyrovanadate, $\text{Pb}_2\text{V}_2\text{O}_7$

Sol in warm dil $\text{HNO}_3 + \text{Aq}$ (Ditte, C R 104 1705)

Min *Desclonite* Sol in cold dil $\text{HNO}_3 + \text{Aq}$

Lead divanadate, $\text{Pb}_2\text{V}_4\text{O}_{11}$

(Ditte, C R 104 1705)

Lead orthovanadate, $\text{Pb}_3(\text{VO}_4)_2$

Insol in H_2O (Roscoe, A suppl 8 109)

Lead zinc orthovanadate, $4\text{Pb}_3(\text{VO}_4)_2$

$3\text{Zn}_3(\text{VO}_4)_2$

Min *Eusynchite* Easily sol in $\text{HNO}_3 + \text{Aq}$

Lead zinc vanadate, $(\text{Pb}, \text{Zn})_4\text{V}_2\text{O}_9 + \text{H}_2\text{O}$

Min *Descloizite* Sol in excess of $\text{HNO}_3 + \text{Aq}$

Lead vanadate chloride, $3\text{Pb}_3(\text{VO}_4)_2, \text{PbCl}_2$

Min *Vanadinite* Easily sol in $\text{HNO}_3 + \text{Aq}$

Lithium vanadate, basic, $\text{Li}_3\text{V}_2\text{O}_8 + 6\text{H}_2\text{O}$

Sol in H_2O (Ditte, C R 104 1168)
 $\text{Li}_3\text{V}_2\text{O}_8 + \text{H}_2\text{O}$, and $14\text{H}_2\text{O}$ Sol in H_2O (Ditte)

Lithium metavanadate, LiVO_3

Easily sol in H_2O (Berzelius)
 $+2\text{H}_2\text{O}$ Quite easily sol in H_2O (Rammelsberg, B A B 1883 3)

Lithium divanadate, $\text{Li}_2\text{V}_4\text{O}_{11} + 9\text{H}_2\text{O}$

Very sol in H_2O (Norblad)
 Correct formula is $\text{Li}_3\text{V}_5\text{O}_{14} + 12\text{H}_2\text{O}$ (Rammelsberg)
 $+8$, or $12\text{H}_2\text{O}$ (Ditte, C R 104 1168)

Lithium orthovanadate, Li_3VO_4

Insol in H_2O (Rammelsberg, B A B 1883 3)

Lithium pyrovanadate, $\text{Li}_4\text{V}_2\text{O}_7 + 4\text{H}_2\text{O}$

Very sol in H_2O (Rammelsberg, B 16 1676)
 $+3\text{H}_2\text{O}$ (Ditte, C R 104 1168)

Lithium vanadate, $\text{Li}_3\text{V}_5\text{O}_{14} + 7\text{H}_2\text{O}$

Difficultly sol in H_2O (Rammelsberg)
 $+12\text{H}_2\text{O}$ Very efflorescent Correct formula for v Hauer's divanadate (Rammelsberg)
 $\text{Li}_4\text{V}_6\text{O}_{17} + 16\text{H}_2\text{O}$ Sol in H_2O (Ditte, C R 104 1168)
 $+15\text{H}_2\text{O}$ (Rammelsberg)
 $+11\text{H}_2\text{O}$ (R)
 $+3\text{H}_2\text{O}$ (R)
 $\text{Li}_5\text{V}_4\text{O}_{13} + 15\text{H}_2\text{O}$ Not very easily sol in H_2O (Rammelsberg)
 $\text{Li}_6\text{V}_8\text{O}_{23} + 12\text{H}_2\text{O}$ Moderately sol in H_2O (Rammelsberg)
 $\text{Li}_{10}\text{V}_{12}\text{O}_{36} + 30\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Rammelsberg)

Magnesium metavanadate, $\text{Mg}(\text{VO}_3)_2$

Very easily sol in H_2O (Berzelius)
 $+6\text{H}_2\text{O}$ Very sol in H_2O (Ditte, C R 104 1705)

Magnesium divanadate, $\text{MgV}_4\text{O}_{11} + 8\text{H}_2\text{O}$

Difficultly sol in H_2O , but much more sol than barium divanadate (v Hauer)
 $+9\text{H}_2\text{O}$ (Ditte, C R 104 1705)

Magnesium trivanadate, $\text{Mg}_2\text{V}_6\text{O}_{17} + 4\frac{1}{2}\text{H}_2\text{O}$

Very sl sol in H_2O (Manasse, A 240 23)

Magnesium vanadate, $\text{Mg}_3\text{V}_{10}\text{O}_{28} + 28\text{H}_2\text{O}$

Sol in H_2O (Sugura and Baker, Chem Soc 35 715)

Manganous metavanadate, $\text{Mn}(\text{VO}_3)_2 + 4\text{H}_2\text{O}$

Very sl sol in cold, somewhat more sol in hot H_2O Easily sol in dil acids (Radau, A 251 125)

Sl sol in H_2O_2 , insol in alcohol (Scheuer, Z anorg 1898, 16 304)

Manganous pyrovanadate, $\text{Mn}_2\text{V}_2\text{O}_7$

Sl sol in hot dil $\text{HNO}_3 + \text{Aq}$ (Ditte, C R 96 1048)

Manganous potassium vanadate, $\text{MnKV}_5\text{O}_{14} + 8\text{H}_2\text{O}$

100 pts H_2O dissolve 17 pts salt at 18°
 Easily sol in acids (Radau, A 251 129)
 $3\text{Mn}_3\text{V}_5\text{O}_{23}$, $\text{K}_3\text{V}_5\text{O}_{23} + 54\text{H}_2\text{O}$ (Radau)
 $7\text{Mn}(\text{VO}_3)_2$, $2\text{KVO}_3 + 25\text{H}_2\text{O}$ (Radau)
 $11\text{Mn}(\text{VO}_3)_2$, $2\text{KVO}_3 + 48\text{H}_2\text{O}$ (Radau)

Mercuric vanadate

Sl sol in H_2O

Nickel vanadate, $\text{Ni}(\text{VO}_3)_2$

Sol in H_2O (Ditte, C R 104 1705)

Nickel orthovanadate, $\text{Ni}_3(\text{VO}_4)_2$

Insol in H_2O , sol in $\text{HNO}_3 + \text{Aq}$ (Ditte, C R 96 1049)

Nickel divanadate, $\text{NiV}_4\text{O}_{11} + 3\text{H}_2\text{O}$

Sol in H_2O (Ditte, C R 104 1705)

Nickel potassium vanadate, $5\text{Ni}(\text{VO}_3)_2, 2\text{KVO}_3 + 25\text{H}_2\text{O}$

$\text{Ni}_3\text{K}_3\text{V}_{10}\text{O}_{20} + 17\text{H}_2\text{O}$ Very sl sol in hot H_2O
 $\text{NiKV}_5\text{O}_{14} + 8\text{H}_2\text{O}$
 $2\text{Ni}_3\text{V}_{14}\text{O}_{30}$, $\text{K}_3\text{V}_{14}\text{O}_{30} + 69\text{H}_2\text{O}$ 1000 pts H_2O dissolve 17 pts of salt at 17.5° (Radau, A 251 137)

Potassium vanadate, basic, $\text{K}_3\text{V}_2\text{O}_9 + 20\text{H}_2\text{O}$

Sol in H_2O (Ditte, C R 104 902)

Potassium metavanadate, KVO_3

Anhydrous Slowly sol in cold, more easily in hot H_2O Insol in alcohol (Berzelius)

Completely sol in a little cold H_2O (Norblad)

$+ \text{H}_2\text{O}$ Sol in H_2O (Rammelsberg)
 $+ 1\frac{1}{2}\text{H}_2\text{O}$ (Ditte)
 $+ 1\frac{1}{2}\text{H}_2\text{O}$ (Ditte)
 $+ 2\text{H}_2\text{O}$ (Ditte)
 $+ 3\text{H}_2\text{O}$ (Ditte, C R 104 902)
 $+ 7\text{H}_2\text{O}$ (Rammelsberg)

Potassium divanadate, $K_2V_4O_{11} + 4H_2O$

Sol in cold or lukewarm H_2O Decomp by
 hot H_2O (Rammelsberg)
 + $3H_2O$ (Berzelius)
 + $3\frac{1}{2}H_2O$ Sol in warm H_2O (Norblad)
 + 8 or $10H_2O$ (Litte, C R 104 902)
 + $6H_2O$ (Ephraim, Z anorg 1903, 35 76)

Potassium trivanadate, $K_3V_6O_{18}$

Anhydrous Nearly insol in H_2O (Norblad)
 + $6H_2O$ Insol in cold or hot H_2O (Norblad)
 + 1, and $5H_2O$ (Ditte, C R 104 902)

Potassium orthovanadate, $K_3VO_4 + 4\frac{1}{2}$ or $6H_2O$

Deliquescent Sol in H_2O (Ditte, C R 104 902)
 Decomp by H_2O into $K_4V_2O_7$ and KOH (Rammelsberg, B A B 1883 3)

Potassium pyrovanadate, $K_4V_2O_7 + 3H_2O$

Deliquescent Easily sol in H_2O Insol in alcohol (Norblad)
 + $4H_2O$ (Ditte, C R 104 902)

Potassium vanadate, $K_3V_5O_{14} + 5H_2O$

100 pts H_2O dissolve 19.2 pts at 17.5° (Radau, A 251 120)
 + $4\frac{1}{2}H_2O$ (Radau)
 $K_4V_5O_{17} + 2H_2O$ Slowly sol in H_2O (Rammelsberg)
 + $6H_2O$ (Ditte C R 104 902)
 + $7H_2O$ (Friedheim B 23 1526)
 $K_4V_{10}O_{27} + 12H_2O$ Very sol in H_2O (Manasse, A 240 42)
 $K_{10}V_5O_{25} + 7H_2O$ Sol in H_2O (Rammelsberg)
 $K_2V_8O_{21} + 1\frac{1}{2}H_2O$ Very sl sol in H_2O (Ephraim, Z anorg 1903, 35 75)
 $K_4V_{18}O_{47}$ (Ephraim, Z anorg 1903, 35 78)

Potassium sodium vanadate, $2(2K_2O, 3V_2O_5) + 3(2Na_2O, 3V_2O_5) + 30H_2O$

(Friedheim, Z anorg 1894, 5 442)
 $2K_2O, 3V_2O_5, 4(2Na_2O, 3V_2O_5) + 35H_2O$
 Efflorescent (Friedheim, Z anorg 1894, 5 441)

Potassium strontium vanadate, $K, Sr_3V_{14}O_{39} + 20H_2O$

Sol in H_2O (Manasse, A 240 23)
 $K_2Sr_3V_{14}O_{39} + 30H_2O$ As above (Manasse)
 $K_4Sr_3V_{14}O_{39} + 18H_2O$ As above (Manasse)

Potassium zinc vanadate, $KZnV_5O_{14} + 8H_2O$

1000 pts H_2O dissolve 4.1 pts of the salt (Radau, A 251 145)
 $2K_2V_{14}O_{39}, 3Zn_2V_{14}O_{39} + 90H_2O$ (Radau)

Potassium vanadate cyanide, $K_4V_2O_7, 4KCN + 14H_2O$

Easily decomp
 Insol in alcohol (Petersen Z anorg 1904, 38 343)

Samarium vanadate, $Sm_2O_3, 5V_2O_5 + 28H_2O$

(Cleve)
 + $24H_2O$ (Cleve)

Samarium orthovanadate

Precipitate

Silver metavanadate, $AgVO_3$

Sol in HNO_3 or dil $NH_4OH + Aq$ (Berzelius)
 Insol in liquid NH_3 (Gore, Am Ch J 1898, 20 829)

Silver orthovanadate, Ag_3VO_4

Ppt Easily sol in HNO_3 or $NH_4OH + Aq$ (Roscoe, Proc Roy Soc 18 316)

Silver pyrovanadate, $Ag_4V_2O_7$

Ppt (Roscoe)
 Sol in $NH_4OH + Aq$ (Ditte C R 104 1705)

Silver vanadate, Ag_3VO_3

Sol in 21.414 pts H_2O at 14° and 13.617 pts at 100° (Carnelley A 166 155)

Silver vanadate ammonia, $6AgVO_3, 4NH_3 + 8H_2O$

(Ditte, C R 104 1705)

Sodium vanadate, basic, $Na_3VO_3 \cdot 26$ or $30H_2O$

Very sol in H_2O Ditte

Sodium metavanadate, $NaVO_3$

Anhydrous Slowly sol in cold water in hot H_2O (Norblad)
 100 g H_2O dissolve at
 25° 40° 60° 75
 21.10 26.23 32.97 38.3 g $NaVO_3$
 (McAdam and Pierle J Am Chem Soc 1912, 34 606)

+ $2H_2O$ Easily sol in H_2O
 100 g H_2O dissolve at
 25° 40° 60
 15.23 29.93 65.36 g $NaVO_3$

At 75° a value was obtained which showed that the solid phase had changed in the less solid modification (McAdam and Pierle J Am Chem Soc 1912 34 607)
 + $1\frac{1}{2}H_2O$ (Ditte C R 104 1061)
 + 3, 4 and $5H_2O$ (Ditte)

Sodium divanadate, $Na_2V_4O_{11}$

Anhydrous Sl sol even in warm H_2O but easily sol on addition of acid-

+9H₂O Easily sol in cold H₂O Insol
in alcohol (Norblad)
+5H₂O (Ditte, C R 104 1061)
Not obtained by Rammelsberg (B A B
1883 3)

Sodium trivanadate, Na₂V₃O₁₆+9H₂O

Insol in cold or hot H₂O (Norblad)
Composition is Na₆V₁₈O₄₃+24H₂O (Ram-
melsberg)
+2H₂O (Ditte, C R 104 1061)

anadate, Na₃VO₄+16H₂O

in H₂O, but decomp into
KOH Precipitated by an ex-
(Roscoe, A suppl 8 102)
Fall, Chem Soc 51 96)
12H₂O Less sol in dil NaOH
H₂O (Baker, A 229 286)

anadate, Na₄V₂O₇+18H₂O

in H₂O Insol in alcohol

hol (Ditte, C R 104 1061)
Ditte)

esquivanadate, Na₄V₆O₁₇

amorphous Insol in H₂O or NH₄OH+Aq
(Rammelsberg)

+10H₂O (Norblad)
+16H₂O Efflorescent (Rammelsberg)
+18H₂O (Ditte)

Sodium pentavanadate, Na₄V₁₀O₂₇+3½H₂O

Scarcely sol in H₂O (Rammelsberg)

Sodium vanadate, Na₆V₄O₁₃+6H₂O

Difficultly sol in cold H₂O (Carnelley,
A 166 155)

+2H₂O (Carnelley)
Na₆V₁₆O₄₃+24H₂O Correct formula for
Norblad's trivanadate (Rammelsberg)

Na₂O, 4V₂O₅+7½H₂O (Baragiola, Dis-
sert 1902)

+8½H₂O (Baragiola)
3Na₂O, 5V₂O₅+22H₂O (Prandtl and
Lustig, Z anorg 1907, 53 405)

4Na₂O, 7V₂O₅+33H₂O (Friedheim, Z
anorg 1894, 5 443)

5Na₂O, 8V₂O₅+39H₂O Sol in H₂O
(Friedheim, Z anorg 1894, 5 441)

**Sodium vanadate fluoride, 2Na₃VO₄, NaF+
19H₂O**

Sol in H₂O (Rammelsberg, W Ann 20
928)

Strontium metavanadate, Sr(VO₃)₂+4H₂O

Difficultly sol in cold H₂O (Norblad)

Strontium divanadate, SrV₄O₁₁+9H₂O

Sl sol in H₂O, but much more sol than
barium divanadate (v Hauer)

Sol in H₂O₂+Aq free from H₂SC
Insol in alcohol (Scheuer, Z anorg 189
16 303)

Strontium trivanadate, SrV₆O₁₆+14H₂O

Sol in H₂O, but decomposes slowly (v
boiling Easily sol in hot H₂O acidified
with HC₂H₃O₂, and crystallizes therefrom
without decomp (v Hauer, J pr 76 156)

Strontium tetravanadate, SrV₈O₂₁+11H₂O

Sol in hot H₂O with partial decomposition
(Manasse, A 240 34)

Strontium vanadate, Sr₃V₈O₂₈+14H₂O

Sol in H₂O (Manasse, A 240 23)
Sr₄V₁₄O₃₉+30H₂O Sol in H₂O (Nor-
blad)

Thallous metavanadate, TlVO₃

Sol in 11,534 pts H₂O at 11°, and 47
pts at 100° (Carnelley)

Thallous orthovanadate, Tl₃VO₄

Sl sol in H₂O Sol in 999 pts H₂O at 1°
and 574 p s at 100° (Carnelley, Chem
Soc (2) 11 323)

Thallous pyrovanadate, Tl₄V₂O₇

Sol in 4996 pts H₂O at 14°, and 3840 p
H₂O at 100° (Carnelley)

Thallous vanadate, Tl₁₂V₈O₂₈

Sol in 3406 pts H₂O at 14°, and 533 p
at 100° (Carnelley)

Tl₁₂V₁₀O₃₁ Sol in 9372 pts H₂O at 1
and 3366 pts at 100° (Carnelley)

Tl₁₂V₁₄O₄₁ Ppt (Carnelley)

**Thorium vanadate, Th₃O₁₂(VO)₄, 16V₂O₅
24H₂O (?)**

Sol in H₂O (Cleve)
ThO₂, V₂O₅+6H₂O Sol in acids (Vols
Z anorg 1894 6 167)

Uranyl vanadate, 2UO₃, V₂O₅, (UO₂)₂V₂O₇

Insol in H₂O (Carnot, C R 104 185)

Vanadium vanadate, 2VO₂, V₂O₅=V₄O₉

Insol in H₂O Sol in dil H₂SO₄ or HN
+Aq R n n l l cr.)

Slowly sol in HNO₃+Aq Slow
sol in NH₄OH+Aq Easily sol in HCl+
(Ditte, C R 101 1487)

+2½H₂O (Brierley)
2VO₂, 2V₂O₅+8H₂O Insol in H
(Brierley, Chem Soc 49 31)

Ytterbium vanadate, 3Yb₂O₃, 5V₂O₅+3H₂O

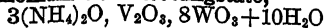
Yb₂O₃, 15V₂O₅ Ppt (Cleve, Z anorg
1902, 32 150)

Yttrium vanadate

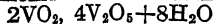
Precipitate (Berzelius)

Inc vanadate, $\text{Zn}(\text{VO}_3)_2 + 2\text{H}_2\text{O}$ Sol in H_2O (Ditte, C R 104 1705)**Inc pyrovanadate, $\text{Zn}_2\text{V}_2\text{O}_7$** Appreciably sol in H_2O (Ditte, C R 6. 1048)**Pervanadic acid**

See Pervanadic acid

Vanadicotungstic acid**Ammonium vanadicotungstate,**Very sol in H_2O

Insol in organic solvents (E F Smith, Am Chem Soc 1903, 25 1227)

Vanadicoxovanadic acid**Ammonium vanadicoxovanadate, $(\text{NH}_4)_2\text{O}$,**Sl sol in cold and warm H_2O (Gibbs, Am Ch J 7 209) $(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_4, 2\text{V}_2\text{O}_5 + 14\text{H}_2\text{O}$ Sol in H_2O (Brierley, Chem Soc 49 30) $3(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_4, 4\text{V}_2\text{O}_5 + 6\text{H}_2\text{O}$ Insol in H_2O (Brierley)**Potassium —, $2\text{K}_2\text{O}, 2\text{V}_2\text{O}_4, \text{V}_2\text{O}_5 + 6\text{H}_2\text{O}$** Sol in hot H_2O (Brierley, Chem Soc 51 30) $5\text{K}_2\text{O}, 2\text{V}_2\text{O}_4, 4\text{V}_2\text{O}_5 + \text{H}_2\text{O}$ Insol in H_2O (Brierley) $\text{K}_2\text{O}, \text{V}_2\text{O}_4, 8\text{V}_2\text{O}_5$ Insol in H_2O Sol in conc H_2SO_4 (Prandtl, B 1905, 18 660)**Sodium —, $2\text{Na}_2\text{O}, 2\text{V}_2\text{O}_4, \text{V}_2\text{O}_5 + 13\text{H}_2\text{O}$** Easily sol in H_2O Insol in conc solutions of salts, especially acetate (Brierley, Chem Soc 49 30) $2\text{Na}_2\text{O}, \text{V}_2\text{O}_4, 5\text{V}_2\text{O}_5$ Insol in H_2O Sol in conc H_2SO_4 Not attacked by boiling with conc HNO_3 Slowly attacked by hot dil $\text{NH}_4\text{OH} + \text{Aq}$ (Prandtl, B 1905, 38 359)**Vanadioarsenic acid**

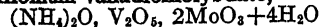
See Arsenovanadic acid

Vanadioiodic acid

See Iodovanadic acid.

Vanadiomolybdic acid, $8\text{MoO}_3, \text{V}_2\text{O}_5 + 5\text{H}_2\text{O}$ Very sl sol, in H_2O , and sl sol in boiling $\text{HNO}_3 + \text{Aq}$ (Ditte, C R 102 757)

Could not be obtained (Friedheim, B 24 1173)

Ammonium vanadiomolybdate,Nearly insol in H_2O (Friedheim and Castendyck, B 1900, 33 1615) $(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 2\text{MoO}_3 + 8\text{H}_2\text{O}$ Nearly insol in H_2O (Friedheim and Castendyck) $2(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 3\text{MoO}_3 + 6\text{H}_2\text{O}$ (Euler-Chelpin, Dissert, 1895) $(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 3\text{MoO}_3 + 17\text{H}_2\text{O}$ (Euler-Chelpin) $2(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 4\text{MoO}_3 + 7\text{H}_2\text{O}$ and $+ 8\text{H}_2\text{O}$ (Euler-Chelpin) $3(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 4\text{MoO}_3 + 7\text{H}_2\text{O}$ (Milch, Dissert Berlin, 1887) $+ 9\text{H}_2\text{O}$ Sol in H_2O (Ditte, C R 102 1019) $+ 11\text{H}_2\text{O}$ Easily sol in H_2O Correct composition of above compounds is $(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5 + 2[(\text{NH}_4)_2\text{O}, 2\text{MoO}_3] + 11\text{H}_2\text{O}$ (Friedheim, B 24 1173)Moderately sol in H_2O and can be recryst therefrom (Euler-Chelpin, Dissert, 1895) $2(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 4\text{MoO}_3 + 11\text{H}_2\text{O}$ Nearly insol in H_2O (Friedheim and Castendyck, B 1900, 33 1615) $2(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 5\text{MoO}_3$ Nearly insol in cold H_2O (Euler-Chelpin, Dissert 1895) $+ 8\text{H}_2\text{O}$ Nearly insol in H_2O (Friedheim and Castendyck, B 1900, 33 1615) $3(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 5\text{MoO}_3 + 8\frac{1}{2}\text{H}_2\text{O}$ Very easily sol in H_2O (Liebert, Dissert 1891) $4(\text{NH}_4)_2\text{O}, 12\text{V}_2\text{O}_5, 5\text{MoO}_3 + 24\text{H}_2\text{O}$ Practically insol in H_2O (Friedheim and Castendyck, B 1900, 33 1615) $2(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 6\text{MoO}_3 + 5\text{H}_2\text{O}$ Sol in a large amount of H_2O (Gibbs, Am Ch J 5 361) $+ 6\text{H}_2\text{O}$ Rather sl sol in H_2O

Easily sol in acids (Liebert, Dissert, 1891)

Composition is double the above formula, or—

 $4(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 12\text{MoO}_3 + 12\text{H}_2\text{O}$ Rather difficultly sol in H_2O Composition is $(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5 + 3[(\text{NH}_4)_2\text{O}, 4\text{MoO}_3]$ (Friedheim) $3(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 6\text{MoO}_3 + 7\text{H}_2\text{O}$ (Isenburg, Dissert, 1901) $5(\text{NH}_4)_2\text{O}, 4\text{V}_2\text{O}_5, 6\text{MoO}_3 + 12\text{H}_2\text{O}$ and $+ 14\text{H}_2\text{O}$ (Euler-Chelpin, Dissert, 1895) $5(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 7\text{MoO}_3 + 13\text{H}_2\text{O}$ and $+ 16\text{H}_2\text{O}$ Sol in H_2O and can be recryst therefrom (Toggenburg, Dissert, 1902) $5(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 8\text{MoO}_3 + 14\text{H}_2\text{O}$ (Stamm, Dissert, 1905) $5(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5, 12\text{MoO}_3 + 10\text{H}_2\text{O}$ Quite easily sol in H_2O Composition is $(\text{NH}_4)_2\text{O}, 2\text{V}_2\text{O}_5 + 4[(\text{NH}_4)_2\text{O}, 3\text{MoO}_3] + 10\text{H}_2\text{O}$ $6(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 12\text{MoO}_3 + 21\text{H}_2\text{O}$ Sol in H_2O Composition is $(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5 + 5(\text{NH}_4)_2\text{O}, 12\text{MoO}_3$ (F) $8(\text{NH}_4)_2\text{O}, 4\text{V}_2\text{O}_5, 13\text{MoO}_3 + 21\text{H}_2\text{O}$ Sol in H_2O (Isenburg, Dissert, 1901) $8(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 18\text{MoO}_3 + 15\text{H}_2\text{O}$ Decomp by hot H_2O (Gibbs) Could not be obtained (Friedheim) $10(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 24\text{MoO}_3 + 10\text{H}_2\text{O}$ Sol in H_2O (Milch) Could not be obtained (Friedheim)

Ammonium barium vanadiomolybdate,
 $5(\text{NH}_4)_2\text{O}, 15\text{BaO}, 6\text{V}_2\text{O}_5, 36\text{MoO}_3$

(Milch)

 $(\text{NH}_4)_2\text{O}, \text{BaO}, \text{V}_2\text{O}_5, \text{MoO}_3 + 6\text{H}_2\text{O}$

(Euler-Chelpin, Dissert, 1895)

 $3(\text{NH}_4)_2\text{O}, \text{BaO}, 3\text{V}_2\text{O}_5, 5\text{MoO}_3 + 9\text{H}_2\text{O}$ Sl sol in cold and hot H_2O (Euler-Chelpin)**Ammonium potassium —, $(\text{NH}_4)_2\text{O}, 3\text{K}_2\text{O}, 2\text{V}_2\text{O}_5, 4\text{MoO}_3 + 5\text{H}_2\text{O}$** Decomp by H_2O (Euler-Chelpin.) $(\text{NH}_4)_2\text{O}, 3\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 5\text{MoO}_3 + 9\text{H}_2\text{O}$
(Euler-Chelpin) $\frac{1}{2}(\text{NH}_4)_2\text{O}, 3\frac{1}{2}\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 5\text{MoO}_3 + 16\text{H}_2\text{O}$ Sol in H_2O (Jacoby, Dissert 1900)**Ammonium sodium —, $(\text{NH}_4)_2\text{O}, \text{Na}_2\text{O}, 2\text{V}_2\text{O}_5, 6\text{MoO}_3 + 12\text{H}_2\text{O}$**

(Euler-Chelpin, Dissert, 1895)

Barium —, $\text{BaO}, \text{V}_2\text{O}_5, \text{MoO}_3 + 7\text{H}_2\text{O}$

(Euler-Chelpin)

Barium —, $3\text{BaO}, 2\text{V}_2\text{O}_5, 6\text{MoO}_3$

(Milch)

 $+ 8\text{H}_2\text{O}$ (Euler-Chelpin) $5\text{BaO}, 4\text{V}_2\text{O}_5, 6\text{MoO}_3 + 28\text{H}_2\text{O}$ Sol in hot H_2O (Euler-Chelpin) $3\text{BaO}, \text{V}_2\text{O}_5, 8\text{MoO}_3 + 2\text{BaO}, \text{H}_2\text{O}, \text{V}_2\text{O}_5, 8\text{MoO}_3 + 28\text{H}_2\text{O}$ Sol in hot H_2O (Gibbs, Am Ch J 5 361) $7\text{BaO}, 3\text{V}_2\text{O}_5, 18\text{MoO}_3 + 16\text{H}_2\text{O} = \text{BaO}, 3\text{V}_2\text{O}_5 + 6(\text{BaO}, 3\text{MoO}_3) + 16\text{H}_2\text{O}$ Sl sol in H_2O $+ 36\text{H}_2\text{O}$ and $+ 48\text{H}_2\text{O}$ (Liebert, Dissert 1891)**Potassium —, $\text{K}_2\text{O}, \text{V}_2\text{O}_5, 3\text{MoO}_3 + 15\text{H}_2\text{O}$** Nearly insol in cold H_2O (Euler-Chelpin, Dissert, 1895) $3\text{K}_2\text{O}, 2\text{V}_2\text{O}_5, 4\text{MoO}_3 + 8\text{H}_2\text{O} = \text{K}_2\text{O}, 2\text{V}_2\text{O}_5 + 2(\text{K}_2\text{O}, 2\text{MoO}_3) + 8\text{H}_2\text{O}$ Very sol in H_2O (Friedheim) $+ 7\text{H}_2\text{O}$ Easily sol in cold H_2O (Euler-Chelpin) $+ 9\text{H}_2\text{O}$ Easily sol in cold H_2O (Euler-Chelpin) $2\text{K}_2\text{O}, 2\text{V}_2\text{O}_5, 5\text{MoO}_3 + 10\text{H}_2\text{O}$ Nearly insol in cold, very sl sol in hot H_2O (Euler-Chelpin) $3\text{K}_2\text{O}, \text{V}_2\text{O}_5, 6\text{MoO}_3 + 5\text{H}_2\text{O}$ (Euler-Chelpin) $2\text{K}_2\text{O}, \text{V}_2\text{O}_5, 6\text{MoO}_3 + 6\text{H}_2\text{O}$ Very sl sol in cold easily sol in hot H_2O (Liebert) $4\text{K}_2\text{O}, 2\text{V}_2\text{O}_5, 12\text{MoO}_3 + 12\text{H}_2\text{O} = \text{K}_2\text{O}, 2\text{V}_2\text{O}_5 + 3(\text{K}_2\text{O}, 4\text{MoO}_3) + 12\text{H}_2\text{O}$ Sl sol in H_2O (Friedheim) $5\text{K}_2\text{O}, 2\text{V}_2\text{O}_5, 12\text{MoO}_3 + 12\text{H}_2\text{O} = \text{K}_2\text{O}, 2\text{V}_2\text{O}_5 + 4(\text{K}_2\text{O}, 3\text{MoO}_3) + 12\text{H}_2\text{O}$ Rather sl sol in H_2O (Friedheim)Sl sol in cold easily sol in hot H_2O (Liebert, Dissert 1891.) $3\text{K}_2\text{O}, \text{V}_2\text{O}_5, 12\text{MoO}_3 + 15\text{H}_2\text{O}$ (Liebert)**Potassium sodium vanadiomolybdate, $\text{K}_2\text{O}, 4\text{Na}_2\text{O}, 2\text{V}_2\text{O}_5, 12\text{MoO}_3 + 18\text{H}_2\text{O}$**

(Euler-Chelpin Dissert 1895)

Sodium —, $2\text{Na}_2\text{O}, \text{V}_2\text{O}_5, 6\text{MoO}_3 + 16\text{H}_2\text{O}$

(Euler-Chelpin, Dissert, 1895)

Vanadiophosphoric acid

See Phosphovanadic acid

Vanadiouselenious acid, $3\text{V}_2\text{O}_5, 4\text{SeO}_2 + 4\text{H}_2\text{O}$ $+ 6\text{H}_2\text{O}$ Difficultly sol in H_2O Can be cryst from H_2O $+ 10\text{H}_2\text{O}$ Difficultly sol in H_2O Can be cryst from H_2O (Prandtl, B 1905, 38 1307)**Ammonium vanadiouselenite,** $4(\text{NH}_4)_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 13\text{H}_2\text{O}$ Sl sol in H_2O Decomp by boiling H_2O $3(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{SeO}_2 + 2\text{H}_2\text{O}$ Ppt (Prandtl, B 1905, 38 1309) $(\text{NH}_4)_2\text{H}_2\text{V}_2\text{O}_{17}, 12\text{SeO}_2 + 2\text{H}_2\text{O}$ Ppt $+ 4\text{H}_2\text{O}$ Ppt (Prandtl, Z anorg 1911, 73 231)**Ammonium silver —, $2\frac{2}{3}(\text{NH}_4)_2\text{O}, 1\frac{1}{3}\text{Ag}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 12\text{H}_2\text{O}, + 16\text{H}_2\text{O}$ and $+ 22\text{H}_2\text{O}$**

(Prandtl, Z anorg 1907, 53 402)

Lithium —, $4\text{Li}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 30\text{H}_2\text{O}$ Very sol in H_2O (Prandtl)**Potassium —, $4\text{K}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 13\text{H}_2\text{O}$** $3\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{SeO}_2$ (Prandtl, B, 1905 38 1309)**Sodium —, $4\text{Na}_2\text{O}, 6\text{V}_2\text{O}_5, 5\text{SeO}_2 + 20\text{H}_2\text{O}$** Verv sol in H_2O (Prandtl Z anorg 1907, 53 403)**Vanadiousulphuric acid, $\text{V}_2\text{O}_5, 3\text{SO}_3 + 3\text{H}_2\text{O}$** Deliquescent Sol in H_2O but is decomp by boiling (Dittc C P 102 757)

See Sulphate, vanadium

Vanadiousulphurous acid**Ammonium vanadiousulphite,** $3(\text{V}_2\text{O}_5, \text{SO}_2), (\text{NH}_4)_2\text{O}, \text{SO}_2 + 4\text{H}_2\text{O}$

(Grun, C R 1907 144 1158)

Cæsium —, $(\text{V}_2\text{O}_5, \text{SO}_2), 3(\text{Cs}_2\text{O}, \text{SO}_2) + 8\text{H}_2\text{O}$

(Grun)

Lithium —, $(\text{V}_2\text{O}_5, \text{SO}_2), 5(\text{Li}_2\text{O}, \text{SO}_2) + 8\text{H}_2\text{O}$

(Grun)

di 5

Potassium vanadiosulphite, $3\text{SO}_2, (\text{V}_2\text{O}_4), \text{SO}_2, (\text{K}_2\text{O}) + 5\text{H}_2\text{O}$
(Gain)

Rubidium —, $(\text{V}_2\text{O}_4, \text{SO}_2), 2(\text{Rb}_2\text{O}, \text{SO}_2) + 2\text{H}_2\text{O}$
(Gain)

Sodium —, $5(\text{V}_2\text{O}_4, \text{SO}_2), (\text{Na}_2\text{O}, \text{SO}_2) + 2\text{H}_2\text{O}$
(Gain)

Thallium —, $3(\text{V}_2\text{O}_4, \text{SO}_2), (\text{Tl}_2\text{O}, \text{SO}_2) + 8\text{H}_2\text{O}$
(Gain)

Vanadiotungstic acid, $6\text{H}_2\text{O}, \text{V}_2\text{O}_5, 10\text{WO}_3 + 16\text{H}_2\text{O}$

Very sl sol in cold, more easily in hot H_2O (Gibbs, Am Ch J 5 361)

$6\text{H}_2\text{O}, \text{V}_2\text{O}_5, 16\text{WO}_3 + 30\text{H}_2\text{O}$ Readily sol in H_2O (Gibbs)

$17\text{H}_2\text{O}, 4\text{V}_2\text{O}_5, 16\text{WO}_3 + 24\text{H}_2\text{O}$ Sl sol in cold, easily in hot H_2O (Rosenheim, A 251 228)

Aluminum sodium vanadiotungstate, $7\text{Al}_2\text{O}_3, 27\text{Na}_2\text{O}, 36\text{V}_2\text{O}_5, 144\text{WO}_3 + 504\text{H}_2\text{O} = 3(\text{Al}_2\text{O}_3, 9\text{Na}_2\text{O}, 48\text{WO}_3), 4(\text{Al}_2\text{O}_3, 9\text{V}_2\text{O}_5) + 504\text{H}_2\text{O}$
Sol in H_2O (Rothenbach, B 23 3055)

Ammonium —, $(\text{NH}_4)_2\text{O}, 3\text{V}_2\text{O}_5, \text{WO}_3 + 6\text{H}_2\text{O}$

Sol in H_2O (Rammelsberg, B 1 158)

$2(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 4\text{WO}_3 + 4\text{H}_2\text{O}$ (Friedheim and Lowy, Z anorg 1984, 6 24)

$4(\text{NH}_4)_2\text{O}, 2\text{H}_2\text{O}, \text{V}_2\text{O}_5, 5\text{WO}_3 + 11\text{H}_2\text{O}$ Sol in H_2O (Gibbs Am Ch J 5 361)

$2(\text{NH}_4)_2\text{O}, \text{V}_2\text{O}_5, 5\text{WO}_3 + 10\text{H}_2\text{O}$ Sol in H_2O (Ditté, C R 102 1019)

$31(\text{NH}_4)_2\text{O}, 14\text{V}_2\text{O}_5, 60\text{WO}_3 + 58\text{H}_2\text{O} = 5[5(\text{NH}_4)_2\text{O}, 12\text{WO}_3], 2[3(\text{NH}_4)_2\text{O}, 7\text{V}_2\text{O}_5]$ Sol in H_2O (Rothenbach, B 23 3051)

$7(\text{NH}_4)_2\text{O}, 4\text{V}_2\text{O}_5, 14\text{WO}_3 + 16\text{H}_2\text{O}$ Sol in H_2O (Rosenheim A 251 197)

$8(\text{NH}_4)_2\text{O}, 4\text{V}_2\text{O}_5, 16\text{WO}_3, 9\text{H}_2\text{O} + 4\text{H}_2\text{O}$ Efflorescent Very sol in H_2O (Rosenheim, A 251 216)

Barium —, $19\text{BaO}, 10\text{V}_2\text{O}_5, 36\text{WO}_3 + 94\text{H}_2\text{O} = 3(5\text{BaO}, 12\text{WO}_3), 2(2\text{BaO}, 5\text{V}_2\text{O}_5) + 94\text{H}_2\text{O}$

Sl sol in H_2O (Rothenbach, B 23 3052)

$8\text{BaO}, 4\text{V}_2\text{O}_5, 16\text{WO}_3, 9\text{H}_2\text{O} + 44\text{H}_2\text{O}$ Efflorescent Not very sol in H_2O (Rosenheim, A 251 218)

$3\text{BaO}, 12\text{WO}_3, 3\text{V}_2\text{O}_5 + 20\text{H}_2\text{O}$ Not easily sol in H_2O (Friedheim and Lowy, Z anorg 1894, 6 18)

$4\text{BaO}, 4\text{V}_2\text{O}_5, 12\text{WO}_3 + 44\text{H}_2\text{O}$ Less sol,

than preceding salt Decomp by boiling or by mineral acids (Rosenheim)

Composition is $4\text{BaO}, 12\text{WO}_3, 3\text{V}_2\text{O}_5 + 30\text{H}_2\text{O}$ (Friedheim)

Calcium vanadiotungstate, $2\text{CaO}, \text{V}_2\text{O}_5, 2\text{WO}_3 + 12\text{H}_2\text{O}$

(Friedheim and Löwy, Z anorg 1894, 6 20)

Magnesium sodium —, $\text{MgO}, 6\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 12\text{WO}_3 + 42\text{H}_2\text{O} = 5\text{Na}_2\text{O}, 12\text{WO}_3 + \text{MgO}, \text{Na}_2\text{O}, 3\text{V}_2\text{O}_5 + 42\text{H}_2\text{O}$

Sol in H_2O (Rothenbach, B 23 3054)

Potassium —, $4\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 12\text{WO}_3 + 30\text{H}_2\text{O}$

Sol in H_2O

Composition is potassium *metatungstate* vanadate, $3(\text{K}_2\text{O}, 4\text{WO}_3) + \text{K}_2\text{O}, 3\text{V}_2\text{O}_5 + 30\text{H}_2\text{O}$ (Friedheim, B 23 1515)

$8\text{K}_2\text{O}, 4\text{V}_2\text{O}_5, 16\text{WO}_3, 9\text{H}_2\text{O} + 24\text{H}_2\text{O}$ Very efflorescent Easily sol in H_2O , (Rosenheim, A 251 214)

Formula is $6\text{K}_2\text{O}, 12\text{WO}_3, 3\text{V}_2\text{O}_5 + 24\text{H}_2\text{O}$, which is a double salt, $5\text{K}_2\text{O}, 12\text{WO}_3 + \text{K}_2\text{O}, 3\text{V}_2\text{O}_5$ (Friedheim, B 23 1505)

Potassium sodium —, $(5\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 22\text{H}_2\text{O}), 4(5\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 22\text{H}_2\text{O})$ or $\text{Na}_2\text{O}, 4\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 22\text{H}_2\text{O}$

(Friedheim and Lowy, Z anorg 1894, 6 22)

$4(5\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 24\text{H}_2\text{O}), 3(5\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 24\text{H}_2\text{O})$ (Friedheim and Lowy)

$5(5\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 24\text{H}_2\text{O}), 5\text{K}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 24\text{H}_2\text{O}$ (Friedheim and Lowy)

Silver —, $8\text{Ag}_2\text{O}, 4\text{V}_2\text{O}_5, 16\text{WO}_3, 9\text{H}_2\text{O}$

Somewhat sol in cold H_2O , more easily upon addition of little HNO_3 Decomp by warm H_2O (Rosenheim, A 251 224)

$3\text{Ag}_2\text{O}, 2\text{V}_2\text{O}_5, 6\text{WO}_3 + 3\text{H}_2\text{O}$ Nearly insol in cold H_2O Decomp by addition of HNO_3 or upon warming (Rosenheim)

Sodium —, $5\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 6\text{WO}_3 + 36\text{H}_2\text{O}$

Sol in H_2O

Composition is $3(\text{Na}_2\text{O}, 2\text{WO}_3) + 2(\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5) + 36\text{H}_2\text{O}$ (Friedheim, B 23 1527)

$+ 38\text{H}_2\text{O}$ Sol in 125 pts H_2O at 13.8° (Friedheim and Lowy)

$2\text{Na}_2\text{O}, 2\text{V}_2\text{O}_5, 3\text{WO}_3 + 20\text{H}_2\text{O}$ Very sol in H_2O

Composition is $\text{Na}_2\text{O}, 3\text{WO}_3 + \text{Na}_2\text{O}, 2\text{V}_2\text{O}_5 + 20\text{H}_2\text{O}$, double salt of sodium *tritungstate* and *divanadate* (Friedheim, B 23 1523)

$4\text{Na}_2\text{O}, 3\text{V}_2\text{O}_5, 12\text{WO}_3 + 38\text{H}_2\text{O} = 3(\text{Na}_2\text{O}, 4\text{WO}_3) + \text{Na}_2\text{O}, 3\text{V}_2\text{O}_5 + 38\text{H}_2\text{O}$ Sol in H_2O (Rothenbach, B 23 3050)

$3\text{Na}_2\text{O}, 4\text{V}_2\text{O}_5, 16\text{WO}_3, 9\text{H}_2\text{O} + 48\text{H}_2\text{O}$

Efflorescent Easily sol in H_2O (Rosenheim, A 251 210)

Formula is $6Na_2O, 12WO_3, 3V_2O_5 + 42H_2O$, and is a double salt of sodium *paratungstate*, $5Na_2O, 12WO_3$, and sodium *trivanadate*, $Na_2O, 3V_2O_5$ (Friedheim, B 23 1505)

$7Na_2O, V_2O_5, 12WO_3 + 29H_2O$ Easily sol in H_2O (Friedheim and Lowy, Z anorg 1894, 6 15)

$8Na_2O, V_2O_5, 14WO_3 + 60H_2O$ and $+66H_2O$ (Friedheim and Lowy)

Strontium vanadotungstate, $19SrO, 36WO_3, 10V_2O_5 + 122H_2O = 3(5SrO, 12WO_3, 2(2SrO, 5V_2O_5) + 122H_2O$

Sol in H_2O (Rothenbach, B 23 3053)

Vanadious acid

See Hypovanadic acid

Vanadovanadicomolybdic acid

Ammonium vanadovanadicomolybdate, $11(NH_4)_2O, 4V_2O_5, VO_3, 28MoO_3 + 48H_2O$

Sl sol in cold, sol in hot H_2O without decomp (Gibbs, Am Ch J 5 391)

Barium —, $14BaO, 2V_2O_5, 3VO_2, 30MoO_3 + 48H_2O$

Very sl sol in cold, decomp (Gibbs)

Vanadovanadicotungstic acid

Ammonium vanadovanadicotungstate, $6(NH_4)_2O, 2V_2O_5, 3VO_2, 12WO_3 + 12H_2O$

Sol in H_2O (Gibbs, Am Ch J 5 391)

Silver —, $6Ag_2O, 2V_2O_5, 3VO_2, 12WO_3 + 8H_2O$

Precipitate Very sl sol in cold, sol in much warm H_2O (Gibbs)

Sodium —, $6Na_2O, 2V_2O_5, 3VO_2, 12WO_3$
Very sol in H_2O (Gibbs)

Vanadium, V

Insol in H_2O , HCl, dil $H_2SO_4 + Aq$, and cold conc H_2SO_4 Sol in hot conc H_2SO_4 Slowly sol in $HF + Aq$ Easily sol in dil or conc $HNO_3 + Aq$ Not attacked by hot or cold $NaOH$ or $KOH + Aq$ (Roscoe, A suppl 7 85)

Does not alter in the air, not acted upon by HCl and very slowly by H_2SO_4 (Moissan, C R 1896, 122 1299)

Vanadium boride, VB

Sol in HF and HNO_3 Decomp by fused alkalis (Wedekind, B 1913, 46 1203)

Vanadium tribromide, VBr₃

Very deliquescent, quickly decomposes (Roscoe, A suppl 8 99)

$+6H_2O$ Sol in H_2O with decomp (Locke and Edwards, Am Ch J 1898, 20 600)

Sol in H_2O , alcohol and ether Insol in HBr (Piccini Z anorg 1899, 19 398)

Vanadium carbide, VC

Insol in HCl and H_2SO_4

Sol in HNO_3 in the cold, and in fused KNO_3 and $KClO_3$ (Moissan, C R 1896, 122 1300)

Vanadium dichloride, VCl₂

Very deliquescent Sol in H_2O , alcohol, and ether (Roscoe, A suppl 7 79)

Vanadium trichloride, VCl₃

Deliquescent Sol in H_2O , absolute alcohol, and ether

$+6H_2O$ Sol in H_2O , sl sol in conc HCl + Aq

Sol in alcohol and ether (Piccini, Z anorg 1899, 19 395)

Vanadium tetrachloride, VCl₄

Sol with decomp in H_2O , alcohol, and ether (Roscoe)

Sol in H_2O with decomp

Sol in fuming HCl with decomp

Sol in anhydrous $CHCl_3$ or glacial acetic acid apparently without chemical change (Koppel, Z anorg 1905, 45 346)

Vanadium difluoride, VF₂

Sol in HF with evolution of H_2 and formation of VF_3 (Manchot, A 1907, 357 135)

Vanadium trifluoride, VF₃

Nearly insol in H_2O and organic solvents (Ruff, B 1911, 44 2544)

$+3H_2O$ Efflorescent Easily sol in cold, extremely sol in hot H_2O with decomp

Can be recryst from $HF + Aq$ Insol in strong alcohol (Petersen, J pr (2) 40 48)

Vanadium tetrafluoride, VF₄

Very hygroscopic

Easily sol in H_2O

Difficultly sol in SO_2Cl_2 and $SiCl_4$

Sol in $POCl_3$ with evolution of gas

Sol in acetone and acetic acid

Difficultly sol in alcohol and $CHCl_3$ (Ruff, B 1911, 44 2545)

Vanadium pentafluoride, VF₅

Easily sol in H_2O

Easily sol in alcohol, $CHCl_3$, acetone, and ligroin Insol in CS_2 Decomp toluene and ether (Ruff, B 1911, 44 2549)

Vanadium trifluoride with MF

See Fluovanadate, M

Vanadium hydride,

Stable Does not react with boiling H_2O
 Not attacked by boiling HCl , but oxidized
 by hot H_2SO_4
 Sol in boiling HNO_3 (Muthmann, A
 1907, 355 86)

Vanadium dihydroxide, VO , $x\text{H}_2\text{O}$

Insol in KOH or $\text{NaOH} + \text{Aq}$
 $\text{V}(\text{OH})_2$ Sol in HCl (Locke and Ed-
 wards, Am Ch J 1898, 20 598)

Vanadium trihydroxide, V_2O_3 , $x\text{H}_2\text{O}$

Easily sol in all acids (Petersen, J pr
 (2) 40 49)

**Vanadium tetrahydroxide (Hypovanadic hy-
 droxide), $\text{V}_2\text{O}_3(\text{OH})_4 + 5\text{H}_2\text{O}$**

Easily sol in acids or alkalis (Crow,
 Chem Soc 30 453)

Vanadium trioxide, $\text{VI}_3 + 6\text{H}_2\text{O}$

Very hygroscopic, sol in H_2O Only sl
 sol in cold conc $\text{HI} + \text{Aq}$
 Sol in alcohol (Piccini, Z anorg 1899,
 19 399)

Vanadium nitride, V_2N

Insol in H_2O , HCl , and $\text{KOH} + \text{Aq}$ Sol
 in $\text{HNO}_3 + \text{H}_2\text{SO}_4$
 Decomp by fusing with KOH (Muth-
 mann, A 1907, 355 93)
 Insol in liquid NH_3 (Gore, Am Ch J
 1898, 20 830)
 VN (Roscoe, A suppl 6 114)
 VN_2 Not attacked by cold $\text{HNO}_3 + \text{Aq}$
 (Uhrlaub, Pogg 103 134)

Vanadium dioxide, VO

Insol in H_2O , easily sol in dil acids
 (Roscoe, A suppl 6 95)

Vanadium trioxide, V_2O_3

Oxidized in H_2O in contact with air and
 then dissolves Insol in acids, except HNO_3 ,
 and in alkalis + Aq (Roscoe, A suppl 6
 99)
 Easily sol in HF (Petersen, J pr (2) 40
 48)

Vanadium tetroxide, VO_2

Sol in acids and alkalis + Aq

Vanadium pentoxide, V_2O_5

Sol in about 1000 pts H_2O (Berzelius)
 Sol in acids, alkali hydrates, and carbon-
 ates + Aq Insol in absolute, very sl sol
 in dil alcohol
 Insol in glacial $\text{HC}_2\text{H}_3\text{O}_2$
 Sol in conc $\text{KF} + \text{Aq}$ (Ditte, C R 105
 1067)
 Sol in $\text{H}_2\text{C}_2\text{O}_4 + \text{Aq}$ and alkali oxalates +
 Aq (Halberstadt, Z anal 22 1)
 Three modifications — (a) Forms hydrates

with 2, and $5\text{H}_2\text{O}$ Sol in H_2O 1 l of sat
 solution contains 8 g V_2O_5

(β) V_2O_5 , $2\text{H}_2\text{O}$ Very sl sol in H_2O 1 l
 of sat solution contains 0.5 g V_2O_5
 (γ) V_2O_5 , $5\text{H}_2\text{O}$ Less sol in H_2O than
 β 1 l H_2O contains 0.05 g V_2O_5 when sat-
 urated (Ditte, C R 101 698)
 See Vanadic acid.

Vanadium oxide, $\text{V}_4\text{O}_{13} = 2\text{VO}_2$, V_2O_5

See Vanadate, vanadium
 V_2O_4 , $\text{V}_2\text{O}_5 + \frac{1}{3}\text{H}_2\text{O}$ (Brierley, Chem
 Soc 49 30)
 See also Vanadiovanadic acid
 V_2O_4 , $2\text{V}_2\text{O}_5 + 8\text{H}_2\text{O}$
 See Vanadate, vanadium

Vanadium pentoxide with MF

See Fluoxyvanadate, M

Vanadium oxy compounds

See Vanadyl compounds

Vanadium silicide, V_2Si

Insol in H_2O
 Not attacked by HCl , HNO_3 or H_2SO_4
 Readily attacked by HF
 Not attacked by $\text{KOH} + \text{Aq}$, $\text{NaOH} + \text{Aq}$
 or NH_4OH Decomp by fused KOH
 Insol in alcohol, ether and benzene
 (Moissan, C R 1902 135 496)
 VSi_2 Sol in HF , insol in acids and al-
 kalies
 Decomp by fused KOH (Moissan, C R
 1902, 135 78)

Vanadium disulphide, V_2S_2

Insol in boiling dil or conc HCl , dil
 $\text{H}_2\text{SO}_4 + \text{Aq}$, or cold conc H_2SO_4 Easily
 sol in hot dil or conc $\text{HNO}_3 + \text{Aq}$, or in
 boiling conc H_2SO_4 Insol in alkalis + Aq
 Sl sol in $\text{KSH} + \text{Aq}$, sol in $\text{NH}_4\text{SH} + \text{Aq}$
 (Kay, Chem Soc 37 728)

Vanadium trisulphide, V_2S_3

Insol in cold HCl or dil $\text{H}_2\text{SO}_4 + \text{Aq}$ Very
 sl sol in hot HCl or dil $\text{H}_2\text{SO}_4 + \text{Aq}$ More
 sol in $\text{HNO}_3 + \text{Aq}$ or conc H_2SO_4 Sl sol
 in NaOH or $\text{NH}_4\text{OH} + \text{Aq}$ Easily sol in
 $(\text{NH}_4)_2\text{S}$ or $\text{NH}_4\text{SH} + \text{Aq}$, also in $\text{KSH} + \text{Aq}$
 (Kay, Chem Soc 37 728)

Vanadium pentasulphide, V_2S_5

Sl attacked by hot conc HCl or hot dil
 $\text{H}_2\text{SO}_4 + \text{Aq}$, sol in hot conc H_2SO_4 Sol in
 hot dil $\text{HNO}_3 + \text{Aq}$ Sl sol in $\text{NH}_4\text{OH} + \text{Aq}$,
 but easily dissolved by $\text{NaOH} + \text{Aq}$ Sl sol
 in $\text{Na}_2\text{S} + \text{Aq}$ Sol in $\text{NH}_4\text{SH} + \text{Aq}$ (Kay)

**Vanadium sulphochloride sulphur chloride,
 4VSCl_3 , S_2Cl_2**

Decomp in the air (Koppel, Z anorg
 1905, 45 357)

Vanadous acid**Ammonium vanadite, basic, $2(\text{NH}_4)_2\text{O}$, V_2O_4**

Sl sol in cold, easily in hot H_2O (Ditte, C R 102 1310)

Ammonium vanadite, $(\text{NH}_4)_2\text{V}_2\text{O}_5 + 3\text{H}_2\text{O}$

Sol in H_2O (Crow, Chem Soc 30 460)
 $+x\text{H}_2\text{O}$ Sol in H_2O
 Insol in alcohol, ether and ammonia
 (Koppel, Z anorg 1903, 36 297)
 $+3\text{H}_2\text{O}$ Easily sol in H_2O (Mawrow, Z anorg 1907, 55 150)

Barium vanadite, $\text{BaV}_2\text{O}_5 + 4\text{H}_2\text{O}$

Ppt (Koppell, Z anorg 1903, 36 300)
 $+5\text{H}_2\text{O}$ Precipitate Easily sol in HNO_3 ,
 or $\text{HCl} + \text{Aq}$ (Crow, Chem Soc 30 460)

Lead vanadite, PbV_2O_5

Ppt (Crow)

Potassium vanadate, $\text{K}_2\text{V}_2\text{O}_5 + 4\text{H}_2\text{O}$

Sol in H_2O
 Insol in alcohol, ether and ammonia
 (Koppel, Z anorg 1903, 36 300)
 $+7\text{H}_2\text{O}$ Easily sol in H_2O Insol in
 cold, sol in hot $\text{KOH} + \text{Aq}$ Insol in alcohol
 (Crow)
 (Ditte, C R 102 1310)

Sodium vanadate, $\text{Na}_2\text{V}_2\text{O}_5 + 4\text{H}_2\text{O}$

Sol in H_2O
 Insol in alcohol, ether and ammonia
 (Koppel, Z anorg 1903, 36 299)
 $+7\text{H}_2\text{O}$ Easily sol in H_2O (Crow, Chem Soc 30 459)

Vanadosotungstic acid**Ammonium vanadosotungstate, $5(\text{NH}_4)_2\text{O}$, $2\text{V}_2\text{O}_5$, $14\text{WO}_3 + 13\text{H}_2\text{O}$**

Vcry sol in H_2O (E F Smith, J Am Chem Soc 1903, 25 1228)

Vanadous acid

See Hypovanadic acid

Vanadovanadic acid

See Vanadicovanadic acid

Vanadyl bromide, VOBr_2

Very sl sol in H_2O , acetic anhydride, ethyl acetate, and acetone
 Insol in alcohol, ether, acetic acid, CHCl_3 , toluene and CCl_4 (Ruff, B 1911, 44 2537)

Vanadyl dibromide, VOBr_2

Very deliquescent, and sol in H_2O (Roscoe)

Vanadyl tribromide, VOBr_3

Very deliquescent, and quickly decomposes in moist air Sol in H_2O (Roscoe)

Vanadyl bromide, $\text{V}_2\text{O}_5\text{Br}_2$, $2\text{HBr} + 7\text{H}_2\text{O}$

Very deliquescent (Ditte, C R 102 1310)

Vanadyl semichloride, $\text{V}_2\text{O}_5\text{Cl}$

Insol in H_2O Easily sol in $\text{HNO}_3 + \text{Aq}$ (Roscoe, A suppl 6 114)

Vanadyl monochloride, VOCl

Insol in H_2O Easily sol in $\text{HNO}_3 + \text{Aq}$ (Roscoe)

Vanadyl dichloride, VOCl_2

Deliquescent Slowly decomp by H_2O
 Easily sol in $\text{HNO}_3 + \text{Aq}$ (Roscoe)

Vanadyl trichloride, VOCl_3

Deliquescent Sol in H_2O and alcohol with decomp (Bedson, A 180 235)
 Sol in ether with combination

Divanadyl chloride, $\text{V}_2\text{O}_5\text{Cl}_2 + 5\text{H}_2\text{O}$

Deliquescent, and sol in H_2O , fuming HCl , or alcohol (Crow, Chem Soc 30 457)

Vanadyl chloride, $\text{V}_2\text{O}_5\text{Cl}_2 + 4\text{H}_2\text{O}$

Very deliquescent (Ditte, C R 102 1310)

Vanadyl platinum chloride

See Chloroplatinate, vanadyl

Vanadyl trichloride ammonia, $\text{VOCl}_3, x\text{NH}_3$

Decomp by H_2O (Roscoe)

Vanadyl difluoride, VOF_2

Insol in H_2O Insol in alcohol, ether, CHCl_3 Sl sol in acetone (Ruff, B 1911, 44 2546)

Vanadyl trifluoride, VOF_3

Very hygroscopic Easily sol in H_2O
 Sol in POCl_3 with evolution of gas Difficultly sol in PCl_3 and AsCl_3 Sol in hot CHCl_3 and acetic anhydride (Ruff, B 1911, 44 2547)

Vanadyl fluoride *wh h* MF

See Fluoxyvanadate, and Fluoxhypovanadate, M

Vanadyl iodide, $\text{V}_2\text{O}_5\text{I}_2, 3\text{HI} + 10\text{H}_2\text{O}$

Very deliquescent and sol in H_2O (Ditte, C R 102 1310)
 $\text{V}_2\text{O}_5\text{I}_2, 2\text{HI} + 8\text{H}_2\text{O}$ As above

Vanadyl sulphide, VOS (?)

(a) Insol in H_2O , alkalis, alkali sulphides + Aq Sol in acids, except nitric acid and aqua regia (Berzelius)

(b) Sol in alkalis, alkali carbonates, and sulphides + Aq Insol in acids (Berzelius)

Water, H₂O

Water is the most universal solvent. It absorbs all gases, usually with an increase of volume, seldom, as in the case of NH₃, with a diminution of volume. It dissolves almost all solids in greater or less quantity, and mixes with or dissolves considerable amounts of many liquids.

Miscible with alcohol Sol in 36 pts ether
Sol in 30-33 vols ethyl acetate (Becker)
Sol in 5 vols iodhydric
Sl sol in most of the fatty oils

Solubility in organic solvents at t°

Solvent	t°	G H ₂ O in 100 g of the solution
Benzene	+3	0.030
	23	0.060
	40	0.114
	55	0.184
	66	0.255
	77	0.337
Petroleum bpt 190-250° at atmos pressure	-2	0.0012
	+18	0.005
	23	0.007
	30	0.008
	36	0.012
	53	0.026
	59	0.031
	61	0.035
	66	0.043
	79	0.063
	85	0.075
	94	0.097
Paraffin oil bpt 200-300° at 10 mm pressur	+16	0.003
	50	0.013
	65	0.022
	73	0.030
	77	0.035
	94	0.055

(Groschuff, Z Elektrochem, 1911, 17 350)

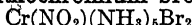
White precipitate, fusible

See Mercuriammonium chloride

White precipitate, infusible

See Mercuric chloramide

Xanthochromium bromide,

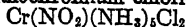


Sol in H₂O. Resembles the chloride (Christensen, J pr (2) 24 74)

Carbonate, Cr(NO₂)(NH₃)₅CO₃

Easily sol in H₂O (Christensen)

Xanthochromium chloride,



More sol in H₂O than the roseo, but less than the purpureo salt

Solution decomp by light or boiling. Decomp by dil acids. Sol in NaOH + Aq and in NH₄OH + Aq (sp gr 0.91). Insol in alcohol (Christensen, J pr (2) 24 74)

Chloroplatinate, Cr(NO₂)(NH₃)₅PtCl₆

Insol in pure H₂O, but sol when warmed with H₂O containing HCl, with formation of a new double salt (Christensen)

Mercuric chloride, Cr(NO₂)(NH₃)₅Cl₂, 2HgCl₂

Precipitate. Decomp by long contact with H₂O (Christensen)

Chromate, Cr(NO₂)(NH₃)₅CrO₄

Difficultly sol in H₂O (Christensen)

Dichromate, Cr(NO₂)(NH₃)₅Cr₂O₇

Difficultly sol in H₂O (Christensen)

Dithionate, Cr(NO₂)(NH₃)₅S₂O₈

Insol in cold H₂O (Christensen)

Hydroxide, Cr(NO₂)(NH₃)₅(OH)₂

Known only in solution (Christensen)

Iodide, Cr(NO₂)(NH₃)₅I₂

Quite difficultly sol in H₂O (Christensen)

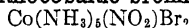
Nitrate, Cr(NO₂)(NH₃)₅(NO₃)₂

Sol in about 150 pts H₂O (Christensen)

Sulphate, Cr(NO₂)(NH₃)₅SO₄ + H₂O

Sol in H₂O and (NH₄)₂SO₄ + Aq (Christensen)

Xanthocobaltic bromide,



Easily sol in cold H₂O (Werner and Miolati, Gazz ch it 23, 2 140)

Bromonitrate, Co(NO₂)(NH₃)₅(NO₃)Br

Sl sol in cold, more easily in hot H₂O (Gibbs)

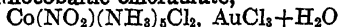
Chloride, Co(NO₂)(NH₃)₅Cl₂

Sl sol in cold H₂O, and decomp by boiling therewith. Insol in HCl + Aq and alkali chlorides + Aq. Easily decomp by boiling with acids, even dilute (Gibbs and Genth)

Sol in 50 pts cold H₂O (Jorgensen Z anorg 5 172)

Mercuric chloride, Co(NO₂)(NH₃)₅Cl₂, 2HgCl₂ + H₂O

Insol in cold, sl sol in hot H₂O without decomp. More sol in acidified H₂O (Gibbs and Genth)

Xanthocobaltic chloraurate,

Can be easily crystallised out of hot H_2O
(Gibbs and Genth, Sill Am J (2) **24** 90)

— **chloronitrate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_3)\text{Cl}$
Sl sol in cold, more easily in hot H_2O

— **chloronitrate gold chloride**,
 $\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_3)\text{Cl}, \text{AuCl}_3$

— **chloronitrate platmic chloride**,
 $2\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_3)\text{Cl}, \text{PtCl}_4$

— **chloroplatinate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{Cl}_2$,
 $\text{PtCl}_4 + \text{H}_2\text{O}$

Scarcely sol in hot or cold H_2O Can be
recryst from dil $\text{HNO}_3 + \text{Aq}$ Sol in hot dil
 $\text{HCl} + \text{Aq}$ (Gibbs and Genth, Sill Am J (2)
24 91)

— **chromate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{CrO}_4 + \text{H}_2\text{O}$
Very sl sol in cold, and but slightly sol in
hot H_2O (Gibbs)

— **dichromate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{Cr}_2\text{O}_7$
Easily sol in hot H_2O

— **ferrocyanide**, $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]_2\text{Fe}(\text{CN})_6$
 $\perp 7\text{H}_2\text{O}$
insol in cold, decomp by warm
 $+ 6\text{H}_2\text{O}$ (Braun, A **132** 47)

— **iodide**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{I}_2$
Sol in H_2O (Gibbs)

— **iodosulphate**,
 $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]_2(\text{SO}_4)_2\text{I}_2$
Sol in H_2O

— **periodosulphate**,
 $[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]_2(\text{SO}_4)_2\text{I}_4$
Easily decomp by hot H_2O

— **nitrate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_3)_2$
Sl sol in cold, moderately sol in hot H_2O
Decomp by boiling Much less sol than
 NH_4Cl or $(\text{NH}_4)_2\text{SO}_4$ in cold H_2O Insol in
 HNO_3 (Gibbs and Genth)

— **nitrite**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_2)_2 + 2\text{H}_2\text{O}$
Sol in H_2O (Gibbs)

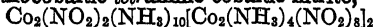
— **cobaltic nitrite**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5(\text{NO}_2)_2$
 $+ 2\text{H}_2\text{O}$

Sl sol in H_2O (Gibbs, Proc Am Acad
11 8)

Is nitratopurpureocobaltic cobaltic nitrite,

$[(\text{NO}_2)\text{Co}(\text{NH}_3)_5]_3[\text{Co}(\text{NO}_2)_6]_2 + 2\text{H}_2\text{O}$ (Jor-
gensen, Z anorg **5** 175)

$[\text{Co}(\text{NO}_2)(\text{NH}_3)_5]_3[\text{Co}(\text{NO}_2)_6]_2$ Not so
difficultly sol as the luteo salt (Jorgensen)

Xanthocobaltic tetramine cobaltic nitrite,

Can be recryst from hot H_2O (Gibbs,
Proc Am Acad **11** 8)

$= (\text{NO}_2)\text{Co}(\text{NH}_3)_5[(\text{NO}_2)_2(\text{NH}_3)_2\text{Co}(\text{NO}_2)_2]_2$
Xanthocobaltic diamine cobaltic nitrite
Very sl sol in cold H_2O (Jorgensen, Z
anorg **5** 180)

— **oxalate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{C}_2\text{O}_4$

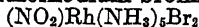
Nearly insol in cold, sl sol in hot H_2O

— **sulphate**, $\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{SO}_4$

Moderately sol in hot, much less in cold
 H_2O Sol without decomp in $\text{H}_2\text{SO}_4 + \text{Aq}$
(Gibbs and Genth)

Sol in 25 pts hot H_2O acidified with
 $\text{HCl} \cdot \text{H}_2\text{O}_2$ (Jorgensen, Z anorg **5** 172)

$4\text{Co}(\text{NO}_2)(\text{NH}_3)_5\text{SO}_4, 3\text{H}_2\text{SO}_4$ Decomp
by H_2O , not by absolute alcohol (Jorgensen)

Xanthorhodum bromide,

Moderately sol in H_2O (Jorgensen, J
pr (2) **34** 394)

— **chloride**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{Cl}_2$

Much more sol in H_2O than the nitrate

— **chloroplatinate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{PtCl}_6$
Ppt Extremely sl sol in cold H_2O

— **dithionate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{S}_2\text{O}_6 + \text{H}_2\text{O}$
Nearly insol in H_2O

— **fluosilicate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{SiF}_6$
Ppt

— **hydroxide**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5(\text{OH})_2$

— **nitrate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5(\text{NO}_3)_2$

Moderately sol in cold, easily in hot H_2O
Insol in alcohol Less sol in conc $\text{NH}_4\text{OH} +$
 Aq than in H_2O

Insol in dil $\text{HNO}_3 + \text{Aq}$, sol in $\text{HNO}_3 + \text{Aq}$
of 1 4 sp gr

— **oxalate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{C}_2\text{O}_4$

Nearly insol in cold H_2O Very sl sol in
warm H_2O Easily sol in dil $\text{HCl} \cdot \text{H}_2\text{O}_2 + \text{Aq}$

— **sulphate**, $(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{SO}_4$

Slowly sol in cold, quite easily in hot H_2O
 $4(\text{NO}_2)\text{Rh}(\text{NH}_3)_5\text{SO}_4, 3\text{H}_2\text{SO}_4$ Sl sol in
cold, easily in hot H_2O Can be recrystal-
lized from dil $\text{H}_2\text{SO}_4 + \text{Aq}$

Xenon, XeAbsorption by H_2O at t°

t°	Absorption coefficient
0	0 2189
10	0 1500
20	0 1109
30	0 0900
40	0 0812
50	0 0878

(Antropoff, Roy Soc Proc 1910, **83** A, 480)**Ytterbium, Yb****Ytterbium bromide, $\text{YbBr}_3 + 8\text{H}_2\text{O}$** Very sol in H_2O Hydrosopic (Cleve, Z anorg 1902, **32** 135)**Ytterbium chloride, $\text{YbCl}_3 + 6\text{H}_2\text{O}$** Very sol in H_2O (Cleve, Z anorg 1902, **32** 134)Mpt $150-155^\circ$ Anhydrous salt is sol in H_2O and in alcohol (Matignon, A ch 1906, (8) **8** 442)**Ytterbium oxide, Yb_2O_3** Slowly attacked by cold or warm acids, but easily sol at 100° **Ytterbium oxychloride, YbOCl** Ppt (Cleve, Z anorg 1902, **32** 135)**Yttrium, Y**Decomposes H_2O (Cleve, Bull Soc (2) **21** 344) Decomp H_2O slightly at ord temp, more rapidly by boiling Easily sol in dil acids, even acetic acid Slightly acted upon by conc H_2SO_4 Decomposes hot $\text{KOH} + \text{Aq}$ and cold $\text{NH}_4\text{Cl} + \text{Aq}$ Not attacked by $\text{NH}_4\text{OH} + \text{Aq}$ (Popp, A **131** 179)

Popp's yttrium contained erbium

Yttrium bromide, YBr_3 Sol in H_2O with evolution of heat (Duboin, C R **107** 243) $+9\text{H}_2\text{O}$ Deliquescent Easily sol in H_2O and alcohol Insol in ether (Cleve)**Yttrium carbide, YC_2** Decomp by H_2O and by dil acids, very slowly attacked by conc acids (Moissan, C R 1896, **122** 575)Decomp by H_2O and dil acids (Pettersson, B 1895, **28** 2421)**Yttrium chloride, YCl_3** Anhydrous Sol in H_2O with evolution of heat (Cleve) $+6\text{H}_2\text{O}$ Deliquescent Very sol in H_2O Sl sol in alcohol Insol in ether (Cleve)Mpt $156-160^\circ$, sol in alcohol60 l grams anhydrous salt are sol in 100 grams of abs alcohol at 15°
65 grams are sol in 100 grams pyridine (Matignon, A ch 1906, (8) **8** 437)**Yttrium fluoride, $\text{YF}_3 + \frac{1}{2}\text{H}_2\text{O}$**

Nearly insol in dil acids (Cleve)

Yttrium hydroxide, $\text{Y}_2\text{O}_3, 6\text{H}_2\text{O}$ or $\text{Y}_2\text{O}_3\text{H}_6 + 3\text{H}_2\text{O}$ Insol in H_2O Insol in KOH or $\text{NaOH} + \text{Aq}$ Easily sol in acids Sol in alkali carbonates $+ \text{Aq}$ When freshly pptd, easily sol in $\text{NH}_4\text{Cl} + \text{Aq}$ **Yttrium iodide, YI_3** Very deliquescent Easily sol in H_2O and alcohol

Sl sol in ether (Cleve)

Yttrium oxide, Y_2O_3 Insol in H_2O Sl sol in cold HCl , HNO_3 , or dil $\text{H}_2\text{SO}_4 + \text{Aq}$, but gradually completely sol on warming Insol in NH_4OH and sl sol in $\text{KOH} + \text{Aq}$ Sol in $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$ Somewhat sol in $\text{K}_2\text{CO}_3 + \text{Aq}$ **Yttrium peroxide, Y_4O_7** (Cleve, Bull Soc (2) **43** 53)**Yttrium oxychloride, $\text{Y}_2\text{O}_2\text{Cl}_2$** Insol in H_2O (Popp)**Yttrium sulphide, Y_2S_3** Not prepared in pure state Impure is insol in H_2O , and partially decomp thereby Easily sol in acids with decomp (Popp)**Zinc, Zn**Not attacked by pure cold H_2O Slowly oxidised by boiling H_2O Pure H_2O free from O dissolved nothing from 2500 sq mm Zn Presence of air containing CO_2 caused a solution of 35 mg Zn, which maximum was reached in 2 days Air without CO_2 also caused a slight action (Snyders, B **11** 936)100 ccm distilled H_2O dissolved 14 mg Zn from 118 sq cm in one week, during which air free from CO_2 was passed through the liquid and 19 mg when air containing CO_2 was used (Wagner, Dingl **221** 260)Filtered rain water was found to contain 20 mg Zn per l (Burg, Isis, **1873** 119)Very pure H_2O , when conducted through a great length of galvanized iron pipe, contained 17 pts Zn to 100,000 pts H_2O (Davies, J Soc Chem Ind 1899, **18** 102)Action of H_2O on Zn in galvanized pipes is caused by electrolysis (Smetham, C N 1879, **39** 236)All kinds of H_2O attack Zn, rain water the leastIn distilled H_2O exposed to air Zn is abun-

dantly coated with $\text{ZnCO}_3 \cdot 2\text{ZnO} \cdot 3\text{H}_2\text{O}$. By allowing 32 g Zn to stand in 270 cc distilled H_2O in a flask loosely stoppered with filter paper, 1.2 pts Zn to 100,000 pts H_2O was found in solution in 1-2 days (Smith, J Soc Chem Ind 1904, 23 475)

Sol in all acids. Very slowly sol in dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$ in glass vessels if Zn is pure. According to Jacquelin, 24 hours were necessary to dissolve 6 g pure zinc. When fused at the lowest possible temperature, it is much more slowly sol than when heated to a red heat. In both cases it is much more rapidly dissolved if cooled quickly (Bolley, A 95 294, Rammelsberg)

Dil $\text{H}_2\text{SO}_4 + \text{Aq}$ dissolves given % zinc in the same length of time (B=according to Bolley, R=according to Rammelsberg)

	Slowly cooled		Rapidly cooled	
	B	R	B	R
Cast at the melting point	42 5	74 1	13 0	0 9
Cast at a red heat	100 0	69 4	85 5	9 5

50 cc $\text{H}_2\text{SO}_4 + \text{Aq}$ dissolved in 2 hours the following amts from 1 sq cm Zn at t°

t°	Strength of acid	Grms dissolved
20	H_2SO_4	0 000
130	"	0 075
150	"	0 232
20	$\text{H}_2\text{SO}_4 + \text{H}_2\text{O}$	0 002
130	"	0 142
150	"	0 345
20	$\text{H}_2\text{SO}_4 + 2\text{H}_2\text{O}$	0 002
130	"	4 916
150	"	5 450
20	$\text{H}_2\text{SO}_4 + 3\text{H}_2\text{O}$	0 005
130	"	3 080
20	$\text{H}_2\text{SO}_4 + 4\text{H}_2\text{O}$	0 049
130	"	0 456
20	$\text{H}_2\text{SO}_4 + 5\text{H}_2\text{O}$	0 027
130	"	0 337
20	$\text{H}_2\text{SO}_4 + 6\text{H}_2\text{O}$	0 018
100	"	3 16

(Calvert and Johnson, Chem Soc 19 437)

C P zinc is more quickly sol in dil acids in vacuo than under normal pressure, the ratio being about 1.65. The rate of solubility increases slowly with rise of temp from 0° to 98°, when it amounts to about 4 times that at 0°, but from 98°-100° the increase is thirteenfold. Thus, as an average of 6 experiments, dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (1.20) dissolves in 30 minutes 2.1 mg Zn at 0°, 4.9 mg at 20°, 7.4 mg at 60°, 9.3 mg at 98°, but 122.1 mg at 100°. If, however, the acid was prevented from boiling by increasing the pressure, the sudden increase between 98° and 100° does not take place.

The rate of solubility in dil $\text{H}_2\text{SO}_4 + \text{Aq}$ (1.20) is also increased 175 times by the addition of CrO_3 and 306 times by the addition of H_2O_2 . The above phenomena are explained by assuming the formation of a condensed hydrogen atmosphere around the metal, which prevents the further action of the acid (Weeren, B 24 1785)

Not attacked by $\text{HNO}_3 + \text{Aq}$ of 1.512 to 1.419 sp gr at a temp of -18° or less, but violently attacked if temp is raised. $\text{HNO}_3 + \text{Aq}$ of 1.419-1.401 sp gr does not attack Zn at temp of a freezing mixture, but violently at 0°. More dil $\text{HNO}_3 + \text{Aq}$ attacks Zn even at -20° (Millon, A ch (3) 6 99)

Sol in $\text{H}_2\text{CO}_3 + \text{Aq}$ (Berzelius)

Solubility of Zn in acids is very much affected by the presence of small quantities of various metallic salts. Small amts of $\text{PtCl}_4 + \text{Aq}$ accelerated the action of $\text{H}_2\text{SO}_4 + \text{Aq}$ 149 times, and As_2O_3 123 times. HgCl_2 has a strong retarding action owing to pptn of Hg on the Zn.

The rate of solution of Zn in acids and the effect of changes in concentration and temperature and of the presence of inorganic salts and organic substances on this rate has been studied. 26 Tables are given (Ericson-Aurén, Z anorg 1901, 27 209-253)

Speed of solution in H_2SO_4 and in HCl (Centnerszwer, Z phys Ch 1914, 87 692)

Various saline solutions have a strong solvent power in presence of PtCl_4 , i.e. KCl , NaCl , Na_2SO_4 , K_2SO_4 , $\text{MgSO}_4 + \text{Aq}$. PtCl_4 also causes Zn to decompose distilled H_2O . CuSO_4 has a similar but less energetic effect.

In all the above cases the disengagement of hydrogen is slower in the dark than in the light (Millon, C R 21 37)

According to Barreswill (C R 21 292) the above reactions are all caused by galvanic action due to pptd metal, and a piece of Pt in contact with the Zn causes the same action as the PtCl_4 in solution.

Easily sol in alkalis + Aq, even $\text{NH}_4\text{OH} + \text{Aq}$, especially when the Zn is in contact with Fe. Sol in $\text{NaCl} + \text{Aq}$ with pptn of ZnO (Sierich, J B 1867 257)

Sol in sat alkali and alkali earth chlorides + Aq (Post, 1872)

Sol in NH_4 salts + Aq (Iorin, J B 1865 124)

Sol in sat Na_2SO_4 , K_2SO_4 , MgSO_4 , NaNO_3 , KNO_3 , $\text{Ba(NO}_3)_2$, CaCl_2 , MgCl_2 and $\text{NH}_4\text{NO}_3 + \text{Aq}$. Chlorides and sulphates (especially Na_2SO_4 and MgCl_2) have strongest action, MgSO_4 and nitrates the least. The action is greatly increased by heat (Snyders, B 11 936)

Sol in boiling $\text{NH}_4\text{Cl} + \text{Aq}$. Sol in neutral $\text{FeCl}_2 + \text{Aq}$ with pptn of Fe, especially easily at 100° (Capitaine, C R 9 737)

Sol in $\text{NiSO}_4 + \text{Aq}$ with pptn of NiO (Iupputi)

Sol in conc hot $\text{ZnCl}_2 + \text{Aq}$, but Zn oxy-

chloride is pptd on diluting (Ordway, Am J Sci (2) **23** 222)
Sol in $\text{GISO}_4 + \text{Aq}$ (Debray) —

Solubility of Zn in dilute solutions of salts
100 ccm of solutions of the given salts were allowed to act one week on 11.8 sq cm Zn while a current of air with or without CO_2 was passed through the solution

Salt	G salt in 100 ccm solution	Mg Zn dissolved without CO_2	Mg Zn dissolved with CO_2
NaCl or KCl	0.5	7	38
NH_4Cl	1.0	51	36
MgCl_2	0.83	18	54
K_2SO_4	1.0	30	53
KNO_3	1.0	9	37
Na_2CO_3	1.0	13	
NaOH	0.923	60	
CaO_2H_2	Sat	3	

(Wagner, Dingl **221** 260)

Action of dil salt solutions (1%) on Zn. The following amts of Zn in mg were dissolved from 2500 sq mm Zn in 14 days by 400 ccm 1% solution of the given salts

Salt	Mg Zn	Salt	Mg Zn
NaCl	11.2	NaNO_3	6
KCl	14.8	$\text{Ba}(\text{NO}_3)_2$	8
CaCl_2	15.2	NH_4Cl	24.0
MgCl_2	17.2	$(\text{NH}_4)_2\text{SO}_4$	31.6
BaCl_2	13.2	NH_4NO_3	26.0
K_2SO_4	12.0	NaHCO_3	0
MgSO_4	8.8	K_2CO_3	0
KNO_3	6.8	Na_2CO_3	0

Sl attacked by H_2O at 80° , by hot conc NH_4OH , attacked by H_3PO_4 or $\text{NaCl} + \text{Aq}$, very sl attacked by $\text{NaNO}_3 + \text{Aq}$ or $\text{KNO}_3 + \text{Aq}$ at 100° (Smith J Soc Chem Ind 1904, **23** 476)

$\frac{1}{2}$ ccm oleic acid dissolves 0.0240 g Zn in 6 days (Gates, J phys Chem 1911, **15** 143)

Attacked by conc sugar + Aq at 115° (Klein and Berg, C R **102** 1170)

Zinc amide, $\text{Zn}(\text{NH}_2)_2$

Decomp by H_2O and alcohol Insol in ether (Frankland, Phil Mag (4) **15** 149)

Zinc antimonide, ZnSb

Does not decomp boiling H_2O except slightly Not attacked by dil mineral acids, but decomp by conc HCl or $\text{HNO}_3 + \text{Aq}$ (Cooke, Proc Am Acad **5** 348)

Zn_3Sb_2 Decomp H_2O rapidly at 100°

Violently decomp by dil HCl or $\text{H}_2\text{SO}_4 + \text{Aq}$, also by $\text{HNO}_3 + \text{Aq}$ Completely sol in $\text{HCl} + \text{Aq}$ mixed with a little HNO_3 (Cooke)

Zinc azomide, basic, $\text{Zn}(\text{OH})\text{N}_3$

Very sl sol in H_2O Decomp by hot H_2O (Curtius, J pr 1898, (2) **58** 293)

Zinc azomide ammonia, $\text{ZnN}_3 \cdot 2\text{NH}_3$

Insol in H_2O , but gradually decomp thereby (Dennis, J Am Chem Soc 1907 **29** 20)

Zinc bromide, ZnBr_2

Very deliquescent, and sol in H_2O

Sat $\text{ZnBr}_2 + \text{Aq}$ contains at

-20° $+4^\circ$ 22° 97°
66.3 68.8 77.5 83.6% ZnBr_2 ,

107° 170° 210° 375° (mpt)
83.8 85.0 89.3 100% ZnBr_2

(Étard, A ch 1894, (7) **2** 541)

Solubility in H_2O

100 g of the sat solution contain at

35° 40° 60° 80° 100°
85.45 85.53 86.08 86.57 87.05 g ZnBr_2
(Dietz, Z anorg 1899, **20** 250)

See also below under hydrated salts

Sp gr of $\text{ZnBr}_2 + \text{Aq}$ at 19.5° containing

18.3 31.7 43.2 % ZnBr_2 ,
1.1849 1.3519 1.5276

52.6 59.1 68 % ZnBr_2
1.7082 1.8525 2.1027

(Kremers, Pogg **108** 117)

Sp gr of $\text{ZnBr}_2 + \text{Aq}$ at 19.5°

% ZnBr_2	Sp gr	% ZnBr_2	Sp gr	% ZnBr_2	Sp gr
5	1.045	25	1.265	45	1.560
10	1.093	30	1.330	50	1.650
15	1.196	35	1.400	55	1.755
20	1.204	40	1.475	60	1.875

(Kremers, calculated by Gerlach, Z anal **8** 285)

Sol in conc HCl or $\text{HC}_2\text{H}_3\text{O}_2 + \text{Aq}$, also in $\text{NH}_4\text{OH} + \text{Aq}$

Sol in AlBr_3 (Isbekow, Z anorg 1913 **84** 27)

Very sl sol in liquid NH_3 (Franklin, Am Ch J 1898, **20** 830)

Sol in alcohol and ether (Berthelot, J Pharm **14** 610)

Sol in methyl acetate (Naumann, B 1909, **42** 3790)

Insol in ethyl acetate (Naumann, B 1910, 43 314)

More sol in anhydrous ether than in abs alcohol Insol in CS_2 (Hampe, Ch Z 1887, 11 846)

Sol in quinoline (Beckmann and Gabel Z anorg 1906, 51 236)

Mol weight determined in pyridine (Werner, Z anorg 1897, 15 22)

+ H_2O (Lescoeur, A ch 1894, (7) 2 78)

+ $2\text{H}_2\text{O}$ Very hygroscopic

Solubility in H_2O

100 g of the sat solution contain at

—8° 0° 13° 25° 30° 37° (mpt.)
79 06 79 55 80 76 82 46 84 08 86 20 g ZnBr_2
(Dietz, Z anorg 1899, 20 250)

+ $3\text{H}_2\text{O}$ Solubility in H_2O

100 g of the sat solution contain at

—15° —10° —5° (mpt.)
77 13 78 45 80 64 g ZnBr_2
(Dietz, Z anorg 1899, 20 250)

Zinc bromide ammonia, $\text{ZnBr}_2 \cdot 2\text{NH}_3$

Decomp by H_2O Sl sol in cold, more easily in warm $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 55 240)

+ $\frac{1}{3}\text{H}_2\text{O}$ Decomp by H_2O with separation of ZnO (André C R 96 703)

+ H_2O Above salt of Rammelsberg's has this composition (André)

$3\text{ZnBr}_2 \cdot 8\text{NH}_3 + 2\text{H}_2\text{O}$ Decomp by H_2O (André)

$3\text{ZnBr}_2 \cdot 10\text{NH}_3 + \text{H}_2\text{O}$ Decomp by H_2O (André)

$2\text{ZnBr}_2 \cdot 10\text{NH}_3$ Efflorescent Decomp by H_2O (André)

Zinc bromide cupric oxide, $\text{ZnBr}_2 \cdot 3\text{CuO} + 2\text{H}_2\text{O}$

+ $4\text{H}_2\text{O}$ (Mailhe, C R 1901, 133 227)

Zinc bromide hydrazine, $\text{ZnBr}_2 \cdot 2\text{N}_2\text{H}_4$

Decomp by H_2O

Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 277)

Zinc chloride, ZnCl_2

Very deliquescent, and sol in H_2O

Sol in 0.333 pt H_2O at 18.7° (Abt)
Sol in Aq sat at 12.5° contains 78% ZnCl_2
(Hassensfranz, A ch 28 291)

Solubility in H_2O

100 g of the sat solution contain at

15° 20° 41° 60° 100°
79 12 81 19 82 21 83 51 86 01 g ZnCl_2
(Dietz, Z anorg 1899, 20 245)

$\text{ZnCl}_2 + \text{Aq}$ containing 1 pt ZnCl_2 in 1.520, pts H_2O at 18° has sp gr = 1.3666 (Hit torf, Z phys Ch 1902, 39 628)

Solubility in H_2O at t°
100 g H_2O dissolve g ZnCl_2

t°	Solid phase	g ZnCl_2	
—5	ice	14	
—10		25	
—40		83	
—62	ice 4aq	104	crvohydrate point
—50	$\text{ZnCl}_2 + 4\text{H}_2\text{O}$	113	
—40		127	
—30	4aq 3aq	160	transition point
—10	$\text{ZnCl}_2 + 3\text{H}_2\text{O}$	189	
0		208	
+5		230	
6 5		252	mpt
5		282	
0	3aq 1½aq	309	eutectic point
0	$\text{ZnCl}_2 + 2½\text{H}_2\text{O}$	235	
6 5	2½aq 3aq	252	transition point
10	$\text{ZnCl}_2 + 2½\text{H}_2\text{O}$	272	
12 5		303	mpt
11 5	2½aq 1½aq	335	eutectic point
9	2½aq 1aq	360	eutectic point
6	$\text{ZnCl}_2 + 2½\text{H}_2\text{O}$	385	
—6	$\text{ZnCl}_2 + 1½\text{H}_2\text{O}$	298	
+10		330	
20		368	
26	1½aq 1aq	423	transition point
26 3	1½aq ZnCl_2	433	transition point
0	$\text{ZnCl}_2 + \text{H}_2\text{O}$	342	
10		364	
20		396	
28	1aq 7n Cl_2	436	transition point
31	7n $\text{Cl}_2 + \text{H}_2\text{O}$	477	
25	ZnCl_2	432	
40		452	
60		488	
80		543	
100		610	
26.2			mpt

(Mylus and Dietz, Z anorg 1905, 44 217)
See also below under hydrated salts

Sp gr of $\text{ZnCl}_2 + \text{Aq}$ at 19.5°

% ZnCl_2	Sp gr	% ZnCl_2	Sp gr
13.5	1.1275	37.5	1.3859
25.8	1.2466	49.2	1.5551

(Kremers Pogg 105 360)

Sp gr of $\text{ZnCl}_2 + \text{Aq}$ at 19°

% ZnCl_2	Sp gr	% ZnCl_2	Sp gr	% ZnCl_2	Sp gr
1	1.010	2	1.238	4	1.188
5	1.045	30	1.291	50	1.366
10	1.091	35	1.352	55	1.650
15	1.137	40	1.420	60	1.710
20	1.186				

(Garduch, Z anorg 8 28) calculated from Kremers)

Sp gr of $\text{ZnCl}_2 + \text{Aq}$ at t°

t°	15°	15°	15°	15°
% ZnCl_2	2.5	4.89	10.0	20.0
Sp gr	1.024	1.046	1.094	1.190

t°	15°	15°	15°
% ZnCl_2	29.86	40.0	58.88
Sp gr	1.297	1.423	1.728

(Long, W Ann 1880, 11 38)

Sp gr of $\text{ZnCl}_2 + \text{Aq}$ at room temp containing

15 334	23 487	33 752% ZnCl_2
1 1459	1 2288	1 3431

(Wagner, W Ann 1883, 18 267)

Sp gr of $\text{ZnCl}_2 + \text{Aq}$ at 25°

Concentration of ZnCl_2 +Aq	Sp gr
1—normal	1 0590
$\frac{1}{2}$ —	1 0302
$\frac{1}{4}$ —	1 0152
$\frac{1}{8}$ —	1 0077

(Wagner, Z phys Ch 1890, 5 40)

Sp gr of $\text{ZnCl}_2 + \text{Aq}$

% ZnCl_2 g in 1000 g of solution	Sp gr 16°/16
0	1 000000
0 5994	1 000560
2 3163	1 002163
5 0406	1 004708
9 8988	1 009243
19 4914	1 018228

(Dijken, Z phys Ch 1897, 24 108)

Insol in SbCl_3 (Klemensiewicz, C C 308, II 1850)

Insol in liquid NH_3 (Franklin, Am Ch 1898, 20 830)

Easily sol in hot absolute alcohol, and her Sol in 1 pt strong alcohol at 12.5° Wenzel)

Sol in 0.35 pt absolute alcohol (Graham)

Sol in butyl (Wurtz), and hexyl (Bous) cohoh at ord temp, but decomp on heating

Very sol in acetic ether with evolution of eat (Cann, C R 102 363)

Easily sol in acetone (Krug and M'Elroy, J Anal Ch 6 181)

1 g ZnCl_2 is sol in 2.3 g acetone at 18° p gr of sat solution 18/1° = 1.14 (Nauann, B 1901, 37 1338)

Sol in acetone and in methylal (Pridinn, C 1899, II 1011)

Sol in methyl acetate (Neumann, B 909, 42 3790)

Sol in hot benzonitrile also in other aromatic nitrile

Sol in methyl sulphide and in ethyl sulphide Very sol in piperidine (Werner, Z anorg 1897, 15 7)

Sol in benzyl alcohol, furfural, methylpropylketone, acetophenone, ethyl monochloracetate, ethyl cyanacetate, ethyl acetate, ethyl benzoate, ethyl oxalate, amylnitrate, piperidine, and quinoline

Insol in aldehyde, ethyl nitrate, and nitrobenzene (Lincoln, J phys Chem 899, 3 460)

Sol in quinoline (Beckmann and Gabel, anorg 1906, 51 236)

Sol in 2 pts glycerine at ord temp (Clever, Bull Soc 1872, (2) 18 372)

100 g glycerol dissolve 50 g ZnCl_2 at 15.5° (Ossendowski, Pharm J 1907, 79 575)

Insol in CS_2 (Arctowski, Z anorg 1894, 6 257)

Sol in urethane (Castoro, Z anorg 1899, 20 61)

Mol weight determined in piperidine, pyridine and methyl sulphide (Werner, Z anorg 1897, 15 18)

+ H_2O Very deliquescent Contains 1½ H_2O (Engel, C R 102 1111)

Solubility in H_2O

100 g of the sat solution contain at

0° 11° 27° (mpt)

74 33 78 25 84 61 g ZnCl_2

(Dietz, Z anorg 1899, 20 245)

+1½ H_2O

Solubility in H_2O

100 g of the sat solution contain at

0° 10° 20° 26° (mpt)

67 45 73 65 80 08 83 43 g ZnCl_2

(Dietz, Z anorg 1899, 20 245)

+2 H_2O Sat aq solution contains at

—20° —14° —10° —4° —1°
54 7 55 4 56 5 57 4 57 9% salt,

+5° 9° 15° 33° 42°
59 1 60 2 62 0 88 0 88 0

(Étard, A ch 16)

Solubility in H_2O

100 g of the sat solution contain at

0° 10° 19° (mpt)

67 56 73 70 79 07 g ZnCl_2

(Dietz, Z anorg 1899, 20 245)

+2½ H_2O Solubility in H_2O

100 g of the sat solution contain at

0° 8° 13° (mpt)

67 42 71 96 75 14 g ZnCl_2

(Dietz, Z anorg 1899, 20 245)

+3 H_2O Sol in 12.5 pts H_2O at 0° (Engel)

Solubility in H_2O

100 g of the sat solution contain at

—5° 0° +7° (mpt)

64 5 67 58 71 57 g ZnCl_2

(Dietz, Z anorg 1899, 20 245)

Zinc hydrogen chloride, $2\text{ZnCl}_2, \text{HCl} + 2\text{H}_2\text{O}$

Deliquescent (Engel, C R 102 1068)

$\text{ZnCl}_2, \text{HCl} + 2\text{H}_2\text{O}$ (Engel)

Zinc hydrazine chloride, $\text{ZnCl}_2, \text{N}_2\text{H}_4, \text{HCl}$

Very hygroscopic

Sol in H_2O (Curtius, J pr 1894, (2) 50 338)

ZnCl₂, 2(N₂H₄, HCl) Hygroscopic, very sol in H₂O

Sol in hot alcohol and NH₄OH + Aq (Cur-tius, J pr 1894, (2) 50 338)

Zinc chloride ammonia, ZnCl₂, 5NH₃ + H₂O

Easily sol in little but decomp by much H₂O Still more sol in ZnCl₂ + Aq with decomp (Divers, C N 18 13)

ZnCl₂, 4NH₃ + H₂O (Kane)
ZnCl₂, 2NH₃ Not completely sol in H₂O, can be recryst from hot NH₄Cl + Aq (Ritt-hausen, J pr 60 473)

Insol in H₂O Sol in NH₄Cl or NH₄OH + Aq (Thomas, B 20 743)

+1/4 H₂O
+1/2 H₂O
+1/2 H₂O } Decomp by H₂O
+H₂O

(André, C R 1882, 94 964)

ZnCl₂, NH₃ Decomp by H₂O (Kaut, A ch 72 290)

Zinc chloride cupric oxide, ZnCl₂, 3CuO + 4H₂O

(Mailhe, C R 1901 134 226)

Zinc chloride hydrazine, ZnCl₂, 2N₂H₄

(Franzen, Z anorg 1908 60 275)

l₂, 2N₂H₄ Insol in H₂O
Easily sol in NH₄OH + Aq (Curtius, J pr 1894, (2) 50 315)

Zinc chloride hydroxylamine, ZnCl₂, 2NH₂OH

Sl sol in cold water, more in warm H₂O Very sol in NH₄OH + Aq Very sol in alcohol and other organic solvents (Crimmet, Bull Soc C 3 116)

1 pt is dissolved in 100 pts aq solution sat at 20° (Antonoff, C C 1905, II 810)

Zinc fluoride, ZnF₂

Sl sol in cold water, more in warm H₂O Insol in 95% alcohol Sol in boiling HNO₃, HCl, or H₂SO₄ (Poulsen, C R 116 81)

Contrary to older statements ZnF₂ is quite sol in H₂O (Kohlensch, Z phys Ch 1901, 44 213)

Insol in liquid NH₃ (Com. Am. Ch. 1 1898, 20 830)

Insol in methyl acetate (Nann, Ann 1 1909, 42 3790)

+H₂O Difficultly sol in H₂O, some what more sol in H₂O containing HCl or HNO₃ Easily sol in NH₄OH + Aq (Berzelius, Pogg. 1 26)

1 l H₂O dissolves 16 g at 18° (Dobz)

Zinc hydrogen fluoride

Known only in solution

Zinc zirconium fluoride

See Fluozirconate, zinc

Zinc hydrophosphide, Zn₂H₂P₂

Decomp by cold H₂O and by dil HCl + Aq (Drechsel and Linkelstein, B 1871, 4 353)

Zinc hydroxide, ZnO₂H₂

Insol in H₂O Sol in acids Sol in KOH, NaOH, NH₄OH, or (NH₄)₂CO₃ + Aq

1 l H₂O dissolve 0.01 g ZnO₂H₂ at 25° (Bodlander, Z phys Ch 1898, 27 66)

Solubility in H₂O is calculated to be 2.6 × 10⁻⁵ g mols per l (Herz, Z anorg 1900, 23 227)

1 l H₂O dissolves 0.0042 g ZnO₂H₂ at 18° (Dupre and Bialas, Z angew Ch 1903, 16 55)

See also Zinc oxide

Solubility in NH₄OH + Aq at 25°

ZnO ₂ H ₂ used	NH ₃ norm	G ZnO per l
prepared from ZnSO ₄	1 287	7 28
	0 825	3 84
	0 311	0 85
prepared from Zn(NO ₃) ₂	0 321	0 34
	0 613	0 845
	1 215	2 70
	1 928	5 07
	2 570	7 01
	2 215	10 16

(Bonsdorff, Z anorg 1901, 41 189)

Solubility of ZnO₂H₂ in NH₄OH and ammonium bases + Aq at 17-19°

g ZnO ₂ H ₂ in 100 g solution	g ZnO ₂ H ₂ in 100 g solution
0 0042 NH	0 0018
0 2 6 NH	0 0179
0 2 07 NH	0 0959
0 0 04 NH CH	0 0008
0 4 2 NH CH	0 0152
0 0 04 NH CH	0 0181
0 0 08 NH CH	0 0005
0 4 NH CH	0 0071
0 0 8 NH CH	0 0160
NH CH	insol
NH CH	

Herz, Z anorg 1902 30 280)

Solubility in NH₄OH + Aq increases with increasing concentration of NH₄OH (Fuler, P 1900 36 101)
2 pts ZnO₂H₂ dissolve in 5 pts KOH + Aq (sp gr 1.0) (Bonsdorff)

Solubility of ZnO_2H_2 in $\text{NaOH}+\text{Aq}$

G Na in 20 ccm	G Zn in 20 ccm
0 1012	0 0040
0 1978	0 0150
0 4278	0 0442
0 6670	0 1771
0 9660	0 9630
1 4951	0 2481
2 9901	0 3700

When zinc hydroxide is treated with alkali, more dissolves at first than corresponds with the true equilibrium under the prevailing conditions, for such solutions spontaneously deposit more or less zinc hydroxide according to the concentration (Rubenbauer, Z anorg 1902, **30** 333)

Solubility of ZnO_2H_2 in $\text{NaOH}+\text{Aq}$ at 25°

G mol per l	
Na	Zn
0 2636	0 00311
0 3871	0 0057
0 5414	0 0129
0 9280	0 0425

(Wood, Chem Soc 1910, **97** 884)

Freshly pptd ZnO_2H_2 is easily sol in $\text{KOH}+\text{Aq}$, but it gradually goes over into a stable form which is difficultly sol in $\text{KOH}+\text{Aq}$ (Herz, Z anorg 1901, **28** 474)

Freshly pptd ZnO_2H_2 is sol in dil salt solutions (1 %) as follows. The given amts in mg (calculated as Zn) were dissolved per l at t°

Salt	Mg Zn	t
NaCl	51	18
KCl	43	20
CaCl_2	57 5	16
MgCl_2	65	16
BaCl_2	38	18
K_2SO_4	37 5	20
MgSO_4	27	21
KNO_3	17 5	15
NaNO_3	22	15
$\text{Ba(NO}_3)_2$	25	21
K_2CO_3	0	15
NH_4Cl	95	20
NH_4NO_3	77	20
$(\text{NH}_4)_2\text{SO}_4$	58	20

(Snyders, B **11** 936)

+HCl

See also Zinc oxide

Zinc hydrosulphide, $\text{Zn}(\text{SH})_2$

Very unstable. Decomp by H_2O (Zotta, M **10** 807)

Sol in $\text{NaSH}+\text{Aq}$ (Thomsen, B **11** 2044)

$\text{Zn}_3\text{H}_2\text{S}_4$ (Zotta)

Zinc iodide, ZnI_2

Deliquescent Easily sol in H_2O

Sat ZnI_2+Aq contains at

-18° -5° $+17^\circ$ 47° 62° 73°
 70 9 74 0 80 4 80 3 81 3 81 2% ZnI_2 ,
 97° 100° 107° 138° 140°
 82 1 83 0 82 6 83 8% ZnI_2
 (Étard, A ch 1894, (7) **2** 544)

Solubility in H_2O

100 g of the sat solution contain at

0° 18° 40° 60° 80° 100°
 81 11 81 20 81 66 82 37 83 05 83 62 g ZnI_2
 (Dietz, Z anorg 1899, **20** 251)

See also under $+2\text{H}_2\text{O}$

Sp gr of ZnI_2+Aq at 19.5° containing

23 1 42 6 56 3 63 5 76 0% ZnI_2
 1 2340 1 5121 1 7871 1 9746 2 3976
 (Kremers, Pogg **111** 61)

Sp gr of ZnI_2+Aq at 19.5° containing

5 10 15 20 25 % ZnI_2 ,
 1 045 1 091 1 140 1 196 1 255
 30 35 40 45 50 % ZnI_2 ,
 1 368 1 390 1 420 1 560 1 650
 55 60 65 70 75 % ZnI_2
 1 754 1 875 2 020 2 180 2 360

(Kremers, calculated by Gerlach, Z anal **8** 285)

Sol in $(\text{NH}_4)_2\text{CO}_3+\text{Aq}$

Moderately sol in liquid NH_3

Am Ch J **1898**, **20** 830)

Sol in alcohol

100 pts glycerine dissolve 40 pts at ord temp (Klever, Bull Soc 1872, (2) **18** 372)

100 g glycerol dissolve 40 g ZnI_2 at 15.5° (Ossendowski, Pharm J 1907, **79** 575)
 More sol in anhydrous ether than in abs alcohol Insol in CS_2 (Hampe, Ch Z **1887**, **11** 846)

Sol in methyl acetate (Naumann, B 1909, **42** 3790), acetone (Eidmann, C C **1899**, II 1014, Naumann, B 1904, **37** 4328)

Sol in quinoline (Beckmann and Gabel, Z anorg 1906, **51** 236)

Mol weight determined in methyl sulphate (Werner, Z anorg 1897, **15** 25)

$+2\text{H}_2\text{O}$ Solubility in H_2O

100 g of the sat solution contain at
 -10° -5° 0° $+10^\circ$ 22° 27° (mpt)
 80 50 80 77 81 16 82 06 83 12 89 52 g ZnI_2
 (Dietz, Z anorg 1899, **20** 251)

$+4\text{H}_2\text{O}$ (Lubarski, Z anorg 1898, **18** 387)

Zinc tetraiodide, ZnI_4

Known only in aqueous solution (Baup, Report **14** 412)

Sol in fenchone (Rimini and Olivari, C C **1907**, II 241)

Zinc iodide ammonia, $\text{ZnI}_2, 4\text{NH}_3$

Decomp by cold H_2O Easily sol in acids and $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg, Pogg 48 152)

$\text{ZnI}_2, 5\text{NH}_3$ Decomp by cold H_2O Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Rammelsberg)

$3\text{ZnI}_2, 5\text{NH}_3 + 3\text{H}_2\text{O}$ (Tassily, C R 1896, 122 324)

Zinc iodide hydrazine, $\text{ZnI}_2, 2\text{N}_2\text{H}_4$

Decomp by H_2O
Sol in $\text{NH}_4\text{OH} + \text{Aq}$ (Franzen, Z anorg 1908, 60 277)

Zinc nitride, Zn_3N_2

Decomp by H_2O with the greatest violence (Frankland, Phil Mag (4) 15 149)

Easily decomp by H_2O when finely powdered (Rossel, C R 1895, 121 942)

Sol in HCl (Fischer, B 1910, 43 1468)

Zinc oxide, ZnO

Insol in H_2O Some preparations of ZnO are sl sol in H_2O , never, however, in less than 1 million pts H_2O (Bineau, C R 41 510)

Calculated from electrical conductivity of $\text{ZnO} + \text{Aq}$ 1 pt ZnO is sol in 236,000 pts H_2O at 18° (Dupre and Bialas, Zeit angew Ch 1903, 16 55)

Zinc hydroxide

sol in acids, even after ignition
in acids, even H_2SO_4 , or $\text{H}_2\text{CO}_3 +$

Solubility of ZnO in $\text{CrO}_3 + \text{Aq}$ at 25°
1 l of the solution contains

G CrO_3	G ZnO	G CrO_3	G ZnO
0 010	0 013	101	44 9
0 010	0 013	151	66 1
0 010	0 013	192	83 8
0 604	0 409	192	83 6
2 14	1 16	285	123
4 19	2 24	392	168
11 4	5 84	450	193
11 5	5 89	461	196
22 2	10 7	463	197
31 4	14 9	475	202
43 1	20 1	574	240
57 5	26 7	660	274
66 5	30 3	769	318
66 7	30 4	879	354
70 6	32 2	970	389
93 3	41 5		

(Grogger Z anorg 1911, 70 136)

When moist is easily sol in KOH , NaOH , and $\text{NH}_4\text{OH} + \text{Aq}$, but only sl sol therein after ignition Partially reprecipitated from solution in $\text{NH}_4\text{OH} + \text{Aq}$ by dilution with H_2O

Anhydrous ZnO is insol in dil, but sol in conc alkali hydrates + Aq , but the hydroxide is easily sol even in dil alkalis + Aq (Fremy, A ch (3) 23 390)

Very sl sol in $\text{NH}_4\text{OH} + \text{Aq}$ After igni-

tion its solubility is greatly increased by traces of K and NH_4 salts Phosphates have the strongest action, then, in the following order arsenates, chlorides, sulphites, nitrates, acetates, carbonates, tartrates, citrates, and sulphates Succinates and benzoates increase the solubility in $\text{NH}_4\text{OH} + \text{Aq}$, only when it is very dil, borates, iodides, chlorates, arsenites, gallates, and oxalates do not increase the solubility (Schindler)

ZnO is sol in $\text{NH}_4\text{OH} + \text{Aq}$ only in presence of NH_4 salts (Brandhorst, Zeit angew Ch 1904, 17 513)

Solubility in KOH , NaOH , and $\text{NH}_4\text{OH} + \text{Aq}$

An excess over 4 mols KOH to 1 mol ZnO is necessary for solution, but that excess may be neutralised after solution, until only 4 mols are left, without pptn of ZnO Solution is pptd by addition of 12 vols H_2O $\text{KOH} + \text{Aq}$ containing 16 5 g KOH to a litre H_2O is the weakest solution which will dissolve ZnO Three times as much alkali are necessary for solution at 50° as at $16-17^\circ$ Less excess of NaOH than of KOH is necessary 3 mols NH_4OH will dissolve 1 mol ZnO , and the temp and dilution are in this case of little influence (Prescott)

100 cc of 20% $\text{NaOH} + \text{Aq}$ dissolve in many hours at most 2 97 g ignited ZnO Pptd ZnO is more quickly dissolved but the action becomes very slow after 100 cc of the solution contain 3 87 g of Zn (Forster and Gunther, Z Elektrochem 1900, 6 301)

Solubility of ignited ZnO in $\text{NaOH} + \text{Aq}$ gradually decreases (Kunschert, Z anorg 1904, 41 343)

Sol in hot $\text{NH}_4\text{Cl} + \text{Aq}$, either when moist or dry

Somewhat less sol in $\text{NH}_4\text{NO}_3 + \text{Aq}$

Somewhat sol in water glass + Aq (Ordway)

Slowly sol in cold, easily in hot $\text{NaCl} + \text{Aq}$ (Siersch, J B 1867 255)

Solubility of ZnO in $\text{ZnCl}_2 + \text{Aq}$ at room temp

G ZnCl_2 per 100 g H_2O	G ZnO per 100 g H_2O
8 22	0 0137
23 24	0 138
45 95	0 497
51 50	0 604
56 90	0 723
62 85	0 854
96 00	1 792
124 70	3 213
144 80	2 640
203 00	1 590

The solubility curve has a maximum at a point corresponding to about 125 g ZnCl_2 per 100 g H_2O On the first branch of the curve the solid phase in equilibrium with the solution is $\text{ZnCl}_2, 4\text{ZnO}, 6\text{H}_2\text{O}$, on the second branch it is $\text{ZnCl}_2, \text{ZnO}, 1 5\text{H}_2\text{O}$

(Driot, C R 1910, 150 1427)

Sol in boiling $\text{Fe}(\text{NO}_3)_3$, and $\text{Pb}(\text{NO}_3)_2$ + Aq with pptn of oxides Not attacked by $\text{Co}(\text{NO}_3)_2$, $\text{Ni}(\text{NO}_3)_2$, and $\text{Ce}(\text{NO}_3)_3$ + Aq (Persoz)

Sol in boiling KCN + Aq

Insol in boiling K tartrate + Aq (Kahlenberg and Hillyer, Am Ch J 1894, 16 101)
Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

Tartaric acid somewhat hinders the pptn of ZnO_2H_2

Insol in methyl acetate (Naumann, B 1909, 42 3790)

Insol in acetone (Naumann, B 1904, 37 4329, Erdmann, C C 1899, II 1014)

Sol in methyl amine, but insol in amyl amine + Aq (Wurtz)

1 l solution containing 174.4 g sugar and 14.1 g CaO dissolves 0.24 g ZnO (Bodenbender, J B 1865, 600)

Min *Zincate* Sol in acids

Zinc peroxide

1 pt sol in 45,000 pts H_2O

Very sol in acids (Foregger and Philipp, J Soc Chem Ind 1906, 25 300)

ZnO_2 (?) Ppt Decomp by acids with evolution of H_2O_2 (Haass, B 17 2249)

ZnO , H_2O , H_2O_2 (de Forcrand, A ch 1902, (7) 27 58)

3ZnO , $2\text{H}_2\text{O}_2$ (de Forcrand)

3ZnO , H_2O , $2\text{H}_2\text{O}_2$ (de Forcrand)

4ZnO , H_2O , $3\text{H}_2\text{O}_2$ (de Forcrand)

ZnO_2 , ZnO_2H_2 Insol in NH_4OH + Aq (Kouriloff, A ch (6) 23 431)

3ZnO_2 , $\text{Zn}(\text{OH})_2$ Sol in NaOH + Aq with evolution of O (Eijkman, C C 1905, I 1628)

Zn_2O_7 , 3ZnO + $4\text{H}_2\text{O}$ Completely sol in dil H_2SO_4 (de Forcrand)

10ZnO , 4ZnO + $5\text{H}_2\text{O}$ Ppt (Teletow, C C 1911, I 1799)

Zinc oxybromide, ZnBr_2 , ZnO + $13\text{H}_2\text{O}$

ZnBr_2 , 4ZnO + 10, 13, and 19 H O Decomp by H_2O into—

ZnBr_2 , 6ZnO + $35\text{H}_2\text{O}$ (André)

ZnBr_2 , 5ZnO + $6\text{H}_2\text{O}$ (André)

All oxybromides are sol in KOH and NH_4OH + Aq (André, C R 96 703)

Zinc oxybromide ammonia, ZnBr , 3ZnO , 2NH_3 + $5\text{H}_2\text{O}$

Decomp by H_2O (André, C R 96 703)

Zinc oxychloride, ZnO , 3ZnCl_2 + H_2O

Decomp by H_2O

Very sol in dil acids (Ephraim, Z anorg 1908, 59 67)

+ $4\text{H}_2\text{O}$ Sl sol in H_2O , more sol in ZnCl_2 + Aq

Easily sol in acids, or NH_4OH , or KOH + Aq (Schindler, Mag Pharm 36 45)

+ $5\text{H}_2\text{O}$ and $8\text{H}_2\text{O}$ (André, A ch (6) 3 94)

ZnO , ZnCl_2 + $1\frac{1}{2}\text{H}_2\text{O}$ (Driot, C R 1910, 150 1427)

3ZnO , ZnCl_2 + $2\text{H}_2\text{O}$ Sl sol in H_2O , more easily sol in ZnCl_2 + Aq Easily sol in acids and in NH_4OH or KOH + Aq (Schindler, Mag Pharm 36 45)

+ $3\text{H}_2\text{O}$ (Werner, B 1907, 40 4443)

+ $5\text{H}_2\text{O}$ (Mailhe, A ch 1902, (7) 27 367)

3ZnO , 2ZnCl_2 + $11\text{H}_2\text{O}$ (André, C R 1888, 106 854)

4ZnO , ZnCl_2 + $6\text{H}_2\text{O}$ (André, C R 1888, 106 854)

+ $11\text{H}_2\text{O}$ (André, A ch (6) 3 94)

5ZnO , ZnCl_2 + $6\text{H}_2\text{O}$ (Perrot Bull Soc 1895, (3) 13 976)

+ $8\text{H}_2\text{O}$ (André, C R 1882 94. 1524)

5ZnO , 2ZnCl_2 + $26\text{H}_2\text{O}$ Sol in KOH or NH_4OH + Aq Decomp by H_2O into—

5ZnO , ZnCl_2 + $26\text{H}_2\text{O}$ Sol in KOH or NH_4OH + Aq Decomp by H_2O into—

6ZnO , ZnCl_2 + $6\text{H}_2\text{O}$ Insol in H_2O (Kane, A ch 72 296)

8ZnO , ZnCl_2 + $10\text{H}_2\text{O}$ (Mailhe, A ch 1902, (7) 27 367)

9ZnO , ZnCl_2 + $3\text{H}_2\text{O}$ Insol in H_2O Less sol in NH_4OH + Aq than ZnCl_2 , 3ZnO + $2\text{H}_2\text{O}$, but easily sol in + $14\text{H}_2\text{O}$

9ZnO , 2ZnCl_2 + $12\text{H}_2\text{O}$ Insol in hot or cold H_2O (Habermann, M 5 432)

Zinc oxychloride ammonia, 6ZnCl , ZnO , 12NH_3 + $4\text{H}_2\text{O}$

Decomp by H_2O and boiling alcohol (André, A ch (6) 3 90)

ZnCl , 3ZnO , 2NH_3 + $5\text{H}_2\text{O}$ Decomp by H_2O (André)

ZnCl , 2ZnO , 2NH_3 + $3\text{H}_2\text{O}$ André

6ZnCl , 3ZnO , 10NH_3 + $15\text{H}_2\text{O}$ André

4ZnCl , ZnO , 8NH_3 + $2\text{H}_2\text{O}$ André

Zinc oxyiodide, ZnI , 3ZnO + $2\text{H}_2\text{O}$

Insol in cold sl sol in boiling H_2O (Muller, J pr 26 441)

ZnI , 9ZnO + $24\text{H}_2\text{O}$ Insol in cold H_2O

ZnI , 5ZnO + $11\text{H}_2\text{O}$ Decomp by H_2O (Tassilly, C R 1896 122 524)

Zinc oxyphosphide, ZnP O

(Renault, A ch 4, 9 162)

Probably is a mixture of zinc oxide and phosphorus (Vigier Bull Soc 1861 5)

Zinc oxysulphide, ZnO , ZnS

Sol in HCl + Aq (Arvedson, Pogg 1 59)

4ZnS , ZnO Not decomp by H_2O HCl , H_2O + Aq (Kersten, Schw J 57 180)

Min *bolite* Sol in HCl + Aq

Zinc phosphide, ZnP

Less easily attacked by HCl + Aq than Zn_3P_2

ZnP Not attacked by hot HCl + Aq (Hvoslef, A 100 99)

ZnP_4 Insol in dil HCl + Aq Renault,

Zn_3P_2 Insol in H_2O Sol in dil HCl , H_2SO_4 , or HNO_3 +Aq, with evolution of PH_3 (Renault, A ch (4) 9 162)

Zn_3P_4 Insol in HCl +Aq (Renault)

Zinc selenide, ZnSe

Cold dil HNO_3 +Aq dissolves out Zn, and Se separates out, which dissolves on warming as H_2SeO_3 (Berzelius)

+x H_2O Insol in H_2O (Berzelius)

Zinc sulphide, ZnS

Anhydrous Insol in H_2O Sol in HCl +Aq, insol in $\text{HC}_2\text{H}_3\text{O}_2$ +Aq (Ebelmen, A ch (3) 25 97)

Sol in H_2S +Aq under pressure in a sealed tube (Senarmont, A ch (3) 32 168)

Min *Blende, Sphalerite* Sl attacked by acids, expecting aqua regia

1 l H_2O dissolves 6.65×10^{-6} mols zinc blende at 18°

1 l H_2O dissolves 6.63×10^{-6} mols artificial cryst ZnS at 18° (Wiegel, Z phys Ch 1907, 58 294)

Sol in an alkaline solution of NaClO (Sadtler, Trans Am Electrochem Soc 1902, 1 142)

Insol in liquid NH_3 (Franklin, Am Ch J 1898, 20 830)

+ $\frac{1}{2}$, $\frac{2}{3}$, or $1\text{H}_2\text{O}$

Pptd ZnS

1 l H_2O dissolves 70.60×10^{-6} mols pptd ZnS at 18° (Wiegel, Z phys Ch 1907, 58 294)

Insol in alkali hydrates, carbonates, and sulphides+Aq Insol in NH_4OH , HCl , or $(\text{NH}_4)_2\text{CO}_3$ +Aq Easily sol in very dil HCl and HNO_3 +Aq, but H_2S ppts ZnS in presence of very dil HCl +Aq, or H_2SO_4 +Aq (Ehott and Storer)

More easily sol in HNO_3 +Aq than in HCl +Aq (Fresenius)

Only sl sol in acetic acid (Wackenroder)

When still moist is sol in H_2SO_4 +Aq

Insol in NH_4Cl or NH_4NO_3 +Aq

K_2S +Aq when added to ZnSO_4 +Aq produces a ppt in presence of 10,000 pts H_2O , and a slight opalescence with 20,000 pts (Lassaigne)

Slowly sol in conc KCN +Aq (Halm, J B 1870 1008)

Sl sol in N_2S +Aq, sol in NaSH +Aq (Becker, Sil Am J (3) 33 199)

Zinc pentasulphide, ZnS_5

Sol in acids, with separation of S (Schiff, A 115 74)

Zinc sulphosilicide, ZnSiS

Decomp by acids and by alkalis (Fraenkel, Metall, 1909, 6 653)

Zinc telluride, ZnTe

Decomp by acids Sol in Br_2 +Aq (Fabre C R 105 277)

Zincic acid

Zinc hydroxide shows weak acid properties, and forms the following salts

Ammonium zincate, 3ZnO , 4NH_3 + $12\text{H}_2\text{O}$ =
 3ZnO , $2(\text{NH}_4)_2\text{O}$ + $10\text{H}_2\text{O}$

Decomp by much H_2O

Barium zincate, $\text{BaH}_2\text{Zn}_2\text{O}_4$ + $7\text{H}_2\text{O}$

Decomp by H_2O (Bertrand, C R 115 939)

Calcium zincate, $\text{CaH}_2\text{Zn}_2\text{O}_4$ + $4\text{H}_2\text{O}$

Decomp by H_2O Sol in NH_4OH +Aq (Bertrand, C R 115 939)

Cobaltous zincate, $x\text{CoO}$, $y\text{ZnO}$

Runman's green Sol in acids H_2CO_3 +Aq dissolves out ZnO (Corney)

Potassium zincate, ZnO , K_2O

Easily sol in H_2O , but decomp by boiling (Laux, A 9 183)

2ZnO , K_2O Decomp immediately by cold H_2O (Fremy, C R 15 1106)

Sodic zincate, Na_2O , 2ZnO + $8\text{H}_2\text{O}$, or
 $2\text{NaHZN}_2\text{O}_2$ + $7\text{H}_2\text{O}$

Decomp by H_2O or alcohol (Corney and Jackson, Am Ch J 11 145)

+ $7\text{H}_2\text{O}$ (Forster and Gunther, Z Elektrochem, 1899, 6 301)

$2\text{Na}_2\text{O}$, 3ZnO + $18\text{H}_2\text{O}$ or $\text{Zn}_3\text{O}_6\text{Na}_4\text{H}_2$ + $17\text{H}_2\text{O}$ Decomp by H_2O or alcohol Insol in ether (Corney and Jackson)

Strontium zincate, $\text{SrH}_2\text{Zn}_2\text{O}_4$ + $7\text{H}_2\text{O}$

Decomp by H_2O (Bertrand)

Zirconic acid

See Zirconium hydroxide

Barium zirconate, BaZrO_3

Insol in acids (Ouvrard, C R 113 80)

Calcium zirconate, CaZrO_3

Insol in acids (Ouvrard, C R 113 80)

Calcium zirconate, acid

Insol in H_2O or HCl +Aq (Hjorth, A 137 237)

Calcium potassium zirconate, $(\text{Ca}, \text{K})\text{LaO}_3$ (small quantity of CaO substituted by K_2O)

Sol in HCl (Venable, J Am Chem Soc 1896, 18 444)

Cupric zirconate

(Berthier, A ch 59 195)

Lithium zirconate, Li_2ZrO_3

Easily attacked by acids (Ouvrard, C R 112 1444)

Magnesium zirconate

Insol in H_2O or $\text{HCl} + \text{Aq}$ (Hiordthal, C R 61 215)

Potassium zirconate

Decomp by $\text{HCl} + \text{Aq}$ (Knop, A 159 44)

Sodium zirconate, Na_2ZrO_3

Decomp by H_2O
 Na_4ZrO_4 . Decomp by $\text{HCl} + \text{Aq}$, and is dissolved by subsequent addition of H_2O
 Na_2O , $8\text{ZrO}_2 + 12\text{H}_2\text{O}$ (Hiordthal)

Strontium zirconate, SrZrO_3

As CaZrO_3 (Ouvrard)

Zirconium, Zr

Crystallized Attacked by conc $\text{HCl} + \text{Aq}$ above 50° , but very slowly even at 100° , rapidly by hot aqua regia. Sol in cold conc $\text{HF} + \text{Aq}$ (Troost, C R 61 109)

Very violently attacked by a mixture of HNO_3 and HF (Berzelius, Pogg 4 117)

Amorphous Slowly attacked by boiling aqua regia, H_2SO_4 , or conc $\text{HCl} + \text{Aq}$ (Berzelius)

Easily sol in HF or $\text{HNO}_3 + \text{HF}$

Zirconium bromide, ZrBr_4

Very hygroscopic. Violently decomp by H_2O to form oxybromide (Melliss, Zeit Ch (2) 6 296)

Sl sol in organic solvents (Matthews, J Am Chem Soc 1898, 20 840)

Zirconium bromide ammonia, $\text{ZrBr}_4 \cdot 4\text{NH}_3$

Ppt. Insol in organic solvents (Matthews, J Am Chem Soc 1898, 20 840)

$\text{ZrBr}_4 \cdot 10\text{NH}_3$. Very hygroscopic. Decomp by H_2O (Stahler, B 1905, 38 2612)

Zirconium carbide, ZrC

Insol in H_2O and $\text{NH}_4\text{OH} + \text{Aq}$ and HCl Aq even when heated. Sol in HNO_3 , H_2SO_4 , and fused alkali nitrates, chlorates, or hydroxides (Moissan, C R 1896, 122 653)

Zirconium chloride, ZrCl_4

Sol in H_2O with evolution of much heat to form ZrOCl_2 . Sol in alcohol (Hinsberg, A 239 253)

Very unstable

Probably substances so described in the literature by Nylander and others were oxychlorides (Venable, J Am Chem Soc 1894, 16 471)

Sol in ether (Matthews, J Am Chem Soc 1898, 20 821)

Zirconium chloride ammonia, $\text{ZrCl}_4 \cdot 2\text{NH}_3$

Fumes in the air. Decomp by H_2O (Matthews, J Am Chem Soc 1898, 20 821)
 $\text{ZrCl}_4 \cdot 3\text{NH}_3$ (Stahler, B 1905, 38 2611)
 $\text{ZrCl}_4 \cdot 4\text{NH}_3$. Decomp by H_2O (Paykull)

Unstable. Decomp by H_2O (Matthews, J Am Chem Soc 1898, 20 821)

$\text{ZrCl}_4 \cdot 8\text{NH}_3$. Stable in the air. Decomp by H_2O . Insol in ether (Matthews, J Am Chem Soc 1898, 20 821)

Very hygroscopic. Decomp by H_2O . (Stahler, B 1905, 38 2611)

Zirconium fluoride, ZrF_4

Anhydrous Insol in H_2O and acids (Deville, A ch (3) 49 84)

Only sl sol in H_2O

1388 g dissolve in 100 cc H_2O without hydrolysis. On warming the solution, zirconium hydrate begins to ppt out at about 50° (Wolter, Ch Z 1908, 32 606)

+3H₂O. Sol in H_2O , but solution decomposes on diluting, with pptn of an insol basic salt. Sol in dil $\text{HF} + \text{Aq}$ (Berzelius)

Zirconium fluoride ammonia, $5\text{ZrF}_4 \cdot 2\text{NH}_3$

(Wolter, Ch Z 1908, 32 607)

Zirconium hydride, ZrH_2

Not attacked by acids (Winkler B 24 873)

Zirconium hydroxide, Zr(OH)_4

Insol in H_2O or alcohol. Sol in 5000 pts H_2O (Melliss)

Sol in acids, even oxalic or tartaric acid, when precipitated cold. If precipitated hot it is slowly dissolved upon heating with conc acids

Sol in dil or conc min acids except HI . Readily sol in oxalic only sl sol in acetic acid

Much less sol when pptd from Li solution than when pptd from cold solution (Venable, J Am Chem Soc 1898, 20 274)

Sl sol in $(\text{NH}_4)_2\text{CO}_3 + \text{Aq}$. Insol in K_2CO_3 and $\text{Na}_2\text{CO}_3 + \text{Aq}$. Insol in NaOH , KOH , and $\text{NH}_4\text{OH} + \text{Aq}$

Sol in $(\text{NH}_4)_2\text{C}_2\text{O}_4 + \text{NH}_4\text{OH} + \text{Ac}$. Insol in NH_4 salts + Aq

Zirconium iodide, ZrI_4

Fumes in the air

Sol in H_2O and acids with violent reaction

Decomp by alcohol. Sol in ether. Sl sol in benzene and CS_2 (Stahler B 1904, 37 1157)

Insol in H_2O , HNO_3 , HCl , aqua regia, and CS_2

Sol in H_2SO_4 with decomp unchanged by boiling H_2O (Dennis J Am Chem Soc 1896, 18 678)

Zirconium iodide ammonia, $\text{ZrI}_4 \cdot 6\text{NH}_3$,
 $\text{ZrI}_4 \cdot 7\text{NH}_3$, $\text{ZrI}_4 \cdot 8\text{NH}_3$, $\text{ZrI}_4 \cdot 10\text{NH}_3$

All above comps are hygroscopic and lose NH_3 in the air (Stahler, B 1905, **38** 2615)

Zirconium nitride

Scarcely attacked by acids, aqua regia, and caustic alkalis. Slowly decomp by long contact with H_2O (Mallet, Sill Am J (2) **28** 346)

Zr_2N_3 Decomp when heated in the air, sol in HF, insol in other min acids (Mathews, J Am Chem Soc 1898, **20** 844)

Zr_3N_8 Decomp when heated in the air. Sol in HF, insol in other min acids (Mathews, J Am Chem Soc 1898, **20** 844)

Zirconium oxide, ZrO_2

When ignited, is insol in all acids except HF and H_2SO_4 . Sl sol in HF, sol in H_2SO_4 only when very finely powdered and heated with a mixture of 2 pts H_2SO_4 and 1 pt H_2O until the H_2SO_4 volatilises (Berzelius)

Zirconium peroxide, ZrO_3

(Cleve, Bull Soc (2) **43** 53), or Zr_2O_5 according to Bailey (Chem Soc **49** 150)

Not attacked by cold dil $\text{H}_2\text{SO}_4 + \text{Aq}$

n silicon oxide

See Silicate, zirconium

Zirconium oxy-compounds

See Zirconyl compounds

Zirconium phosphide, ZrP_2

Insol in dil or conc acids and alkalis. Sl sol in aqua regia (Gewecke, A 1908, **361** 85)

Zirconium silicide, ZrSi_2

Sol in HF, insol in other min acids. Not acted upon by 10% $\text{KOH} + \text{Aq}$ or $\text{NaOH} + \text{Aq}$

Decomp by fusion with KOH (Hougschmid, C R 1906, **143** 225)

Zirconium sulphide

Insol in H_2O . Sol in HF, slowly sol in aqua regia. Insol in HNO_3 , HCl , H_2SO_4 , or $\text{KOH} + \text{Aq}$ (Berzelius)

Insol in dil acids. Sol in conc $\text{HNO}_3 + \text{Aq}$ (perhaps an oxysulphide) (Fremy)

Zirconomolybdic acid

Ammonium zirconomolybdate,

$2(\text{NH}_4)_2\text{O} \cdot \text{ZrO}_2 \cdot 12\text{MoO}_3 + 10\text{H}_2\text{O}$

Sol in H_2O (Pechard, C R 1893, **117** 790)

Potassium zirconomolybdate,
 $2\text{K}_2\text{O} \cdot \text{ZrO}_2 \cdot 12\text{MoO}_3 + 18\text{H}_2\text{O}$

Sol in H_2O (Pechard)

Zirconotungstic acid

Ammonium zirconodecatungstate,

$3(\text{NH}_4)_2\text{O} \cdot \text{ZrO}_2 \cdot 10\text{WO}_3 + 13\text{H}_2\text{O}$

Very sol in H_2O

Efflorescent (Hallopeau, Bull Soc 1896, (3) **15** 921)

$3(\text{NH}_4)_2\text{O} \cdot \text{H}_2\text{O} \cdot \text{ZrO}_2 \cdot 10\text{WO}_3 + 13\text{H}_2\text{O}$

Sol in H_2C , unstable, effloresces in the air (Hallopeau)

Potassium zirconotungstate, $4\text{K}_2\text{O} \cdot \text{ZrO}_2 \cdot \text{WO}_3 + 20\text{H}_2\text{O}$

Sol in hot H_2O (Hallopeau)

$4\text{K}_2\text{O} \cdot \text{ZrO}_2 \cdot 10\text{WO}_3 + 15\text{H}_2\text{O}$ More sol in hot than in cold H_2O

Sol in fused alkali carbonates (Hallopeau)

Potassium dizirconodecatungstate,

$4\text{K}_2\text{O} \cdot 2\text{ZrO}_2 \cdot 10\text{WO}_3 + 20\text{H}_2\text{O}$

More sol in hot than in cold H_2O

Sol in fused alkali carbonates (Hallopeau)

Zirconyl bromide, $\text{ZrOBr}_2 + 3\text{H}_2\text{O}$

Deliquescent. Decomp in moist air. Very sol in H_2O (Venible, J Am Chem Soc 1898, **20** 324)

+ $7\text{H}_2\text{O}$ Sol in H_2O (Melliss)

+ $8\text{H}_2\text{O}$ Deliquescent. Decomp in moist air. Very sol in H_2O (Venible, J Am Chem Soc 1898, **20** 324)

+ $13\text{H}_2\text{O}$ Deliquescent. Decomp in moist air

Very sol in H_2O (Venible)

+ $14\text{H}_2\text{O}$ Deliquescent. Decomp in moist air (Venible)

Very sol in H_2O (Venible)

$\text{ZrBr}(\text{OH})_3 + \text{H}_2\text{O}$, and + $2\text{H}_2\text{O}$ Deliquescent, and decomp in moist air (Venible)

Zirconyl chloride, ZrOCl_2

Sol in H_2O , insol in HCl (Venible, J Am Chem Soc 1894, **16** 47)

+ $2\text{H}_2\text{O}$ (Chauvenet, C R 1912 **154** 822)

+ $3\text{H}_2\text{O}$ Sol in H_2O (Venible)

+ $3.5\text{H}_2\text{O}$ (Chauvenet, C R 1912, **154** 522)

+ $6\text{H}_2\text{O}$ (Chauvenet)

Sol in H_2O

Insol in HCl (Venible)

+ $4\frac{1}{2}\text{H}_2\text{O}$, $6\frac{1}{2}\text{H}_2\text{O}$, and $8\text{H}_2\text{O}$

Efflorescent. Easily sol in H_2O and alcohol. Very sl sol in conc $\text{HCl} + \text{Aq}$ (Berzelius)

+ $8\text{H}_2\text{O}$ Sol in H_2O (Venible, J Am Chem Soc 1898, **20** 321)

Effloresces in the air

Sol in H_2O Less sol in $HCl + Aq$ and nearly insol in conc HCl (Chauvenet, C R 1912, **154**, 822)

Zr_2OCl_2 Sol in H_2O and alcohol (Endemann, J pr (2) **11** 219)

Not decomp by H_2O

Sol in dil HCl (Chauvenet, C R 1912, **154** 1236)

+ H_2O (Chauvenet, C R 1912, **154** 1236)

+ $3H_2O$ Decomp by H_2O Sol in dil HCl (Chauvenet)

$8ZrO_2, 7HCl$ Sol in H_2O (E)

Zr_2OCl_6 (Troost and Hautefeuille, C R **73** 563)

$Zr_2OCl_4 = ZrCl_4, 2ZrO_2$ Insol in H_2O (Hermann)

Zirconyl iodide, $ZrOI_2 + 8H_2O$

Very sol in H_2O and alcohol

Very hygroscopic ((Stahler, B 1904, **37** 1138)

$ZrI(OH)_3 + 3H_2O$ Easily sol in H_2O (Hinsberg, A **239** 253)

Ppt Sl sol in $HI + Aq$ (Venable, J Am Chem Soc 1898, **20** 328)

Zirconyl sulphide (?)

Decomp by HNO_3 with separation of S (Freymy, A ch (3) **38** 326)



APPENDIX

FORMULÆ FOR CONVERTING AREOMETER DEGREES INTO SPECIFIC GRAVITY

n = no of degrees on the areometer scale, sp gr = specific gravity

Areometer	Temp	Liquids heavier than H ₂ O	Liquids lighter than H ₂ O
1 Baumé			
(a) According to Baumé's original directions For liquids heavier than H ₂ O Sp gr of a solution of 15 pts NaCl dissolved in 85 pts H ₂ O at 12 5° ($d_{12.5}^{12.5} = 1.118988$) = 15°, H ₂ O = 0° For liquids lighter than H ₂ O Sp gr of 10% NaCl + Aq at 12 5° ($d_{12.5}^{12.5} = 1.0737665$) = 0°, H ₂ O = 10°	15°	$\text{Sp gr} = \frac{149.05}{149.05 - n}$	$\text{Sp gr} = \frac{145.56}{135.56 - n}$
(b) Old Form Liquids heavier than H ₂ O, 10% NaCl + Aq at 15° ($d_{15}^{15} = 1.073350$) = 10°, H ₂ O = 0° Liquids lighter than H ₂ O, 10% NaCl + Aq = 0°, H ₂ O = 10°	12 5°	$\text{Sp gr} = \frac{145.88}{145.88 - n}$	$\text{Sp gr} = \frac{145.88}{135.88 - n}$
(c) New Form So-called "Rational Scale" Liquids heavier than H ₂ O, H ₂ SO ₄ + Aq $\frac{15}{15} = 1.842 = 66^\circ$, H ₂ O = 0°	15°	$\text{Sp gr} = \frac{146.3}{146.3 - n}$	$\text{Sp gr} = \frac{146.3}{136.3 - n}$
	17 5°	$\text{Sp gr} = \frac{146.78}{146.78 - n}$	$\text{Sp gr} = \frac{146.78}{136.78 - n}$
(c) New Form So-called "Rational Scale" Liquids heavier than H ₂ O, H ₂ SO ₄ + Aq $\frac{15}{15} = 1.842 = 66^\circ$, H ₂ O = 0°	15°	$\text{Sp gr} = \frac{144.3}{144.3 - n}$	
2 Beck			
H ₂ O = 0°, liquid of 0.850 sp gr ($\frac{12.5}{12.5} = 30^\circ$ Scale continued above and below	12 5°	$\text{Sp gr} = \frac{170}{170 - n}$	$\text{Sp gr} = \frac{170}{170 - n}$
3 Twaddle			
H ₂ O = 0° Each degree corresponds to an increase of 0.005 in the sp gr	Given on the instrument	$\text{Sp gr} = 1.000 + 0.005n$	

TABLES FOR THE CONVERSION OF BAUMÉ DEGREES INTO SP GR

Since the original directions of Baumé there have been many slight modifications suggested, so that there are several varieties of Baumé hydrometers with somewhat varying readings, tables for the two principal ones of which are here-given

1 According to Baumé's original directions

For liquids heavier than H_2O Sp gr of 15 % NaCl+

$$Aq \left(\frac{12.5^\circ}{12.5^\circ} \right) = 1.1118988 = 15^\circ, H_2O = 0^\circ$$

$$\text{Calculated according to the formula, sp gr} = \frac{149.05}{149.05 - n}$$

Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr
0	1.00000	20	1.15497	39	1.35438	58	1.63701
1	1.00675	21	1.16399	40	1.36680	59	1.65519
2	1.01360	22	1.17316	41	1.37945	60	1.67378
3	1.02054	23	1.18246	42	1.39234	61	1.69279
4	1.02757	24	1.19192	43	1.40547	62	1.71223
5	1.03471	25	1.20153	44	1.41885	63	1.73213
6	1.04194	26	1.21129	45	1.43248	64	1.75250
7	1.04927	27	1.22122	46	1.44638	65	1.77335
8	1.05671	28	1.23131	47	1.46056	66	1.79470
9	1.06426	29	1.24156	48	1.47501	67	1.81657
10	1.07191	30	1.25199	49	1.48971	68	1.83899
11	1.07968	31	1.26260	50	1.50479	69	1.86196
12	1.08755	32	1.27338	51	1.52014	70	1.88551
13	1.09555	33	1.28436	52	1.53580	71	1.90967
14	1.10366	34	1.29522	53	1.55179	72	1.93446
15	1.11189	35	1.30688	54	1.56812	73	1.95989
16	1.12025	36	1.31844	55	1.58471	74	1.98601
17	1.12873	37	1.33621	56	1.60182	75	2.01283
18	1.13735	38	1.34218	57	1.61923	76	2.04038
19	1.14609						

For liquids lighter than H_2O Sp gr of 10 % NaCl

$$Aq \left(\frac{12.5^\circ}{12.5^\circ} \right) = 1.0737665 = 0^\circ, H_2O = 10^\circ$$

$$\text{Calculated according to the formula, sp gr} = \frac{145.56}{135.56 + n}$$

Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr
10	1.00000	30	0.87919	50	0.78443	65	0.72577
15	0.96679	35	0.85342	55	0.76385	70	0.70811
20	0.93571	40	0.82912	60	0.74432	75	0.69130
25	0.90657	45	0.80616				

2 According to the so-called Rational Scale

$$\text{Sp gr of } H_2SO_4 + Aq \left(\frac{15^\circ}{15^\circ} \right) = 1.842 = 66^\circ, H_2O = 0^\circ$$

$$\text{Calculated according to the formula, sp gr} = \frac{144.3}{144.3 - n}$$

Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr	Deg Baumé	Sp gr
1	1.007	18	1.142	35	1.320	51	1.547
2	1.014	19	1.152	36	1.332	52	1.563
3	1.021	20	1.161	37	1.345	53	1.580
4	1.029	21	1.170	38	1.357	54	1.598
5	1.036	22	1.180	39	1.370	55	1.616
6	1.043	23	1.190	40	1.384	56	1.634
7	1.051	24	1.200	41	1.397	57	1.653
8	1.059	25	1.210	42	1.411	58	1.672
9	1.066	26	1.220	43	1.424	59	1.692
10	1.074	27	1.230	44	1.439	60	1.712
11	1.082	28	1.241	45	1.453	61	1.732
12	1.091	29	1.251	46	1.468	62	1.753
13	1.099	30	1.262	47	1.483	63	1.775
14	1.107	31	1.274	48	1.498	64	1.797
15	1.116	32	1.285	49	1.514	65	1.820
16	1.125	33	1.296	50	1.530	66	1.842
17	1.133	34	1.308				

SYNCHRONISTIC TABLE OF CHEMICAL

Year	A	A ch	Am J Sci	Ann Min	Ann Phil	Arch Pharm	Ch Gaz	C R	Dungl
1800		(1) 32-34							
1801		35-39							
1802		40-43							
1803		44-47							
1804		48-51							
1805		52-55							
1806		56-60							
1807		61-64							
1808		65-68							
1809		69-72							
1810		73-76							
1811		77-80							
1812		81-84							
1813		85-88			(1) 1, 2				
1814		89-92			3, 4				
1815		93-96			5, 6				
1816		(2) 1-3			7, 8				
1817		4-6		1, 2	9, 10				
1818		7-9		3	11, 12				
1819		10-12	(1) 1	4	13, 14				
1820		13-15	2	5	15, 16			1-3	
		16-18	3	6	(2) 1, 2			4-6	
		19-21	4, 5	7	3, 4	1, 2		7-9	
		22-24	6	8	5, 6	3-6		10-12	
		25-27	7, 8	9	7, 8	7-10		13-15	
		28-30	9	10, 11	9, 10	11-14		16-18	
		31-33	10, 11	12, 13	11, 12	16-19		19-22	
		34-36	12	(2) 1, 2		20-23		23-26	
		37-39	13, 14	3, 4		24-26		27-30	
		40-42	15, 16	5, 6		27-30		31-34	
		43-45	17, 18	7, 8		31-34		35-38	
		46-48	19, 20			35-39		39-42	
1831		49-51	21, 22	(3) 1, 2		40-43		43-47	
1832	1-4	52-55	23, 24	3, 4		44-47		48-50	
1833	5-8	56-57	25-27	5, 6		48-50		51-54	
1834	9-12	58-60	28, 29	7, 8		(2) 1-4		55-58	
1835	13-16	61-63	30, 31	9, 10		5-8		59-62	
1836	17-20	64-66	32, 33	11, 12		9-12		63-66	
1837	21-24	67-69	35, 35	13, 14		13-16		67-70	
1838	25-28	70-72	36, 37	15, 16		17-20		71-74	
1839	29-32	73-75	38, 39	17, 18		21-24		75-78	
1840	33-36	76	40, 41	19, 20		25-28		79-82	
1841	37-40	(3) 1-5	42, 43	(4) 1, 2		29-32		83-86	
1842	41-44	7-9	44, 45	3, 4		33-36	1	87-90	
1843	45-48	10-12	46, 47	5, 6		37-40	2	91-94	
1844	49-52	13-15	48-50	7, 8		41-44		95-98	
1845	53-56	16-18	(2) 1, 2	9, 10		45-48	3	99-102	
1846	57-60	19-21	3, 4	11, 12		49-52	4	24, 25	103-106

AND OTHER SCIENTIFIC PERIODICALS—Part I

Galb Ann	J Chm med	J Pharm	J pr	Phil Mag	Pogg	Proc Am Acad	Proc Roy Soc	Q J Sci	Scher J	Schw J
4-6				6-8					3, 4	
7-9				9-11					5, 6	
10-12				12-14					7, 8	
13-15				15-17					9, 10	
16-18				18-20					12, 12	
19-21				21-23					13, 14	
22-24				24-26					15, 16	
25-27				27-29					17, 18	
28-30				30-32					19, 20	
31-33		(1) 1		33, 34					21, 22	
34-36		2		35, 36					23, 24	
37-39		3		37, 38					Cont as	(1) 1-3
40-42		4		39, 40					Schw J	4-6
43-45		5		41, 42						7-9
46-48		6		43, 44						10-12
49-51		(2) 1		45, 46						13-15
52-54		2		47, 48				1		16-18
55-57		3		49, 50				2, 3		19-21
58-60		4		51, 52				4, 5		22-24
61-63		5		53, 54				6, 7		25-27
64-66		6		55, 56				8, 9		28-30
67-69		7		57, 58				10, 11		(2) 1-3
70-72		8		59, 60				12, 13		4-6
73-75		9		61, 62				14, 15		7-9
76		10		63, 64	1, 2			16, 17		10-12
Cont as	(1) 1	11		65, 66	3-5			18, 19		13-15
Pogg	2	12		67, 68	6-8			20, 21		16-18
	3	13		(2) 1, 2	9-11					19-21
	4	14		3, 4	12-14					22-24
	5	15		5, 6	15-17					25-27
	6	16		7, 8	18-20					28-30
	7	17		9, 10	21-23					(3) 1-3
	8	18		11, (3) 1	24-26					4-6
	9	19		2, 3	27-30	1	1			7-9
	10	20	1-3	4, 5	31-33		2			Cont as
(2) 1	21	4-6	6, 7	34-36	37-39					J pr
2	22	7-9	8, 9	40-42	43-45					
3	23	10-12	10, 11	46-48	49-51					
4	24	13-15	12, 13	52-54	55-57					
5	25	16-18	14, 15	58-60	61-63					
6	26	19-21	16, 17	64-66	67-69					
7	27	22-24	18, 19	70-72						
8	(3) 1, 2	25-27	20, 21							
9	3, 4	28-30	22, 23							
10	5, 6	31-33	24, 25							
(3) 1	7, 8	34-36	26, 27							
2	9, 10	37-39	28, 29							
3	11, 12	40-42	30, 31							

SYNCHRONISTIC TABLE OF CHEMICAL

Year	A	A ch	Am J Sci	Ann Min	Ann Phil	Arch Pharm	Ch Gaz	C R	Dingl
1800		(1) 32-34							
1801		35-39							
1802		40-43							
1803		44-47							
1804		48-51							
1805		52-55							
1806		56-60							
1807		61-64							
1808		65-68							
1809		69-72							
1810		73-76							
1811		77-80							
1812		81-84							
1813		85-88			(1) 1, 2				
1814		89-92			3, 4				
1815		93-96			5, 6				
1816		(2) 1-3			7, 8				
1817		4-6		1, 2	9, 10				
1818		7-9		3	11, 12				
1819		10-12	(1) 1	4	13, 14				
1820		13-15	2	5	15, 16			1-3	
1821		16-18	3	6	(2) 1, 2			4-6	
1822		19-21	4, 5	7	3, 4	1, 2		7-9	
1823		22-24	6	8	5, 6	3-6		10-12	
		25-27	7, 8	9	7, 8	7-10		13-15	
		28-30	9	10, 11	9, 10	11-14		16-18	
		31-33	10, 11	12, 13	11, 12	16-19		19-22	
		34-36	12	(2) 1, 2		20-23		23-26	
		37-39	13, 14	3, 4		24-26		27-30	
		40-42	15, 16	5, 6		27-30		31-34	
		43-45	17, 18	7, 8		31-34		35-38	
1831		46-48	19, 20			35-39		39-42	
1832	1-4	49-51	21, 22	(3) 1, 2		40-43		43-47	
1833	5-8	52-55	23, 24	3, 4		44-47		48-50	
1834	9-12	56-57	25-27	5, 6		48-50		51-54	
1835	13-16	58-60	28, 29	7, 8	(2) 1-4	55-58		55-58	
1836	17-20	61-63	30, 31	9, 10		5-8		59-62	
1837	21-24	64-66	32, 33	11, 12		9-12		63-66	
1838	25-28	67-69	33, 34	13, 14		13-16		67-70	
1839	29-32	70-72	35, 36	15, 16		17-20		71-74	
1840	33-36	73-75	37, 38	17, 18		21-24		75-78	
1841	37-40	(3) 1-3	40, 41	19, 20		25-28		79-82	
1842	41-44	4-6	42, 43	(4) 1, 2		29-32		83-86	
1843	45-48	7-9	44, 45	3, 4		33-36	1	87-90	
1844	49-52	10-12	46, 47	5, 6		37-40	2	91-94	
1845	53-56	13-15	48-50	7, 8		41-44		95-98	
1846	57-60	16-18	(2) 1, 2	9, 10		45-48	3	99-102	
1847	61-64	19-21	5, 4	11, 12		49-52	4	103-106	

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Gilb Ann	J Chim med	J Pharm	J pr	Phil Mag	Pogg	Proc Am Acad	Proc Roy Soc	Q J Sci	Scher J	Schw J
4-6				6-8					3, 4	
7-9				9-11					5, 6	
10-12				12-14					7, 8	
13-15				15-17					9, 10	
16-18				18-20					12, 12	
19-21				21-23					13, 14	
22-24				24-26					15, 16	
25-27				27-29					17, 18	
28-30				30-32					19, 20	
31-33		(1) 1		33, 34					21, 22	
34-36		2		35, 36					23, 24	
37-39		3		37, 38					Cont as	(1) 1-3
40-42		4		39, 40					Schw J	4-6
43-45		5		41, 42						7-9
46-48		6		43, 44						10-12
49-51		(2) 1		45, 46						13-15
52-54		2		47, 48				1		16-18
55-57		3		49, 50				2, 3		19-21
58-60		4		51, 52				4, 5		22-24
61-63		5		53, 54				6, 7		25-27
64-66		6		55, 56				8, 9		28-30
67-69		7		57, 58				10, 11		(2) 1-3
70-72		8		59, 60				12, 13		4-6
73-75		9		61, 62				14, 15		7-9
76		10		63, 64	1, 2			16, 17		10-12
Cont as	(1) 1	11		65, 66	3-5			18, 19		13-15
Pogg	2	12		67, 68	6-8			20, 21		16-18
	3	13		(2) 1, 2	9-11					19-21
	4	14		3, 4	12-14					22-24
	5	15		5, 6	15-17					25-27
	6	16		7, 8	18-20					28-30
	7	17		9, 10	21-23					(3) 1-3
	8	18		11, (3) 1	24-26					4-6
	9	19		2, 3	27-30	1	1			7-9
	10	20	1-3	4, 5	31-33		2			Cont as
(2) 1	21	21	4-6	6, 7	34-36					J pr
2	22	22	7-9	8, 9	37-39					
3	23	23	10-12	10, 11	40-42			3		
4	24	24	13-15	12, 13	43-45					
5	25	25	16-18	14, 15	46-48					
6	26	26	19-21	16, 17	49-51					
7	27	27	22-24	18, 19	52-54					
8	(3) 1, 2	25-27	20, 21	20, 21	55-57					
9	3, 4	28-30	22, 23	22, 23	58-60			4		
10	5, 6	31-33	24, 25	24, 25	61-63					
(3) 1	7, 8	34-36	26, 27	26, 27	64-66					
2	9, 10	37-39	28, 29	28, 29	67-69	2				
3	11, 12	40-42	30, 31	30, 31	70-72					

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	A	A ch	Am Ch J	Am J Sci	Analyst	Ann Min	Arch Pharm	A suppl	B	Bull Soc
1848	65-68	22-24		5, 6		13, 14	53-56			
1849	69-72	25-27		7, 8		15, 16	57-60			
1850	73-76	28-30		9, 10		17, 18	61-64			
1851	77-80	31-33		11, 12		19, 20	65-68			
1852	81-84	34-36		13, 14		(5) 1, 2	69-72			
1853	85-88	37-39		15, 16		3, 4	73-76			
1854	89-92	40-42		17, 18		5, 6	77-80			
1855	93-96	43-45		19, 20		7, 8	81-84			
1856	97-100	46-48		21, 22		9, 10	85-88			
1857	101-104	49-51		23, 24		11, 12	89-92			
1858	105-108	52-54		25, 26		13, 14	93-96			
1859	109-112	55-57		27, 28		15, 16	97-100			1
1860	113-116	58-60		29, 30		17, 18	101-104			2
1861	117-120	61-63		31, 32		19, 20	105-108	1		3
1862	121-124	64-66		33, 34		(6) 1, 2	109-112	2		4
1863	125-128	67-69		35, 36		3, 4	113-116			5
1864	129-132	(4) 1-3		37, 38		5, 6	117-120		(2) 1, 2	6
1865	133-136	4-6		39, 40		7, 8	121-124	4		7
1866	137-140	7-9		41, 42		9, 10	125-128			8
1867	141-144	10-12		43, 44		11, 12	129-132	5		9
1868	145-148	13-16		45, 56		13, 14	133-136	6	1	10
1869	149-152	16-18		47, 48		15, 16	137-140		2	11
1870	153-156	19-21		49, 50		17, 18	141-144	7	3	12
1871	157-160	22-24		(3) 1, 2*		19, 20	145-148		4	13
	161	25-27		3, 4		(7) 1, 2	149, 150	8	5	14
						(3) 1†				15
	-170	28-30		5, 6		3, 4	2, 3		6	16
	171-174	(5) 1-3		7, 8		5, 6	4, 5		7	17
1875	175-179	4-6		9, 10		7, 8	6, 7		8	18
1876	180-183	7-9		11, 12	0	9, 10	8, 9		9	19
1877	184-189	10-12		13, 14	2	11, 12	10, 11		10	20
1878	190-194	13-15		15, 16	3	13, 14	12, 13		11	21
1879	195-199	16-18		17, 18	4	15, 16	14, 15		12	22
1880	200-205	19-21	1	19, 20	5	17, 18	16, 17		13	23
1881	206-210	22-24	2	21, 22	6	19, 20	18, 19		14	24
1882	211-215	25-27	3	23, 24	7	(8) 1, 2	20		15	25
1883	216-221	28-30	4	25, 26	8	3, 4	21		16	26
1884	222-226	(6) 1-3	5	27, 28	9	5, 6	22		17	27
1885	227-231	4-6	6	29, 30	10	7, 8	23		18	28
1886	232-236	7-9	7	31, 32	-11	9, 10	24		19	29
1887	237-242	10-12	8	33, 34	12	11, 12	25		20	30
1888	243-249	13-15	9	35, 36	13, 14	13, 14	26		21	31
1889	250-255	16-18	10	37, 38	15, 16	15, 16	27		22	32
1890	256-260	19-21	11	39, 40	17, 18	17, 18	228		23	33
1891	261-266	22-24	12	41, 42	19, 20	19, 20	229		24	34
1892	267-271	25-27	13	43, 44	21, 22	(9) 1, 2	230		25	35
1893	272-277	28-30	14	45, 46	23, 24	3, 4	231		26	36
1894	278-283	(7) 1-3	15	47, 48	25, 26	5, 6	232		27	37
1895	284-289	4-6	16	49, 50	27, 28	7, 8	233		28	38

* Also cited as whole series, 101, 102, 103, etc

† Also cited as 201, 202, etc

OTHER SCIENTIFIC PERIODICALS—Part II

C C	Chem Ind	Chem Soc	Ch Gaz	Ch Ztg	Cm	C N	C R	Dingl	Gazz ch it	J Am Chem Soc	J Anal Ch
			5				26, 27	107-110			
		1	6				28, 29	111-114			
		2	7				30, 31	115-118			
		3	8				32, 33	119-122			
		4	9		1, 2		34, 35	123-126			
		5	10		3, 4		36, 37	127-130			
		6	11		5, 6		38, 39	131-134			
		7	12		Cont as N		40, 41	135-138			
1		8	13		Cm		42, 43	139-142			
2		9	14				44, 45	143-146			
3		10	15				46, 47	147-150			
4		11	16				48, 49	151-154			
5		12	17			1, 2	50, 51	155-158			
6		13	Cont as N			3, 4	52, 53	159-162			
7		14, 15	16*			5, 6	54, 55	163-166			
8		16*	C N			7, 8	56, 57	167-170			
9		17				9, 10	58, 59	171-174			
10		18				11, 12	60, 61	175-178			
11		19				13, 14	62, 63	179-182			
12		20				15, 16	64, 65	183-186			
13		21				17, 18	66, 67	187-190			
14		22				9, 20	68, 69	191-194			
15		23				21, 22	70, 71	195-198			
16		24				23, 24	72, 73	199-202	1		
17		25				25, 26	74, 75	203-206	2		
18		26				27, 28	76, 77	207-210	3		
19		27				29, 30	78, 79	211-214	4		
20		28				31, 32	80, 81	215-218	5		
21		29, 30				33, 34	82, 83	219-222	6		
22		31, 32				35, 36	84, 85	223-226	7		
23	1	33, 34		1		37, 38	86, 87	227-230	8		
24	2	35, 36		2		39, 40	88, 89	231-234	9	1	
25	3	37, 38		3		41, 42	90, 91	235-238	10	2	
26	4	39, 40		4		43, 44	92, 93	239-242	11	3	
27	5	41, 42		5		45, 46	94, 95	243-246	12	4	
28	6	43, 44		6		47, 48	96, 97	247-250	13	5	
29	7	45, 46		7		49, 50	98, 99	251-254	14	6	
30	8	47, 48		8		51, 52	100, 101	255-258	15	7	
31	9	49, 50		9		53, 54	102, 103	259-262	16	8	
32	10	51, 52		10		55, 56	104, 105	263-266	17	9	
33	11	53, 54		11		57, 58	106, 107	267-270	18	10	
34	12	55, 56		12		59, 60	108, 109	271-274	19	11	
35	13	57, 58		13		61, 62	110, 111	275-278	20	12	
36	14	59, 60		14		63, 64	112, 113	279-282	21	13	
37	15	61, 62		15		65, 66	114, 115	283-286	22	14	
38	16	63, 64		16		67, 68	116, 117	287-290	23	15	
39	17	65, 66		17		69, 70	118, 119	291-294	24	16	
40	18	67, 68		18		71, 72	120, 121	295-298	25	17	

* Also cited as (2) 1, 2, 3, etc

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	A	A ch	Am Ch J	Am J Sci	Analyst	Ann Min	Arch Pharm	A suppl	B	Bull Soc
1848	65-68	22-24		5, 6		13, 14	53-56			
1849	69-72	25-27		7, 8		15, 16	57-60			
1850	73-76	28-30		9, 10		17, 18	61-64			
1851	77-80	31-33		11, 12		19, 20	65-68			
1852	81-84	34-36		13, 14		(5) 1, 2	69-72			
1853	85-88	37-39		15, 16		3, 4	73-76			
1854	89-92	40-42		17, 18		5, 6	77-80			
1855	93-96	43-45		19, 20		7, 8	81-84			
1856	97-100	46-48		21, 22		9, 10	85-88			
1857	101-104	49-51		23, 24		11, 12	89-92			
1858	105-108	52-54		25, 26		13, 14	93-96			
1859	109-112	55-57		27, 28		15, 16	97-100			1
1860	113-116	58-60		29, 30		17, 18	101-104			2
1861	117-120	61-63		31, 32		19, 20	105-108	1		3
1862	121-124	64-66		33, 34		(6) 1, 2	109-112	2		4
1863	125-128	67-69		35, 36		3, 4	113-116			5
1864	129-132	(4) 1-3		37, 38		5, 6	117-120		(2) 1, 2	6
1865	133-136	4-6		39, 40		7, 8	121-124	4	3, 4	7
1866	137-140	7-9		41, 42		9, 10	125-128		5, 6	8
1867	141-144	10-12		43, 44		11, 12	129-132	5	7, 8	9
1868	145-148	13-16		45, 56		13, 14	133-136	6	9, 10	10
1869	149-152	16-18		47, 48		15, 16	137-140		11, 12	11
1870	153-156	19-21		49, 50		17, 18	141-144	7	13, 14	12
1871	157-160	22-24	(3) 1, 2*			19, 20	145-148		15, 16	13
1872	161-164	25-27	3, 4			(7) 1, 2	149, 150	8	17, 18	14
						(3) 1†				
1873	165-170	28-30		5, 6		3, 4	2, 3		19, 20	
1874	171-174	(5) 1-3		7, 8		5, 6	4, 5		21, 22	
1875	175-179	4-6		9, 10		7, 8	6, 7		23, 24	
1876	180-183	7-9		11, 12	0	9, 10	8, 9		25, 26	
1877	184-189	10-12		13, 14	2	11, 12	10, 11	10	27, 28	
1878	190-194	13-15		15, 16	3	13, 14	12, 13	11	29, 30	
1879	195-199	16-18	1	17, 18	4	15, 16	14, 15	12	31, 32	
1880	200-205	19-21	2	19, 20	5	17, 18	16, 17	13	33, 34	
1881	206-210	22-24	3	21, 22	6	19, 20	18, 19	14	35, 36	
1882	211-215	25-27	4	23, 24	7	(8) 1, 2	20	15	37, 38	
1883	216-221	28-30	5	25, 26	8	3, 4	21	16	39, 40	
1884	222-226	(6) 1-3	6	27, 28	9	5, 6	22	17	41, 42	
1885	227-231	4-6	7	29, 30	10	7, 8	23	18	43, 44	
1886	232-236	7-9	8	31, 32	-11	9, 10	24	19	45, 46	
1887	237-242	10-12	9	33, 34	12	11, 12	25	20	47, 48	
1888	243-249	13-15	10	35, 36	13, 14	13, 14	26	21	49, 50	
1889	250-255	16-18	11	37, 38	15, 16	15, 16	27	22	(3) 1, 2	
1890	256-260	19-21	12	39, 40	17, 18	17, 18	228	23	3, 4	
1891	261-266	22-24	13	41, 42	19, 20	19, 20	229	24	5, 6	
1892	267-271	25-27	14	43, 44	21, 22	(9) 1, 2	230	25	7, 8	
1893	272-277	28-30	15	45, 46	23, 24	3, 4	231	26	9, 10	
1894	278-283	(7) 1-3	16	47, 48	25, 26	5, 6	232	27	11, 12	
1895	284-289	4-6	17	49, 50	27, 28	7, 8	233	28	13, 14	

* Also cited as whole series, 101, 102, 103, etc

† Also cited as 201, 202, etc

OTHER SCIENTIFIC PERIODICALS—Part II

C C	Chem Ind	Chem Soc	Ch Gaz	Ch Ztg	Chm	C N	C R	Dingl	Gazz ch it	J Am Chem Soc	J Anal Ch
			5				26, 27	107-110			
		1	6				28, 29	111-114			
		2	7				30, 31	115-118			
		3	8				32, 33	119-122			
		4	9		1, 2		34, 35	123-126			
		5	10		3, 4		36, 37	127-130			
		6	11		5, 6		38, 39	131-134			
		7	12		Cont as N		40, 41	135-138			
		8	13		Cm		42, 43	139-142			
		9	14				44, 45	143-146			
1		10	15				46, 47	147-150			
2		11	16				48, 49	151-154			
3		12	17			1, 2	50, 51	155-158			
4		13	18			3, 4	52, 53	159-162			
5		14, 15	16*			5, 6	54, 55	163-166			
6		16	Cont as C N			7, 8	56, 57	167-170			
7		17				9, 10	58, 59	171-174			
8		18				11, 12	60, 61	175-178			
9		19				13, 14	62, 63	179-182			
10		20				15, 16	64, 65	183-186			
11		21				17, 18	66, 67	187-190			
12		22				9, 20	68, 69	191-194			
13		23				21, 22	70, 71	195-198			
14		24				23, 24	72, 73	199-202	1		
15		25				25, 26	74, 75	203-206	2		
16		26				27, 28	76, 77	207-210	3		
17		27				29, 30	78, 79	211-214	4		
18		28				31, 32	80, 81	215-218	5		
19		29, 30				33, 34	82, 83	219-222	6		
20		31, 32				35, 36	84, 85	223-226	7		
21		33, 34				37, 38	86, 87	227-230	8		
22		35, 36				39, 40	88, 89	231-234	9		
23	1	37, 38				41, 42	90, 91	235-238	10	1	
24	2	39, 40				43, 44	92, 93	239-242	11	2	
25	3	41, 42				45, 46	94, 95	243-246	12	3	
26	4	43, 44				47, 48	96, 97	247-250	13	4	
27	5	45, 46				49, 50	98, 99	251-254	14	5	
28	6	47, 48				51, 52	100, 101	255-258	15	6	
29	7	49, 50				53, 54	102, 103	259-262	16	7	
30	8	51, 52				55, 56	104, 105	263-266	17		1
31	9	53, 54				57, 58	106, 107	267-270	18		2
32	10	55, 56				59, 60	108, 109	271-274	19		3
33	11	57, 58				61, 62	110, 111	275-278	20		4
34	12	59, 60				63, 64	112, 113	279-282	21		5
35	13	61, 62				65, 66	114, 115	283-286	22		6
36	14	63, 64				67, 68	116, 117	287-290	23		7
37	15	65, 66				69, 70	118, 119	291-294	24		
38	16	67, 68				71, 72	120, 121	295-298	25		
39	17										
40	18										

* Also cited as (2) 1, 2, 3, etc

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	J Chim méd	Jena Zeit	J Pharm	J pr	J Russ Soc	J Soc Chem Ind	M Ch	Monit Scient	N Cum	N Rep Pharm	Pharm J Trans	Phil Mag
1848	4		13, 14	43-45								32, 33
1849	5		15, 16	46-48								34, 35
1850	6		17, 18	49-51								36, 37
1851	7		19, 20	52-54								(4) 1, 2
1852	8		21, 22	55-57						1		3, 4
1853	9		23, 24	58-60						2		5, 6
1854	10		25, 26	61-63						3		7, 8
1855	(4) 1		27, 28	64-66					1, 2	4		9, 10
1856	2		29, 30	67-69					3, 4	5		11, 12
1857	3		31, 32	70-72			(1) 1	5, 6	6	6		13, 14
1858	4		33, 34	73-75			2	7, 8	7	7		15, 16
1859	5		35, 36	76-78			3	9, 10	8	8		17, 18
1860	6		37, 38	79-81			4	11, 12	9	9		19, 20
1861	7		39, 40	82-84				13, 14	10	10		21, 22
1862	8		41, 42	85-87					11	11		23, 24
1863	9		43, 44	88-90					12	12		25, 26
1864	10	1	45, 46	91-93			(2) 6		13	13		27, 28
1865	(5) 1		(4) 1, 2	94-96			7		14	14		29, 30
1866	2	2	3, 4	97-99			8		15	15		31, 32
1867	3	3	5, 6	100-102			9		16	16		33, 34
1868	4	4	7, 8	103-105			10		17	17		35, 36
1869	5		9, 10	106-108	1		11		18	18		37, 38
1870	6	5	11, 12	(2) 1, 2	2		12		19	19		39, 40
1871	7	6	13, 14	3, 4	3		(5) 13		20	20		41, 42
1872	8		15, 16	5, 6	4		14		21	21		43, 44
1873	9	7	17, 18	7, 8	5		15		22	22		45, 46
1874	10	8	19, 20	9, 10	6		16		23	23		47, 48
1875	11	9	21, 22	11, 12	7		17		24	24		49, 50
1876	12	10	23, 24	13, 14	8		18			6	(5) 1, 2	51, 52
1877		110	25, 26	15, 16	9		19			7		53, 54
1878		12	27, 28	17, 18	10		20			8		55, 56
1879		13	29, 30	19, 20	11		21			9		57, 58
1880		14	31, 32	21, 22	12		22			10		59, 60
1881		15	33, 34	23, 24	13		23			11		61, 62
1882		16	35, 36	25, 26	14	1	24			12		63, 64
1883		17	37, 38	27, 28	15	2	25			13		65, 66
1884		18	39, 40	29, 30	16		26			14		67, 68
1885		19	41, 42	31, 32	17	4	27			15		69, 70
1886		20	43, 44	33, 34	18		28			16		71, 72
1887		21	45, 46	35, 36	19	5	29			17		73, 74
1888		22	47, 48	37, 38	20		30			18		75, 76
1889		23	49, 50	39, 40	21	8	31			19		77, 78
1890		24	51, 52	41, 42	22		32			20		79, 80
1891		25	53, 54	43, 44	23	10	33			21		81, 82
1892		26	55, 56	45, 46	24	11	34			22		83, 84
1893		27	57, 58	47, 48	25	12	35			23		85, 86
1894		28	59, 60	49, 50	26	13	36			24		87, 88
1895		29	61, 62	51, 52	27	14	37			25		89, 90

OTHER SCIENTIFIC PERIODICALS—Part II—Continued

Pogg	Proc Am Acad	Proc Roy Soc	Rep Anal Ch	R t c	Techn J B	W A B	W Ann	Z anal	Z angew Ch	Z anorg	Zett Ch	Z phys Ch
73-75	3											
76-78	4					1						
79-81						2, 3						
82-84		5				4, 5						
85-87						6, 7						
88-90						8, 9						
91-93		6				10, 11						
94-96	5					12-14						
97-99		7			(1) 1	15-18						
100-102		8			2	19-21						
103-105	6				3	22-27						
106-108		9			4	28-33						
109-111	7	10			5	34-38					(1) 1	
112-114	8				6	39-42					2	
115-117		11			7	43					3	
118-120		12			8	44, 45					4	
121-123		13			9	46-48					5	
124-126		14			10	49						
127-129					11	50-52						
130-132	9	15			12	53, 54					(2) 1	
133-135	10	16			13	55, 56					2	
136-138		17			14	57, 58					3	
139-141		18			15	59, 60					4	
142-144		19			(2) 1	61, 62					5	
145-147		20			2	63, 64					6	
148-150		21			3	65, 66						
151-153		22			4	67, 68						
154-156		23			5	69, 70						
157-159	11	24			6	71, 72						
160	12	25			7	73, 74						
Compt Rend	13	26			8	75, 76	1, 2					
W Ann	14	27			9	77, 78	3, 4					
	15	28			10	79, 80	5, 6					
	16	29			11	81, 82	7, 8					
	17	30			12	83, 84	9, 11					
	18	31			13	85, 86	12, 14					
	19	32			14	87, 88	15, 17					
	20	33			15	89, 90	18, 20					
	21	34			16	91, 92	21, 26					
	22	35			17	93, 94	27, 29					
	23	36			18	95, 96	30, 32					
	24	37			19	97, 98	33, 35					
	25	38			20	99, 100	36, 38					
	26	39			21	101, 102	39, 41					
	27	40			22	103, 104	42, 44					
	28	41			23	105, 106	45, 47					
	29	42			24	107, 108	48, 50					
	30	43			25	109, 110	51, 53					
		44			26	111	54, 56					

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	J Chm méd	Jena Zeit	J Pharm	J pr	J Russ Soc	J Soc Chem Ind	M Ch	Monit Scienc	N Cum	N Rep Pharm	Pharm J Trans	Phil Mag
1848	4		13, 14	43-45								32, 33
1849	5		15, 16	46-48								34, 35
1850	6		17, 18	49-51								36, 37
1851	7		19, 20	52-54								(4) 1, 2
1852	8		21, 22	55-57						1		3, 4
1853	9		23, 24	58-60						2		5, 6
1854	10		25, 26	61-63					1, 2	3		7, 8
1855	(4) 1		27, 28	64-66					3, 4	4		9, 10
1856	2		29, 30	67-69				(1) 1	5, 6	5		11, 12
1857	3		31, 32	70-72				2	7, 8	6		13, 14
1858	4		33, 34	73-75				3	9, 10	7		15, 16
1859	5		35, 36	76-78				4	11, 12	8		17, 18
1860	6		37, 38	79-81					13, 14	9		19, 20
1861	7		39, 40	82-84						10		21, 22
1862	8		41, 42	85-87				5		11		23, 24
1863	9		43, 44	88-90				(2) 6		12		25, 26
1864	10	1	45, 46	91-93				7		13		27, 28
1865	(5) 1		(4) 1, 2	94-96				8		14		29, 30
1866	2	2	3, 4	97-99				9		15		31, 32
1867	3	3	5, 6	100-102				10		16		33, 34
1868	4	4	7, 8	103-105				11		17		35, 36
1869	5		9, 10	106-108	1			12		18		37, 38
1870	6		11, 12	(2) 1, 2	2			(3) 13		19		39, 40
1871	7		13, 14	3, 4				14		20		41, 42
1872	8		15, 16	5, 6	4					21		43, 44
1873	9	7	17, 18	7, 8				15		22		45, 46
1874	10	8	19, 20	9, 10				16		23		47, 48
1875	11	9	21, 22	11, 12				17		24		49, 50
1876	12	10	23, 24	13, 14				18				51, 52
1877		110	25, 26	15, 16				19				53, 54
1878		12	27, 28	17, 18	10			20				55, 56
1879		13	29, 30	19, 20	11			21				57, 58
1880		14	(5) 1, 2	21, 22	12			22				59, 60
1881		15	3, 4	23, 24	13			23				61, 62
1882		16	5, 6	25, 26	14	1		24				63, 64
1883		17	7, 8	27, 28	15	2		25				65, 66
1884		18	9, 10	29, 30	16	3		26				67, 68
1885		19	11, 12	31, 32	17	4		27				69, 70
1886		20	13, 14	33, 34	18	5		28				71, 72
1887		21	15, 16	35, 36	19	6		29				73, 74
1888		22	17, 18	37, 38	20	7		30				75, 76
1889		23	19, 20	39, 40	21	8		31				77, 78
1890		24	21, 22	41, 42	22	9		32				79, 80
1891		25	23, 24	43, 44	23	10		33				81, 82
1892		26	25, 26	45, 46	24	11		34				83, 84
1893		27	27, 28	47, 48	25	12		35				85, 86
1894		28	29, 30	49, 50	26	13		36				87, 88
1895		29	31, 32	51, 52	27	14		37				89, 90
1896		30	33, 34	53, 54	28	15		38				91, 92
1897		31	35, 36	55, 56	29	16		39				93, 94
1898		32	37, 38	57, 58	30	17		40				95, 96
1899		33	39, 40	59, 60	31	18		41				97, 98
1900		34	41, 42	61, 62	32	19		42				99, 100
1901		35	43, 44	63, 64	33	20		43				101, 102
1902		36	45, 46	65, 66	34	21		44				103, 104
1903		37	47, 48	67, 68	35	22		45				105, 106
1904		38	49, 50	69, 70	36	23		46				107, 108
1905		39	51, 52	71, 72	37	24		47				109, 110
1906		40	53, 54	73, 74	38	25		48				111, 112
1907		41	55, 56	75, 76	39	26		49				113, 114
1908		42	57, 58	77, 78	40	27		50				115, 116
1909		43	59, 60	79, 80	41	28		51				117, 118
1910		44	61, 62	81, 82	42	29		52				119, 120
1911		45	63, 64	83, 84	43	30		53				121, 122
1912		46	65, 66	85, 86	44	31		54				123, 124
1913		47	67, 68	87, 88	45	32		55				125, 126
1914		48	69, 70	89, 90	46	33		56				127, 128
1915		49	71, 72	91, 92	47	34		57				129, 130
1916		50	73, 74	93, 94	48	35		58				131, 132
1917		51	75, 76	95, 96	49	36		59				133, 134
1918		52	77, 78	97, 98	50	37		60				135, 136
1919		53	79, 80	99, 100	51	38		61				137, 138
1920		54	81, 82	101, 102	52	39		62				139, 140
1921		55	83, 84	103, 104	53	40		63				141, 142
1922		56	85, 86	105, 106	54	41		64				143, 144
1923		57	87, 88	107, 108	55	42		65				145, 146
1924		58	89, 90	109, 110	56	43		66				147, 148
1925		59	91, 92	111, 112	57	44		67				149, 150
1926		60	93, 94	113, 114	58	45		68				151, 152
1927		61	95, 96	115, 116	59	46		69				153, 154
1928		62	97, 98	117, 118	60	47		70				155, 156
1929		63	99, 100	119, 120	61	48		71				157, 158
1930		64	101, 102	121, 122	62	49		72				159, 160
1931		65	103, 104	123, 124	63	50		73				161, 162
1932		66	105, 106	125, 126	64	51		74				163, 164
1933		67	107, 108	127, 128	65	52		75				165, 166
1934		68	109, 110	129, 130	66	53		76				167, 168
1935		69	111, 112	131, 132	67	54		77				169, 170
1936		70	113, 114	133, 134	68	55		78				171, 172
1937		71	115, 116	135, 136	69	56		79				173, 174
1938		72	117, 118	137, 138	70	57		80				175, 176
1939		73	119, 120	139, 140	71	58		81				177, 178
1940		74	121, 122	141, 142	72	59		82				179, 180
1941		75	123, 124	143, 144	73	60		83				181, 182
1942		76	125, 126	145, 146	74	61		84				183, 184
1943		77	127, 128	147, 148	75	62		85				185, 186
1944		78	129, 130	149, 150	76	63		86				187, 188
1945		79	131, 132	151, 152	77	64		87				189, 190
1946		80	133, 134	153, 154	78	65		88				191, 192
1947		81	135, 136	155, 156	79	66		89				193, 194
1948		82	137, 138	157, 158	80	67		90				195, 196
1949		83	139, 140	159, 160	81	68		91				197, 198
1950		84	141, 142	161, 162	82	69		92				199, 200
1951		85	143, 144	163, 164	83	70		93				201, 202
1952		86	145, 146	165, 166	84	71		94				203, 204
1953		87	147, 148	167, 168	85	72		95				205, 206
1954		88	149, 150	169, 170	86	73		96				207, 208
1955		89	151, 152	171, 172	87	74		97				209, 210
1956		90	153, 154	173, 174	88	75		98				211, 212
1957		91	155, 156	175, 176	89	76		99				213, 214
1958		92	157, 158	177, 178	90	77		100				215, 216
1959		93	159, 160	179, 180	91	78		101				217, 218
1960		94	161, 162	181, 182	92	79		102				219, 220
1961		95	163, 164	183, 184	93	80		103				221, 222
1962		96	165, 166	185, 186	94	81		104				223, 224
1963		97	167, 168	187, 188	95	82		105				225, 226
1964		98	169, 170	189, 190	96	83		106				227, 228
1965		99	171, 172	191, 192	97	84		107				229, 230
1966		100	173, 174	193, 194	98	85		108				231, 232
1967		101	175, 176	195, 196	99	86		109				233, 234
1968		102	177, 178	197, 198	100	87		110				235, 236
1969		103	179, 180	199, 200	101	88		111				237, 238
1970		104	181, 182	201, 202	102	89		112				239, 240
1971		105	183, 184	203, 204	103	90		113				241, 242
1972		106	185, 186	205, 206	104	91		114				243, 244
1973		107	187, 188	207, 208								

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	A	A ch	Am Ch J	Am J Sci	Arch Pharm	B	Bull Soc	C A	Chem Soc	Chem Weekbl	C R	Gazz ch it	J Am Chem Soc
1896	289-293	(7)7-9	18	(4)1, 2	234	29	(2)15, 16		69, 70		122, 123	26	18
1897	294-298	10-12	19	3, 4	235	30	17, 18		71, 72		124, 125	27	19
1898	299-303	13-15	20	5, 6	236	31	19, 20		73, 74		126, 127	28	20
1899	304-309	16-18	21, 22	7, 8	237	32	21, 22		75, 76		128, 129	29	21
1900	310-314	19-21	23, 24	9, 10	238	33	23, 24		77, 78		130, 131	30	22
1901	314-319	22-24	25, 26	11, 12	239	34	25, 26		79, 80		132, 133	31	23
1902	320-326	25-27	27, 28	13, 14	240	35	27, 28		81, 82		134, 135	32	24
1903	326-330	28-30	29, 30	15, 16	241	36	29, 30		83, 84		136, 137	33	25
1904	330-338	(8)1-3	31, 32	17, 18	242	37	31, 32		85, 86	1	138, 139	34	26
1905	338-343	4-6	33, 34	19, 20	243	38	33, 34		87, 88	2	140, 141	35	27
1906	344-351	7-9	35, 36	21, 22	244	39	35, 36		89, 90	3	142, 143	36	28
1907	351-358	10-12	37, 38	23, 24	245	40	(4) 1, 2	1	91, 92	4	144, 145	37	29
1908	358-364	13-15	39, 40	25, 26	246	41	3, 4	2	93, 94	5	146, 147	38	30
1909	364-371	16-18	41, 42	27, 28	247	42	5, 6	3	95, 96	6	148, 149	39	31
1910	371-378	19-21	43, 44	29, 30	248	43	7, 8	4	97, 98	7	150, 151	40	32
1911	378-386	22-24	45, 46	31, 32	249	44	9, 10	5	99, 100	8	152, 153	41	33
1912	386-394	25-27	47, 48	33, 34	250	45	11, 12	6	101, 102	9	154, 155	42	34
1913	395-402	27-30	49, 50	35, 36	251	46	13, 14	7	103, 105	10	156, 157	43	35
1914	402-406	(9)1-2		37, 38	252	47	15, 16	8	105, 106	11	158, 159	44	36
1915	407-410	3-4		39, 40	253	48	17, 18	9	107, 108	12	160, 161	45	37

OTHER SCIENTIFIC PERIODICALS—Part III

J Pharm	J phys Ch	J pr	J Soc Chem Ind	M	Proc Roy Soc	R t c	W Ann	Z anal	Z angew Ch	Z anorg	Z Liek trochem	Z Krvst Min	Z phys Ch
(6)3, 4		53, 54	15	17	59, 60	15	57-59	35	10	11, 12	3	25, 26	19-21
5, 6	1	55, 56	16	18	60, 61	16	60-62	36	11	13-15	4	27, 28	22-24
7, 8	2	57, 58	17	19	62, 63	17	63-65	37	12	16-18	5	29	25-27
9, 10	3	59, 60	18	20	64, 65	18	66-68	38	13	19-21	6	30, 31	28-31
11, 12	4	61, 62	19	21	66, 67	19	(4)1-3	39	14	22-25	7	32, 33	32-35
13, 14	5	63, 64	20	22	68, 69	20	4-6	40	15	26-29		34	36-39
15, 16	6	65, 66	21	23	70, 71	21	7-9	41	16	29-33	8	35, 36	39-42
17, 18	7	67, 68	22	24	71, 72	22	10-12	42	17	33-37	9	37	42-46
21, 22	9	71, 72	24	26	76A	24	16-18	44	19	43-44	11	40	50-54
23, 24	10	73, 74	25	27	77, 78A	25	09-21	45	20	48-51	12	41, 42	54-57
25, 26	11	75, 76	26	28	79A	26	22-24	46	21	52-56	13	42-44	57-61
27, 28	12	77, 78	27	29	80, 81A	27	25-27	47	22	56-60	14	44, 45	61-65
29, 30	13	79, 80	28	30	82, 83A	28	28-30	48	23	61-65	15	46	65-68
(7)1, 2	14	81, 82	29	31	83, 84A	29	33-31	49	24	65-69	16	47	68-75
3, 4	15	83, 84	30	32	84-86A	30	34-36	50	25	69-73	17	48, 49	75-78
5, 6	16	85, 86	31	33	86, 87A	31	37-39	51	26	73-79	18	50	78-81
7, 8	17	87, 88	32	34	88, 89A	32	40-42	52	27	79-84	19	51, 52	81-86
9, 10	18	89, 90	33	35	89, 91A	33	43-45	53	28	84-89	20	53	86-89
11, 12	19	91, 92	34	36	91, 92A	34	46-48	54	29	90-93	21	54	89, 90

SYNCHRONISTIC TABLE OF CHEMICAL AND

Year	A	A ch	Am Ch J	Am J Sci	Arch Pharm	B	Bull Soc	C A	Chem Soc	Chem Weekbl	C R	Gazz ch it	J. Am Chem Soc
1896	289-293	(7)7-9	18	(4)1, 2	234	29	(2)15, 16		69, 70		122, 123	26	18
1897	294-298	10-12	19	3, 4	235	30	17, 18		71, 72		124, 125	27	19
1898	299-303	13-15	20	5, 6	236	31	19, 20		73, 74		126, 127	28	20
1899	304-309	16-18	21, 22	7, 8	237	32	21, 22		75, 76		128, 129	29	21
1900	310-314	19-21	23, 24	9, 10	238	33	23, 24		77, 78		130, 131	30	22
1901	314-319	22-24	25, 26	11, 12	239	34	25, 26		79, 80		132, 133	31	23
1902	320-326	25-27	27, 28	13, 14	240	35	27, 28		81, 82		134, 135	32	24
1903	326-330	28-30	29, 30	15, 16	241	36	29, 30		83, 84		136, 137	33	25
1904	330-338	(8)1-3	31, 32	17, 18	242	37	31, 32		85, 86	1	138, 139	34	26
1905	338-343	4-6	33, 34	19, 20	243	38	33, 34		87, 88	2	140, 141	35	27
1906	344-351	7-9	35, 36	21, 22	244	39	35, 36		89, 90	3	142, 143	36	28
1907	351-358	10-12	37, 38	23, 24	245	40	(4) 1, 2	1	91, 92	4	144, 145	37	29
1908	358-364	13-15	39, 40	25, 26	246	41	3, 4	2	93, 94	5	146, 147	38	30
1909	364-371	16-18	41, 42	27, 28	247	42	5, 6	3	95, 96	6	148, 149	39	31
1910	371-378	19-21	43, 44	29, 30	248	43	7, 8	4	97, 98	7	150, 151	40	32
1911	378-386	22-24	45, 46	31, 32	249	44	9, 10	5	99, 100	8	152, 153	41	33
1912	386-394	25-27	47, 48	33, 34	250	45	11, 12	6	101, 102	9	154, 155	42	34
1913	395-402	27-30	49, 50	35, 36	251	46	13, 14	7	103, 105	10	156, 157	43	35
1914	402-406	(9)1-2		37, 38	252	47	15, 16	8	105, 106	11	158, 159	44	36
1915	407-410	3-4		39, 40	253	48	17, 18	9	107, 108	12	160, 161	45	37

OTHER SCIENTIFIC PERIODICALS—Part III

J Pharm	J phys Ch	J pr	J Soc Chem Ind	M	Proc Roy Soc	R t c	W Ann	Z anal	angew Ch	Z anorg	Z Dlek trochem	Z Krvst Min	Z phys Ch
(6)3, 4		53, 54	15	17	59, 60	15	57-59	35	10	11, 12	3	25, 26	19-21
5, 6	1	55, 56	16	18	60, 61	16	60-62	36	11	13-15	4	27, 28	22-24
7, 8	2	57, 58	17	19	62, 63	17	63-65	37	12	16-18	5	29	25-27
9, 10	3	59, 60	18	20	64, 65	18	66-68	38	13	19-21	6	30, 31	28-31
11, 12	4	61, 62	19	21	66, 67	19	(4)1-3	39	14	22-25	7	32, 33	32-35
13, 14	5	63, 64	20	22	68, 69	20	4-6	40	15	26-29		34	36-39
15, 16	6	65, 66	21	23	70, 71	21	7-9	41	16	29-33	8	35, 36	39-42
17, 18	7	67, 68	22	24	71, 72	22	10-12	42	17	33-37	9	37	42-46
21, 22	9	71, 72	24	26	76A	24	16-18	44	19	43-44	11	40	50-54
23, 24	10	73, 74	25	27	77, 78A	25	09-21	45	20	48-51	12	41, 42	54-57
25, 26	11	75, 76	26	28	79A	26	22-24	46	21	52-56	13	42-44	57-61
27, 28	12	77, 78	27	29	80, 81A	27	25-27	47	22	56-60	14	44, 45	61-65
29, 30	13	79, 80	28	30	82, 83A	28	28-30	48	23	61-65	15	46	65-68
(7)1, 2	14	81, 82	29	31	83, 84A	29	33-31	49	24	65-69	16	47	68-75
3, 4	15	83, 84	30	32	84-86A	30	34-36	50	25	69-73	17	48, 49	75-78
5, 6	16	85, 86	31	33	86, 87A	31	37-39	51	26	73-79	18	50	78-81
7, 8	17	87, 88	32	34	88, 89A	32	40-42	52	27	79-84	19	51, 52	81-86
9, 10	18	89, 90	33	35	89, 91A	33	43-45	53	28	84-89	20	53	86-89
11, 12	19	91, 92	34	36	91, 92A	34	46-48	54	29	90-93	21	54	89, 90